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Agricultural Extension
in South Asia

Taking Stock and
Shaping the Future:

CONVERSATIONS ON EXTENSION



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Taking Stock and Shaping the Future: Conversations on Extension

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May 2019

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About AESA

Agricultural Extension in South Asia (AESA) is a network of all those who are interested and involved in Extension and Advisory Services (EAS) in South Asia (www.aesanetwork.org).

Our vision is to improve food and nutrition security through effective and efficient EAS in South Asia. Our mission is to promote sharing, learning and networking for building effective and efficient EAS.

AESA is part of the **Global Forum for Rural Advisory Services (GFRAS)**.

The **Centre for Research on Innovation and Science Policy (CRISP)** hosts the Secretariat of AESA. CRISP conducts policy relevant research on agricultural extension and rural innovation.

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Any opinions expressed here are those of the authors of the various blog pieces.

Editors

Background

During the last six years (2013-2019), the Agricultural Extension in South Asia (AESA) Network has served as a platform for collating the voices, insights, concerns, and experiences of people in the extension sphere of South Asia. Diverse professionals shared their concerns on the present and future of Extension and Advisory Services (EAS) in the form of blog conversations for AESA. Together, all of these individuals who are involved, interested and passionate about EAS, discussed ways to move beyond some of the seemingly intransigent problems that are hindering the professionalization of EAS. Nevertheless, these blogs also take the time to celebrate and salute the signs of promising new beginnings.

This publication is an effort on our part to compile 100 such conversations on EAS, which were originally published as AESA blogs, starting in February 2013, into this book. Several of our readers have been asking us to assemble all these reflections into a single document so that these are available as a good reference document for a wide spectrum of actors involved in EAS – scholars, practitioners, trainers, faculty, innovation intermediaries, mentors, leaders and managers – all of whom are involved in driving agricultural and rural transformation.

Introduction

Why conversations are important

The developmental and policy context that led to the establishment and strengthening of EAS in the 20th century no longer exists currently in most countries. To remain relevant and contribute effectively to agricultural and rural transformation we need to continuously challenge our professional beliefs and paradigms that have so far shaped our professional behaviour. We need to experiment, evaluate and learn from alternative approaches, and then re-tool, re-equip and re-acquaint our professionals with new knowledge and skills. Conversations around our present and future contributions are a sine qua non for reinventing extension in order to deal with the emerging challenges. This collection of professional reflections by those involved and interested in the policy and practice of extension, is surely one of the most credible means of strengthening EAS.

Farming context as well as farmers aspirations are evolving rapidly. Since our profession deals with the provision of EAS to rural communities it is all the more incumbent upon us that we pause, take stock, probe, self-reflect and then only move forward with more focused and relevant strategies. This is where these conversations become so crucial as we believe that these are not merely conversations but 'voices for change'. These conversations nearly encompass all the issues that EAS are facing and are critical not only for its present, but also for a future that remains relevant to the changing context.

New challenges before EAS

The global food and agriculture sector faces several new challenges. While agribusiness companies and globalised supply chains are transforming agriculture in many parts of the world, the sector faces several new challenges. These include: changing climate, a depleting natural resources base, unstable market dynamics, the unrealized productivity potential of youth and women, along with the critical need to feed the world's growing population through sustainable farming practices.

In South Asia, the agricultural sector is dominated by small farms – often with weak bargaining powers and a limited political voice. Women constitute the majority of the agricultural labour force in small-scale and subsistence farming in the region. The Global Food Policy Report (IFPRI 2018) noted that "South Asia is highly vulnerable to climate change, as climate variables such as temperature, rainfall, flooding, and drought increasingly affects agricultural activities". These new challenges also mean that EAS need to tackle a diversity of objectives that include, but go well beyond, transferring new technologies. A pluralistic, demand driven and gender responsive extension provision that offers a much broader support to rural producers, is critical for agricultural development and ending hunger in South Asia.

While EAS need more human and financial resources to address these new challenges, trends towards state withdrawal from extension and decreased public funding initiated in several countries during the 1990s affected the delivery of EAS. In South Asia, this gap has been partially filled by new non-traditional actors

providing extension services, such as non-governmental organizations (NGOs), private companies engaged in agribusiness (e.g.: selling inputs and procurement and value addition of farm produce), producers' organizations, independent consultants, etc. While they bring enormous value to EAS, lack of coordination of the multiple stakeholders has often jeopardized the effectiveness and inclusiveness of the whole system.

In South Asia, historically, the main focus of public EAS has been on cereals. The horticultural sector started receiving attention only in recent years. Livestock and fisheries are yet to get the desired attention. Though South Asian countries have a long history of organising and reforming extension services, much more needs to be done to strengthen their capacities to deal with the rapidly evolving challenges in agriculture.

New approaches and new capacities

In this changing context, previous top-down approaches where EAS would simply transfer new technologies to producers can no longer address modern challenges, and it appears clear that the EAS will be able to effectively support producers only if it develops new capacities to meet these fresh challenges. For this to happen, diverse EAS providers should also coordinate in order to be able to offer a very wide range of services. While technology transfer focusing on dissemination of new technical knowledge may still be needed, other aspects have become equally or even more important. These include provision of market information, supporting farmers on business and negotiation skills, promoting entrepreneurship among farmers, developing capacities to work with women, youth, migrants and vulnerable groups, supporting adaptation to climate change, etc. Many of these new capacities that are needed at the individual, organisational, and enabling environment levels are articulated in the New Extensionist Position Paper (GFRAS 2012).

Moreover, solutions for most of these new challenges would require new forms of interaction, organization, and agreement between multiple actors (Leeuwis 2004) within the Agricultural Innovation System. EAS could support the innovation process by:

- organising producers and building their capacities to deal with production, natural resource management, and marketing challenges;
- building necessary linkages for producers to access market, credit, and other types of information and inputs needed to improve their production and livelihoods;
- creating space or opportunities to exchange information and experiences among farmers and rural communities for scaling innovation; and
- building coalitions or platforms to facilitate development of consortia of different organisations to address specific issues (e.g. value chain development, participatory irrigation management, inputs to policy formulation, etc.) and also for information sharing and learning.

Clearly, to perform these new roles and provide these broader ranges of services, EAS need new knowledge and skills. Governments can play an important role in creating enabling conditions for agricultural innovation through coordination, development of an appropriate policy framework, innovative financing mechanisms and knowledge management. There is a need to generate policy-relevant evidence on the performance and impact of EAS through research and evaluation. However, the capacities to perform

these roles are limited across all levels – individual, organisational and the enabling environment. A recent capacity needs assessment of EAS providers undertaken in four South Asian countries (Bangladesh, India, Nepal and Sri Lanka) revealed several gaps in capacities at these different levels (AESAs 2016). The conversations in this compilation explore many of these issues, discuss the challenges and ways forward, and also present some promising solutions to address these challenges.

Organisation of this document

The 100 conversations which we published over the last six years are grouped under the following 11 themes:

- Capacity Development for Extension Professionals;
- The Governance of Extension and Advisory Services;
- Strengthening Extension Research;
- New Approaches and Tools for Extension and Advisory Services;
- Promoting Agripreneurship and Technology Commercialisation;
- ICTs for Extension;
- Skill Development;
- Livestock Extension;
- Engaging Youth, Farm Women and Producer Organisations in Extension;
- Influencing Policies;
- Dealing with Uncertainties.

This book ends with a reflection on the AESA web portal; and a deliberation on what else is needed, beyond conversations, to strengthen EAS.

We hope this publication will significantly contribute to the process of strengthening EAS in South Asia and beyond.

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**CAPACITY
DEVELOPMENT
FOR EXTENSION
PROFESSIONALS**

01

01

VALUES AND COMPETENCIES IN AGRICULTURAL EXTENSION

The contribution of extension could be further accentuated if the extension professionals adopt certain human positive values. A parallel investment for development of positive values through pre-service, induction, and in-service trainings is essential for the success of any agricultural extension worker. In this blog, SVN Rao and PVK Sasidhar emphasise these values which every extension workers must imbibe and internalise.

Values or what we value in our life determine the way we live, as they play an important role in prioritisation of our interests and in decision making. Positive values bring in positive effects and negative ones bring in negative effects on the society. There are certain positive values which we need to cherish for the welfare of the society which we often call as general values (irrespective of the profession). Some values are specific to a particular profession and these values drive our professional behaviour (Advaita, 2010).

In the case of public servants, it is becoming increasingly difficult to maintain moral standards and human values in the conduct of public affairs. This is because of the glamour the society is attaching to material prosperity. Although it is the responsibility of the government to provide a clean administration by inculcating ethics and human values in administration, it hasn't been able to do so in several cases (Sukhwinder, 2012).

Why Values are important for Extension Professionals?

Values are important in all walks of life irrespective of the profession and position in the hierarchy. "These values communicate 'what we stand for' and 'what is important to us' ...values are the soul of the organization" (Hitt, 1988). One sign of a healthy, productive organization is agreement between the organization's values and the daily behaviours of its members. This behaviour is determined both by individuals' personal experiences as well as their experiences in a specific profession.

All professions develop their own self-image based on their member's attitudes, and an external image that depends on how they are seen by non-members. Neither can be considered without referring to moral and ethical questions (Hoffman et al 2009a). Values and attitudes such as faith in rural people, commitment to agricultural development, and concern for the whole community are important for all extension personnel (Vijayaraghavan and Singh, 1997) See <http://www.fao.org/docrep/W5830E/w5830e0g.html>.

Although some of the old Agricultural Extension text books (Reddy, 1971) do mention about some of these values as commandments for extension professionals, these are either ignored or not given the prominence they deserve. In the United States of America, Epsilon Sigma Phi (ESP), an independent not-for-profit organization of extension professionals has developed a creed for extension professionals (Box 1).

Box 1: Extension Professionals' Creed

I believe in people and their hopes, their aspirations, and their faith; in their right to make their own plans and arrive at their own decisions; in their ability and power to enlarge their lives and plan for the happiness of those they love.

I believe that education, of which Extension is an essential part, is basic in stimulating individual initiative, self-determination, and leadership; that these are the keys to democracy and that people when given facts they understand, will act not only in their self-interest, but also in the interest of society.

I believe that education is a lifelong process and the greatest university is the home; that my success as a teacher is proportional to those qualities of mind and spirit that give me welcome entrance to the homes of the families I serve.

I believe in intellectual freedom to search for and present the truth without bias and with courteous tolerance toward the views of others.

I believe that Extension is a link between the people and the ever-changing discoveries in the laboratories.

I believe in the public institutions of which I am a part.

I believe in my own work and in the opportunity I have to make my life useful to humanity.

Because I Believe these things, I am an Extension professional.

<http://espnational.org/en/11-about-us/extension-worker-s-creed/47-esp-written-creed>

Box 2: Effective Vs. Ineffective Extension Workers

Extension experience in different parts of the world has stressed the extension workers' central importance and has highlighted a number of features which distinguish an effective extension worker from a less effective one.

An effective extension worker:

- Spends time in developing the skills and attributes of the farmers themselves, and does not merely concentrate on extension projects,
- Gets out to visit and meet farmers and does not become an office bureaucrat,
- Encourages local initiative and self-reliance, and does not adopt a paternalistic attitude towards farmers,
- Plans for the long term development of his area, and does not seek only quick results.

The work of an extension worker demands the particular values of dedication, humility and hard work. Extension administrators should ensure that extension workers are thoroughly prepared before they begin extension activities.

Source : Oakley and Garforth (1985)

The work of Extension professionals requires in-depth knowledge of the processes of effective formal and informal education and the subject matter discipline in which he/she specializes. All extension workers need abilities to perform a task and their performance is directly related to the following aspects:

- The quantum of knowledge about the task,
- The extent of skills they possess, and
- The type of attitude they have towards work.

These behavioural aspects, called as competencies in a way differentiate an 'effective extension worker' from an 'ineffective one' (Box 2).

Hoffman et al (2009b) noted that "Not every person is equally talented to become a good adviser. People who are strongly oriented towards achievement or motivated by power are less suited compared to those who are motivated

by affiliation. A prerequisite for advisory work is the guarantee of confidentiality. But also patience and the art of listening need to be mastered.

An adviser should be able to perform in flexible roles, should have a high level of tolerance towards ambiguity, and a stable personality. Those who have problems with themselves are unable to concentrate fully on the situation of the partner and are not best helpers. Besides these attitudes and personal traits, a good adviser has learned the basics about human behavior and has diagnostic skills to understand the client and his perception of his situation; he also possesses a larger repertory of techniques of intervention and communication".

Extension workers need to upgrade their competencies to match with the changing demands of their work. Irrespective of the methods (pre-service, induction, in-service trainings,

symposia, workshops, and demonstrations) employed to upgrade their competencies, what matters is the mindset of the trainer as well as the trainee. The trainer must be competent to train and ready to impart the skills to the trainees. At the same time, the trainees must be receptive and ready to acquire the skills. This in turn rests up on the values the trainer and the trainees cherish towards the work.

Though essential, values are not being taught in class rooms. We learn or imbibe these values from our role models or parents or teachers. It is easy to preach these values than to follow. The values need to be respected and inculcate. Today, in the society most of us are not able to imbibe and internalise the values and hence people have no opportunity to learn about them. These values are supposed to be passed on from generation to generation. When majority of the people in a society are dishonest, it is very difficult to avoid its negative impact on the young generation. The person who is a stickler of the values is ideally suitable to preach. There are no attempts to do so mainly because these values were thrown to winds. These values are considered as surreal and obsolete in this present day materialistic world.

Following are some of the values that every extension worker should possess, among others:

- **Work is worship:** The job of extension professionals is to help farmers in several ways and they are expected to do it with utmost sincerity and honesty which is considered equivalent to worshipping the Almighty. Inactivity or not doing the duty or work assigned to them is a sin. We must do our duty as extension professionals to the best of our ability. This reflects upon the effectiveness and efficiency of extension worker in performing extension activities.

Extension workers who cherish this positive value will try to acquire competencies to perform their duties to the best of their ability. It is said that "A man should not be judged by the nature of his duties, but by the manner in which he does them. Every duty is holy, and devotion to duty is the highest form of the worship to God. What is important is not what we are doing but how we are doing it." (Swami Vivekananda, 2003).

- **Help the farmers selflessly and transparently:** The farmers, basically food producers, are the back bone of any country and no country can afford to ignore their contribution. The extension professionals have the unique opportunity of helping the farmers directly in increasing food production to meet

the nation's food requirements as well as export demand. The greatest service to society is to help farmers without any expectations (cash or kind) from them.

Selfishness, 'thinking of ourselves first' is the main sin (Swami Vivekananda, 2003). Many among us are working with a business motive i.e., exchange phenomenon. We help others with an expectation of getting something in lieu of our help. Unselfishness will bring success. Whereas, selfishness leads to greed which is detrimental not only to society but also ruins the individual in question. The degree of unselfishness marks the degree of success everywhere. Extension professional must be a true friend of farmers in helping them to produce more from his crops and livestock to feed our ever increasing population. If an extension worker has no or little concern for the farmers, he or she cannot turn out to be a good extension worker and obviously the farmers cannot derive benefit from him which ultimately reflects on the farmers' poor production.

Inbuilt is the value 'transparency' in dealing with the farmers. It is necessary for us to win the trust and confidence of the farmers to plan and implement various extension programmes which are not possible to accomplish without being transparent in working with them.

- **No wealth without work:** This is a fundamental principle on which the lifestyle of an individual depends. The exponential growth in corruption which cuts across religion, caste, language, sex, profession, etc., is attributed to the gross violation of this "value". We are not supposed to accept anything (cash or kind) for which we have not put our effort. All types of problems we are facing today have their roots in our objective of getting easy money that too without sweating for it. As a result, the cases of "wealth disproportionate to the known sources of income" are on the rise in our society which is growing unabated. Plagiarism (literary theft), which has taken the magnitude of a plague among the scientific community is another example of drastic violation of this principle.

Inaction is considered as a sin. But of late, inaction is indirectly rewarded rather than considering it as a sin (Box 3). Extension professionals must effectively deliver extension services with the sole objective of helping farmers without any expectations from the latter. Quite often than not, our public extension system is criticised for delay in delivery of inputs (seeds, fertilizers, vaccines, etc.,) and services.

Box 3: Where there is no cost for doing nothing

"The primary cause behind the snail paced decision making in the Indian bureaucratic system is the incentive offered for doing nothing. When it comes to career advancement, there are hardly any repercussions for not taking any initiative. Contrast this, there is a likelihood that one may end up paying a very significant cost for taking an initiative or taking a decision that is not reliant upon routine precedents and requires an iota of reasoned thinking. Such a bureaucrat may come under the scrutiny of investigating agencies. A pending enquiry will definitely delay his or her promotion even if no merit is discovered. Till such time, penalising lack of initiative and offering immunity for reasoned decision making, it will be erroneous to assume that the pace of bureaucratic decision making will change in India.

Source: Pandey, 2016.

- **Accountability to society:** Every one of us is accountable to society as we derive lots of benefits from it. Man is basically egalitarian in nature and cannot lead a solitary life and depends upon society for satisfaction of his needs. Many of us do not realise that the every state government spends about. 10 to 15 lakh Rupees for producing a graduate (agriculture, veterinary, home science, dairy science) in addition to what the individual spends to

acquire the degree. Hence, morally we are bound to help society in its development. There are several ways one can be involved in helping society. In addition to helping the farmers in increasing their production, we can also extend our helping hand in nurturing values like "helping the people in distress or natural calamities," "sacrificing comforts with a focus on 'development of community rather than individual development'" (Box 4).

Box 4: Shift from Money making Machine to Social Person

"If you had met me a few months back, you would have been shocked. I used to work like a money making machine. I was never a social person. The floods taught me a great lesson. It was an eye opener for me." These were the words of 26 year old Mohammed Yunus who was recently honoured by the Government of Tamil Nadu for his selfless, noble, and brave act of rescuing nearly 2,100 people during the recent floods that devastated Chennai.

Source: The Hindu, Jan 27, 2016 Chennai edition.

This is the main idea behind the concept of Corporate Social Responsibility (CSR) and companies (established with profit motive) are expected to extend help in addressing the problems experienced by societies by spending some percentage of their income on rural development. Similarly all agricultural extension workers should feel "Individual Social Responsibility" to extend a helping hand to farmers and to justify Government's spending on agriculture education.

- **Wrong means can never justify the right ends:** Means are no less important than ends. There could be several ways and means to accomplish a task or attain a goal. But one should be careful in choosing the right means to attain the goal. Right means in the sense accepted and approved by the society in which one is working. One needs to be wise in discriminating (power of intellect/budhi) between right and wrong means. It is worth adopting the right means even if they fail to attain the goal. It is said that, "If a wrong person chooses the right means, the right means will work in the wrong way." We must refrain from achieving targets by targeting the rich or progressive farmers, making false promises to the farmers, etc.

- **Deceiving others tantamount to deceiving yourself:** The extension professionals (as researchers) are involved in organising field trials to test the improved seeds, fertilizers, medicines, chemicals, etc. In this process of experimentation, we should bring out the facts to the notice of the farmers without any bias (Fig. 1). Sometimes we wish to promote the products with a fervent appeal to the farmers although the product in question is not up to the standards. This happens mainly because the companies give us the sample

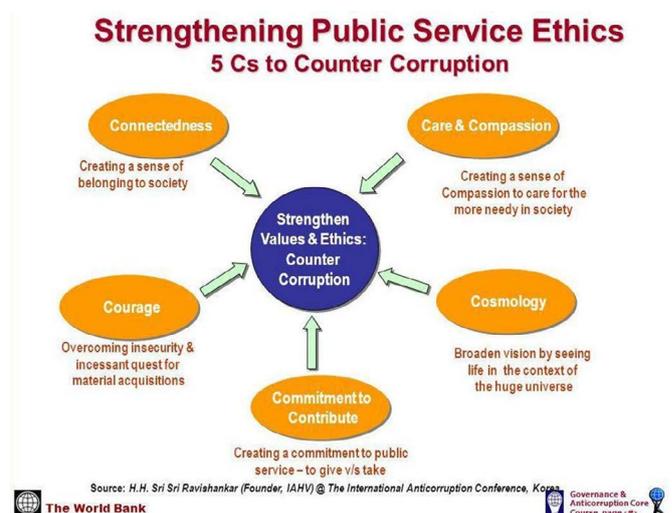


Fig. 1: 5Cs to counter corruption

products with associated freebies to conduct the field trials with an inbuilt expectation that we recommend their products for wider application. Honest reporting of the facts about the worth of a product is very much necessary as it helps us in deriving the peace of not cheating the farmers by giving false reports.

It is not out of context here to quote Michael (2016) who argued that "Considering the political complications in modern-day agriculture, the question that needs answering is this: How do Extension professionals work with people who have polarized agricultural values while respecting those values, not disrespecting the values of any group, and providing unbiased information? This question represents the challenge that faces everyone in agricultural education in the 21st century. We must be able to serve an ever-divided public and respect polarized differences among people, especially when working amid agencies that have more biased agricultural messages". The story of GM seeds (Box 5) is a case in itself.

• **Production by masses but not mass**

production: This is one of the most famous economic principles of Gandhiji (Schumacher, 1973) who insisted on involving more and more people in production to mitigate the problem of unemployment. In India the agricultural production, more so the livestock production, is in the hands of millions of

resource poor farmers who contribute to more than 60% of the agricultural produce in the country. In case of the livestock sector, priority must be given to the landless livestock farmers who need our help the most. Resource poor farmers are slowly deserting farming adding to the problem of unemployment and urban migration. We should be biased towards resource poor farmers in extending all possible help, although it is difficult to achieve targets. We have a tendency to work with few resource-rich farmers for obvious selfish reasons which needs to be curtailed. In response to this, several inclusive and targeted programmes focusing only on the small, marginal and landless farmers emerged over the past few years.

- **Inclusiveness:** Inequality in sharing and using resources is leading to the yawning gap between the rich and the poor. 90% of our resources are being used by 10% of the people and the remaining 10% of the resources are being shared by 90% of our population. The society is groping with the serious problem of social unrest leading to chaos mainly because of the inequality which arises because of greedy people. Gandhiji very rightly pointed out that "there is enough to meet the legitimate needs of every one, but not the greed of any one in the country." Extension workers must aim at reducing the gap between haves and have-nots by consciously working in line with the value of inclusive growth.

Box 5: The Story of Genetically Modified Seeds in India

Monsanto's operation in India illustrates monopolization and manipulation of the market economy, tradition, technology, and mis-governance. The world's largest producer of genetically engineered seeds has been selling genetically modified (GM) in India for the last decade to benefit the Indian farmers – or so the company claims.

Enter Monsanto with its "magic" GM seeds, to transform the lives of the poor Indian farmers. The U.S. agri-business giant took full advantage of its entry into the Indian market. It entered into an agreement with state governments including Rajasthan and Andhra Pradesh to introduce a Memorandum of Understanding (MOU) that dictated the terms of disseminating the GM technology in Indian market. For Monsanto, it is one thing to convince farmers to use artificial seeds for the purposes of enriching their lives, it is quite another to manipulate nature and technology to profit from them.

Source: Vandana Shiva <http://www.navdanya.org/news/423-genetically-modified-seeds-in-india>

Box 6: Changes in the Value Orientation Over a Period of Time

Values in the past

- If character is lost everything is lost and if wealth is lost nothing is lost
- Means are as important as ends
- Inactivity is a sin.
- Righteousness, moral, and ethical values are kept at a high pedestal.

What we value now

- If character is lost nothing is lost and if wealth is lost everything is lost
- Ends justify the means
- Inactivity quite often is rewarded while initiative may invite punishment.
- Righteousness, moral and ethical values are at low

Differences in the value Orientation

People change their values over a period of time. Slowly people are taking to negative values ignoring their serious negative impact on the society. For instance, in the past "character" was considered as the best value one should cherish throughout his life. Now its place is taken by wealth (Box 6). Extension workers must consciously aim at building character among the farmers which is possible only when they value the value of character. Extension professionals with unquestionable character alone can develop trust and confidence among the farmers. In fact the main purpose of education is building character and as professionals of extension education it is still more imperative for us to restore the well deserved place of character – highest value in any society.

- **Individual vs. Organisation Values:** If the value orientation of the individual and organisation is same the probability of accomplishing the objectives is high. On the contrary if they differ or are in disagreement with each other, it may lead to conflict and it may ultimately result in poor performance. Extension professionals may get into conflicts if their personal values and norms clash with those of the clients and the organisation in which they are working (van den Ban and Hawkins, 1996). Same is true with the conflicting values of the employer and employee. If the employer or boss is corrupt and aims at amassing wealth by hook or crook and if the employee or the subordinate is honest to the core, sooner rather than later, the

employee may have to desert the organisation because of the 'value conflict.' If he chooses to toe the line of his boss which is comparatively very easy, it is detrimental to the individual as well as to the society.

- **Value orientation in West and East:** The western society has no issues in slaughtering cows which are suffering with communicable or dreadful diseases like TB, mad cow, BSE (Bovine Spongiform Encephalopathy), FMD, etc. In UK during 2012, millions of cattle were destroyed when they were suspected to be suffering with BSE. Whereas in India, because of the value "cow is holy" we cannot slaughter the cows even if they are suffering with zoonotic diseases (that can be transmitted from man to animal and vice versa). To protect the cows (unproductive) from slaughter goshalas have been established and maintained in India by those who owe their allegiance to gomatha.

Existing situation on value Education

- **Values in School/College Curriculum:** Although values are very important in building a healthy and peaceful society, enough attention has not been paid to inculcate values among students. The fact that Moral Science which speaks of moral values are taught in the schools only up to 9th standard, reflects upon the importance we have been giving to values.
- **IGNOU's Programme On Value Education:** IGNOU has embarked upon a certificate programme to inculcate values among all those associated with education under distance education mode (Box 7).

Box 7: IGNOU's Certificate Programme in Value Education (CPVE)

CPVE is a six months certificate programme designed to inculcate the importance of value education in teaching learning process among teachers, teacher educators, graduates, NGO'S and professionals from the corporate and other sectors.

Course Structure

Course 1: Overview and Perspectives of Values: Deals with the socio-cultural milieu of the present day modern society, reconstructing the society through a holistic development of individuals' - cognitive, physical, affective and moral.

Course 2: Socio Psychological Basis: It analyzes the development of values from various angles: physical, social, intellectual, and spiritual that help in the building up of a holistic personality.

Course 3: Pedagogy of Values: It examines both the normative and descriptive foundations with emphasis on what kind of ethos/value structure could prevail in schools so that they can be considered truly educative institutions and professional communities. It discusses various value models, identification, integration, and transaction of values.

Course 4: Application and Support Skills: It discusses the importance of application skills as means to empower the younger generation and assist them in facing the challenging situations in their lives with an activity component.

Source: <http://www.ignou.ac.in/ignou/aboutignou/school/soeds/programmes/detail/539/2>

Similarly, MANAGE (National Institute of Agricultural Extension Management), Hyderabad has started organising a four day training programme on 'Work Ethics for Development Personnel'. This programme delves on ethics in Public service, understanding and maintaining ethical values in the Public sector, how to developing strong work ethics, how to improve employee work ethics, etc. The reading material for this course could be accessed at <http://www.manage.gov.in/studymaterial/workethics.pdf>.

Values in Curricula: The BVSc and AH curriculum has two courses— Veterinary Jurisprudence & Ethics and Veterinarian in Society— which contain

legal and ethical issues, responsibilities of a vet towards society, and dos and don'ts for a vet; with a focus on human welfare at its centre. Similarly, the vets take the Hippocratic Oath, which lays emphasis on ethical standards, and are expected to honour it while practicing as veterinarians. However, very few graduates (Veterinary, Agriculture, Fisheries, Dairy science) opt for extension profession and neither at graduate nor post graduate level the values required by an extension professional are inculcated. The Fifth Deans Committee Report constituted by the ICAR has proposed a new non-gradual course "Human Value and Ethics" for undergraduate courses in Agriculture (Box 8).

Box 8: Course on Values and Ethics (Credit hours: (1+0): Content

Values and Ethics-An Introduction, Goal and Mission of Life. Vision of Life. Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives. Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

Values in Corporate Sector: The corporate sector increasingly pick up candidates before they graduate (campus recruitment) and train them as per their organisational requirements which include core values and ethos. They usually pick up raw graduates when their minds are comparatively fresh as it is easy to mould them. Every company

has its own unique ethos on which the functioning of the company rests (Bani, 2009). The success of Matsushita (National/Panasonic) is attributed to its company's ethos developed and nurtured by its employees (Box 9). Similarly, civil servants are also given training to maintain certain core values in the interest of the nation.

Box 9: Seven Spiritual Values of Matsushita

The Japanese firm Matsushita has developed its own business philosophy from the founder Konosuke. This philosophy was codified as the "Seven Spiritual Values" of Matsushita that all employees learn today. These values are

- Contribution to society - national service through industry,
- Fairness and honesty,
- Cooperation and team spirit,
- Struggle for betterment,
- Courtesy and humility,
- Adaptability, and
- Gratitude.

Source:<http://www.panasonic.com/global/corporate/management/code-of-conduct/chapter-1.html>

Values in Public Sector Extension Agencies in India

With respect to public sector extension agencies there is nothing like a list of core values (like the extension professionals creed mentioned in Box 1) that need to be imbibed by the extension staff. 'Adherence to the rules' is an important value, which needs to be honoured in public sector organisations even at the cost of the work itself. Public sector extension staff timings quite often do not match with the time convenient to the farmers (before 10 am and after 4 pm). They are expected to perform the task during working hours (10 am

to 5 pm) and that too on week days (Monday to Friday). Transport is also available only during office hours for extension work. This mis-match in the timings has been found to impact extension work.

In this context, NGOs are better placed than public sector extension organisations. NGOs like PRADAN, BAIF, AWARE, SEVA, MSSRF, have their core values and the strength of these NGOs depend upon the extent to which these values are honoured by their staff. The flexible timings being followed by the NGOs will help in reaching the farmers and maintaining contact with them in an effective manner.

To succeed as a human being (must be more useful to the society than any other creature on this globe) in delivering extension services to the farmers, values discussed above are essential in addition to subject matter competencies and soft skills. Therefore a parallel investment in 'human values development' through pre-service, induction and in-service trainings is essential for the success of any agricultural extension worker.

The important values, if valued and cherished, help not only the farmers and extension professionals, but also the entire society. Ignoring these values leads to disproportionate wealth, conflicts, and social unrest; the signs of which are already visible in our society. Although many scholars in the past cautioned us about the negative consequences of neglecting these values in the society, till date we have not taken it seriously. It is high time we focus our attention to values which must be inculcated and imbibed. Cherish the values and save the society or else perish. It is said "Dharmo rakshati -Protect righteousness (core value) and

righteousness protects you" and we need to practice it which is good for all of us.

Way Forward

1. Identification of core values which do not vary from lower to higher positions in the hierarchy is necessary for extension professionals.
2. Identification of suitable trainers who have been adopting these values.
3. Allocation of an exclusive session for inculcating values while organising training programmes for the extension professionals.
4. Inculcating values especially of general nature must be continued at graduate level irrespective of the specialisation. It must be made part of the core curriculum.
5. The core values adopted and adhered to by great leaders, without compromising on the values, need to be stressed.
6. The core values need to be made available in print as well as electronic media and made accessible to the people.

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02

COMPETENCE DEVELOPMENT THROUGH EDUCATION AND CAPACITY DEVELOPMENT THROUGH EXTENSION

While the concept of capacity development is much discussed in extension literature, little attention is given to competence development, argues Dr Laxmi Prasad Pant. In a paper (see Pant, 2012), we argued that the fields of 'competence development' and 'capacity development' remain isolated in the scholarship of learning and innovation despite the contemporary focus on innovation systems thinking in agriculture and rural development.

While the concept of capacity development through technical cooperation is much hyped in the international development literature, including agricultural extension, this body of literature fails to make a connection with the literature on competence development (e.g., Biemans *et al.*, 2009; Mulder, 2001) (Figure 1). To address this gap, we argue for a need to differentiate technological competence from other types of competence, and suggest that while the focus on input and output indicators of innovation are relevant to assess technological innovation competence development, outcome indicators of innovation, such as measures of positive changes in habits and practices, would better serve the purpose of assessing and developing organizational and institutional learning and innovation competence.



Fig. 1: Learning and innovation competence development framework

Source: Pant (2012)

Our study was conducted in the Krishna district of Andhra Pradesh, India and in the Chitwan district of Nepal. Findings suggest that the task of competence development in food and agriculture involves degrees and diplomas from universities and vocational training institutes that engage students in various levels of theory-based, competence-based and experiential learning. For example, the Agriculture and Forestry University (AFU) of Nepal engages students in various experiential learning activities in addition to theory-based conventional lectures. However, one potential area for agricultural universities is to transform conventional instructional practices engaging current and future farmers in occupational competence development in addition to the ongoing efforts to train future agricultural scientists, extension workers and academics. For this to happen, we need to transform farming into a dignified occupation to attract educated youths in this profession that has serious implications to feed nine billion people by 2050.

In conclusion, crossing the conventional boundaries of competence development and

capacity development serves as a way to renew the role of education within the innovation systems thinking. However, such an attempt to enhance human capabilities and functioning through education should focus on transformation at the systems level. Thus our research demonstrates the

value of crossing the conventional boundaries of the two seemingly unrelated fields—competence development through education and capacity development through extension – to provide new directions to operationalise innovation systems thinking in agricultural education and extension.

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03

TOWARDS EXTENSION EDUCATION REFORMS 2.0: THE REALITIES, EXPECTATIONS AND IMPERATIVES

Being an extension student is currently a matter of fate for many. We need to make this a choice through strengthening research in extension argues, Sreeram Vishnu and Jancy Gupta.

The science of extension is evolving and advancing worldwide. The discipline, primarily aimed at empowering the farming community by the means of education and communication, has undergone vast changes over the years. Generally extension education is considered as a profession. A profession is something which needs to be carried out with skill and expertise. But can we justify the status of extension as a profession in the present context? Has the discipline adjusted and modified itself to cater to the emerging needs of its practitioners, particularly the grooming researchers? Through this paper, we are trying to analyse present status of extension as a professional discipline. Also an attempt is made to examine the needs and expectations of the student community.

The extension policy makers seem to continue with an intuition that "All Is Well". For improvements in any discipline, continued focus on research and quest for advancement are necessary. Changes occurring within and outside the system should be acknowledged. However, the extension science is currently at the crossroads—standing averse and apathetic on many critical issues. There is hardly any attempt to introduce any reforms in the age-old methods and curriculum of this renowned discipline. Often this has led to unsystematic and irrelevant research, especially those carried out by student researchers, with little/no practical implications. "In SAUs, the extension faculty engages mainly in teaching. The extension research that comes out from the universities is mainly from the M.Sc/Ph.D. thesis work, which are mostly micro level investigations with little or no policy relevant findings" (Sulaiman, 2012).

Several extension scientists are raising concerns about the quality and contribution of extension research through AESA (Agricultural Extension in South Asia) blogs. As a "field-oriented" professional discipline, the extension research differs significantly from other social science research in terms of its content and methods. Lack of adequate field-orientation and poor professional standards in research have eroded the credibility of extension research and practice. Adding to these woes, the current research tools in extension are outdated and their continued use has resulted in stereotypic and insignificant outcomes. Due to lack of practical significance and stagnation in theory development, extension research is often criticized by other agricultural disciplines as a "non-performing discipline" (Prasad, 2013; Sethuraman, 2015).

Being a student of such demoralised discipline is less desirable for any scholar, lest to carry out a good research. The extension students are

efforts, a national level database of all the research dissertations from all the SAUs and Deemed Universities (at least with research title, main objectives and findings) should be maintained. Even though some platforms like Krishiprabha and CeRA are available for this purpose, they are not totally inclusive. Similarly there should be a mechanism to promote linkage among student researchers at National level who are doing research on similar fields/ different facets of same topic.

Students need to be encouraged to participate in seminars and conferences. To avoid bias in judging the presentations, a grading system can be introduced to evaluate the presentations. In this model, all the outstanding presenters can be recognised. This motivates the student community to attend conferences and seminars more willingly and enthusiastically. Finally there should be a mechanism to review the functioning of Professional Societies. The societies should be made accountable to its members in publishing the accepted papers within a reasonable period of time. Also prompt communication with the

member authors needs to be ensured.

Way Forward

Extension is yet to fully realize its great potential. It is the duty of every student and young researcher of this discipline to come up with innovative ideas and dedicated efforts to enrich this discipline. Some Universities in India like PAU are showing the exemplary way of improving the student research by inducting foreign experts in the student advisory committee, and thus providing an international exposure. Such pragmatic attempts go a long way in ensuring investigation of relevant researchable issues by a student. This also leads to the development of a cadre of vibrant scholars, with sound research competencies, capable of well-directed research attempts and fruitful outcomes. Being an extension student is a matter of fate for many. If systematic attempts are made to strengthen its research and restructure its curriculum in line with the demands of its practitioners, it would become an esteemed profession, and then it automatically becomes a matter of choice to be a student of extension.

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04

TEACHING IN AGRICULTURAL EXTENSION EDUCATION: CAN WE IMPROVE IT?

Among teaching, research and service in extension, teaching remains the most neglected. If we want to bring improvement in all these different dimensions of extension, we must pay serious attention to improving the quality of teaching in extension education, argues Mahesh Chander.

Extension education basically deals with bringing about desirable changes in the behavior of human beings, through various strategies and programs, focusing more on education and information exchange. It is educational in content and purposive in approach. Its main aim is to assist rural communities in gaining a livelihood, improve the level of living (both physical and psychological), and foster welfare. The success of the extension process requires an atmosphere of mutual trust, helpfulness and respect on the part of both extension workers and rural people. This calls for a great deal of understanding on the part of extension workers, which is possible only when they possess sound knowledge of the subject. To successfully achieve this core objective of extension education, the teachers in extension education must be proficient enough, not only to teach but also to attract and orient students towards making them competent extension professionals.

The discipline of extension education largely draws subject matter, methods and tools from various areas of social science, such as: Sociology, Psychology, Anthropology, Administration, Communication etc. It is an independent full-fledged discipline like any other discipline in agriculture, veterinary sciences, fisheries & home sciences such as agronomy, entomology, agricultural economics, Veterinary medicine, human nutrition etc. (Box 1).

Teaching in Extension Education

Every teacher irrespective of the subject/discipline has his or her own style of teaching. The teaching in extension education is no different. However, in the case of extension education, the main difference is the presence of several laboratories for extension students, such as: farmers' field, the agripreneurs, agro-processing centers, farmer producer organizations, extension and advisory services in the public, private and NGO sectors etc., where practical insights have to be gained by the students. Ideally teachers of extension education must first start with practicals in these laboratories before introducing theoretical aspects.

Teaching extension is about bi-directional learning, implying that the teacher also learns from the students during the course of teaching. The notion that farmers' field are the only laboratories for extension students, is changing as the extension professionals need to address the knowledge and information needs of the actors involved in the entire agricultural value chain. The farmers now ask advice beyond production, more on what to do once they have produced/harvested including opportunities for agripreneurship.

Box 1: Extension Discipline: Evolution and Growth

The word 'extension' is derived from the Latin roots, 'tensio' meaning stretching and 'ex' meaning out. The discipline of extension education has come a long way since 1873, when the term 'extension education' was first formally introduced by Cambridge University in England, describing it as a system dedicated to the dissemination of knowledge to rural people where they lived and worked. The concept later spread to other parts of Britain, Europe and North America. In the USA, 'agricultural extension' was adopted in 1914, when the United States Federal Smith-Lever Act of 1914 formalized a nationwide cooperative federal-state-county program and gave operational responsibility to the land grant colleges and Universities.

Agricultural extension later spread to Africa, the Caribbean, Asia and Latin America mostly due to the involvement of the USA through its several bilateral assistance programs launched after the Second World War. In India, the study of extension education as a subject was introduced for the first time at Agricultural College, Sabour (Bhagalpur), Bihar in 1953. With the establishment of the 1st Agricultural University at Pantnagar, on Land Grant Pattern of American universities with the assistance of the USA, the subject of agricultural extension was integrated as a discipline in Agricultural Universities offering Master's and Doctoral degrees in agriculture in India.

Faster spread of this discipline to meet the increasing demands of teaching departments of agricultural colleges that grew rapidly in the 50's and 60's adversely affected the quality of its content. The subject in fact, had not established its roots on sound foundation, when course outline and quality of teaching became a topic of concern. In 1967, a seminar was organized at IARI where model syllabus for under-graduate courses, was recommended, while, nothing significant was done for post-graduate courses then (Singh, 1981). A national seminar on 'orientation of extension education curriculum and strengthening functional linkages', organized at CSAUAT, Kanpur in 1981 was, perhaps, the first attempt that took stock of the post-graduate curricula and suggested various modifications (Sulaiman, 1996).

Now almost all State Agricultural Universities (62), deemed to be universities (5), Central Agricultural Universities (2) and Central Universities (4) with agriculture faculty either have Departments of Agricultural Extension or at least a few faculty members to teach extension education.

The effort to modernize the Extension and Advisory Services (EAS) programs, requires well-trained field agents and supervisors who know and can practice effective planning, deliver and evaluate teaching and learning. However, the EAS personnel in developing countries, typically have technical knowledge and skills, but very often lack preparation in the necessary teaching and learning skills that enables them to be successful extensionists (MEAS 2013). Extension and advisory services also needs to play a brokering role, promoting interactions and knowledge flows among the wide range of actors in the Agricultural Innovation System. Are we really preparing our students to meet these emerging professional requirements?

Challenges in extension education teaching

Extension education being a 'field-oriented' professional discipline differs from other social science teaching in terms of its content and methods. Lack of adequate field-orientation and poor teaching standards have seriously hampered the credibility of the extension education discipline among educationists and development planners. This should be seen as a worrying point. Moreover, teaching of extension education subjects, at the

undergraduate level has been disappointing and woeful in most of the cases causing a kind of dislike for this discipline among students. It is no secret that many bright students later do not opt this subject for post-graduation.

This situation must be taken seriously and teachers of extension education subjects should try to dispel the negative perception about extension education discipline by teaching the subjects in an interesting and exciting manner. Often, we limit our teaching methods to lectures only, occasionally supported by PowerPoint presentations. Year after year many teachers stick with the same content, same mode of teaching with same examples making it mundane, while teaching requires adapting. Effective teaching involves progressively refining our content based on reflection and feedback.

There are several challenges in teaching of extension in India. These are as follows:

1. Shortage of faculty
2. Teachers burdened with plenty of non-teaching activities
3. Lack of induction training, required to orient faculty on teaching skills
4. Lack of refresher courses

5. Limited opportunities for practical sessions, including field experiences
6. Non-availability of standard text books on various subjects under extension education
7. Lack of adequate field exposure among faculty
8. Outdated methods, tools and techniques
9. Deficient curriculum which does not relate well with contemporary needs

Some of these are discussed in detail below.

Weaknesses in quality of teaching

Many SAUs are struggling with shortage of teachers in general. Extension Education departments in many universities are short of sanctioned strength. No wonder, in many veterinary colleges, non-qualified faculty in extension education subjects are engaged in teaching extension subjects like advanced research methods, Sociology, extension program planning etc. Moreover, at many SAUs & ICAR deemed Universities, extension education faculty is often engaged or pre-occupied in many non-teaching tasks. For instance, at ICAR-Indian Veterinary Research Institute, there are only 4 scientists in the Division of Extension Education, who alongside teaching Master's & PhD students, also look after Krishi Vigyan Kendras (KVKs), and Agricultural Technology Information Centres (ATIC) as In-charges and a number of on-campus & off-campus training programs for various categories of stakeholders including farmers, trainers etc. The involvement of faculty in running KVK and ATIC, including field extension activities, leaves little time for quality teaching. The faculty also lack exposure on ways to provide and supplement their teaching with cases and contemporary examples.

Non-availability of standard text books on various subjects under agricultural extension is yet another serious problem. Many of the available books are just compilation of materials with no original style of writing, thus, making these monotonous to students. The recent initiative of ICAR to write a Handbook of Extension Education is an appreciable step, which may help in improving the content for extension education teachers.

Lack of induction training, required to orient faculty on teaching skills is also missing, though some universities in recent times have taken step in this regard. The University Grants Commission, in pursuance of the National Policy on Education 1986 and its program of action, had set up 66 Academic Staff Colleges in different Universities/ Institutions across the country. The Academic Staff Colleges, regularly conduct specially designed orientation programs for newly appointed lecturers

and refresher courses for in-service teachers. The extension education faculty should be encouraged to avail this good facility to sharpen their teaching skills towards making teaching effective.

Recent initiatives to improve teaching quality

The 5th Dean's committee has emphasized capacity building of teachers in SAUs, specifically recommending, that SAUs should build up facilities for induction trainings of faculty for a period of at least 4 months. This should follow the pattern of ICAR-National Academy of Agricultural Research Management (NAARM) for Agricultural Research Services (ARS) scientists and focus on computer literacy, knowledge about national and international agriculture, curriculum development, financial and administrative rules and procedures, etc.

Appreciably the National Institute of Agricultural Extension Management (MANAGE), Hyderabad has recently initiated internship opportunity for PhD students in extension. Such opportunities can also be offered by Extension Education Institutes (EIs), State Agricultural Management and Extension Training Institute (SAMETIs), Agricultural Technology Application Research Institutes (ATARIs) & KVKs to orient students to various extension practices, research projects and extension programs. In fact, MANAGE, EIs, ATARIs & KVKs can be ideal institutions to impart practical opportunities to help extension students and newly recruited faculty in broadening their understanding and sharpening their skills in handling extension programs.

ICAR-NAARM, Hyderabad has recently launched a 4 week MOOC (Massive Open Online Course) on 'Competency Enhancement for Effective Teaching'. Courses like these could be a good opportunity for extension education faculty, especially to the young and aspiring to become effective teachers by development of psycho-pedagogical competencies (NAARM, 2016). On 30th January 2017, I saw few extension education faculty receiving certificates on completion of the first MOOC at NAARM. The faculty of extension education should avail such opportunities to improve teaching standards.

Many universities give recognition to good teachers. Teachers in extension education may enhance their competencies in teaching and bring prestige to the discipline.

Weaknesses in content

The curriculum needs changes to suit current and future requirements. Despite recent initiatives by ICAR to revise curricula including agricultural

extension, those being followed in general and especially at the master's level are not relevant to meet the present and future challenges in extension. In 1996, a National Workshop on Post-Graduate Teaching in Social Sciences, was organized at NIAP (ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi). This workshop found that the curricula followed at the Master's level was 'insufficient' in view of the changing job scenario and 'lacking in competencies' to tackle emerging professional needs and challenges. The workshop also identified critical gaps in the curricula at master's level and recommended a thorough revision of the entire curriculum for introducing these changes (Sulaiman, 1996). Many of the recommendations from this workshop (NIAP, 2016)¹ have not been implemented till now.

While discussing how extension should be taught at the undergraduate, Master's and Doctoral level in India, Sulaiman and Van Den Ban (2000)² opined that major changes are needed to prepare students to work in a rapidly changing environment. They rightly said that extension education is in a crisis, because it has not yet adjusted to changes. As extension graduates are not prepared to perform the roles the market demands, they have difficulties to find jobs. In order to prepare the students for present needs, more training is needed in participatory extension approaches, organizing farmers' groups, planning extension strategies to meet farmers' needs, human resource development, agriprenurship and the use of information and communication

technologies (ICTs). The students ought to learn how to apply theories in these areas to field situations. For this purpose, not only agricultural graduates, but also other social scientists should participate in teaching extension. It should become clear which students will be trained to become an extension field worker, and extension manager or an extension researcher.

Globally there is an increasing interest in developing new capacities among extension and advisory services. This renewed interest emerged from the publication of 'The New Extensionist' position paper by the Global Forum for Rural Advisory Services (GFRAS). The position paper argues for an expanded role for EAS within agricultural innovation systems (AIS) and development of new capacities at different levels to play this role. 'The New Extensionist' vision implies changes in EAS organizations, systems, and enabling environments, plus re-skilling all types of individuals to better contribute to increasing the productivity and effectiveness of agricultural systems to improve the livelihoods of farmers (GFRAS 2012). GFRAS is currently developing the New Extensionist Learning Kit- a learning resource for individual extension field staff, managers, and lecturers. It contains 13 modules that have been identified by the GFRAS Consortium on Extension Education and Training, as core competencies for individual extension agents³. The kit focuses on functional skills and will be available for self-directed, face-to-face, or blended learning, towards the middle of 2017 (Box 2).

Box2: New Extensionist Learning Kit: List of Modules and Competencies Required (GFRAS, 2016)

Module 1: Introduction to the New Extensionist
Module 2: Extension Approaches and Tools
Module 3: Agricultural Extension Programme Management
Module 4: Professional Ethics
Module 5: Adult Education for Behavior Change
Module 6: Basic Knowledge Management and Extension
Module 7: Introduction to Facilitation for

Module 8: Introduction to the New Extensionist
Module 9: Farmer Organizational Development
Module 10: The Role of Extension in Supporting Value Chains (Part 1)
Module 11: The Role of Extension in Supporting Value Chains (Part 2)
Module 12: Agricultural Entrepreneurship
Module 13: Gender in Extension and Advisory Services
Module 14: Risk Management and Adaptation in Extension and Advisory Services

However, many of these new areas where capacities need to be developed among extension professionals, are yet to figure in the recent curricula reforms in India.

Recent extension curricula reforms in India
 Recognizing the need that agricultural education has to evolve in tune with fast changing national and international scenario, ICAR embarked

¹ http://www.ncap.res.in/upload_files/workshop/wsp3.pdf

² <http://www.tandfonline.com/doi/abs/10.1080/13892240008438808>

³ <https://www.g-fras.org/en/component/phocadownload/category/65-counting-only.html?download=455:new-extensionist-learning-kit-list-of-modules-and-competencies-required>

upon an arduous task of restructuring the undergraduate courses by constituting 5th Dean's Committee. The Committee restructured course curricula to be implemented from the 2016-17 academic session (PIB, 2016).

This shows the intent of ICAR, towards emphasizing a professional approach in agriculture education, right from under-graduate courses of different streams of agriculture. The changes have reoriented the system to develop needed skills and entrepreneurial mindset among the graduates to take up self-employment, contribute to enhanced rural livelihood and food security, sustainability of agriculture and propel agricultural transformation.

The new courses added at the undergraduate level in BSc Agriculture program including restructured content (Table 1), if taught properly, can prepare students to be good extension personnel. The extension teachers will have to play a proactive role in engaging students in such a way that they find the subject interesting and they develop a liking for it. The new courses like 'Entrepreneurship Development' and 'Business Communication', as also the 'Communication Skills and Personality Development', give an edge to extension education faculty over other faculty in agriculture, thus, it should be seen as one good opportunity to draw students to the extension discipline by making teaching and learning an exciting experience for students.

Table 1: Extension courses approved for BSc Agriculture program

No.	Title	Credits	
1	Fundamentals of Agricultural Extension Education	3	(2+1)
2	Rural Sociology & Educational Psychology	2	(2+0)
3	Entrepreneurship Development and Business Communication	2	(1+1)
4	Communication Skills and Personality Development	2	(1+1)

Box 3: Revised Curricula in Agricultural/Veterinary at PG Level in Extension Education

In order to keep pace with changing time and future needs, the courses in Agricultural/Veterinary Extension were redesigned and updated by ICAR in 2009, wherein:

- New courses have been introduced to keep pace with the latest developments. Courses like Entrepreneurship Development and Management in Extension, E-extension, Media Management, Market-led Extension, Gender Sensitization for Development and Disaster Management are added that are truly need based.
- Course objectives and suggested readings have been provided for each course. This is a good effort which may need continuous updating.
- List of Journals have been given to keep pace with latest developments in the area. It can

be further strengthened by incorporating more multidisciplinary journals. An exhaustive list of journals where extension faculty could publish has been compiled by AESA (Agricultural Extension in South Asia⁴).

- Suggested broad areas of research have been added for providing directions to future research in the area^{5 & 6}.

While framing the new and restructured post-graduate curricula and syllabi for social sciences in agriculture including agricultural extension, it has been underscored, that the discipline of extension needs proper infrastructure, trained teachers, and computers with internet connections. The facility and availability of equipment, experts/guest lectures with industry, farm and village visits, have been emphasized to provide real life exposure to the students.

⁴<http://www.crispindia.org/Where%20we%20can%20publish%20extension%20research%20-%20Final%20Note%20%281%29.pdf>

⁵<https://drive.google.com/file/d/0B0TX5SvS4IMRNEdVbGpwSFirWTQ/view>

⁶<https://drive.google.com/file/d/0B0TX5SvS4IMRNEdVbGpwSFirWTQ/view>

The ICAR appreciably also revised the course curricula and syllabi of post-graduate (master's and doctoral) education in agriculture and allied sciences at the national level during 2009 (ICAR, 2009). In Social Sciences group, the course structure and course contents have been developed for three programs namely Agri-business Management, Agricultural Economics, and Agricultural Extension. Agri-business program has been introduced for the first time, while new courses have been added by updating many existing courses in Agricultural Economics and Agricultural Extension programs in tune with the changing time and future needs (Box 3).

A cursory look at these new courses and updating of content gives an impression that more changes are required to modernize EAS to keep pace with the developments. In this context, modules and competencies required, as identified in New Extensionist Learning Kit of GFRAS (GFRAS, 2016) could be one good guide to shape the courses and content in future.

How to Make Extension Teaching Exciting?

Teaching is a challenging task. If the learner hasn't learnt, the teacher hasn't taught!! A teacher has the major responsibility for making classroom teaching effective and stimulating. As teachers, we need to inspire students right from the UG level that they

get attracted to the discipline and consider it a subject of choice for Master's program.

Be an effective teacher

Extension teachers should be well aware of the general requirements which help in making classroom teaching a rewarding learning experience for both –teachers & students (Box 4). The conditions necessary for effective use of teaching methods include the learning situation, which comprises of the teacher who has clear objectives, knows the subject matter and is able to communicate freely with the learners. For effective teaching, the learning objectives should be clear and focused. Teaching is more effective and student learning is enhanced when (a) we, as instructors, articulate a clear set of learning objectives (i.e., the knowledge and skills that we expect students to demonstrate by the end of a course); (b) the instructional activities (e.g., case studies, labs, discussions, readings) support these learning objectives by providing goal-oriented practice; and (c) the assessments (e.g., tests, papers, problem sets, performances) provide opportunities for students to demonstrate and practice the knowledge and skills articulated in the objectives, and for instructors to offer targeted feedback that can guide further learning. The teachers in extension education, can assess themselves, where they stand vis-à-vis the required traits in a good teacher (Box 4).

Box 4: Qualities of effective teachers

For students, it matters much, that the teacher, in general should possess the following traits:

- Knowledge and understanding of the subject
- Enthusiasm about the subject
- Interest in students
- Knowledge of teaching skills
- Broad interest and engaging personality
- Demanding
- Give respect to students, value their opinion
- Encourages and motivates
- Maintaining oneself good fitness & dressing
- Entertaining by giving interesting examples from day to day life
- Ability to control the class & self control
- Making classes interesting experiences
- Knowing the students well
- Punctuality
- Preparing well for the class
- Knowing well the subject being handled
- Having broader outlook
- Good command over language

Practice what you preach

We the teachers in extension education, often talk of teaching learning situations and using tools and techniques like role play, games and exercises to supplement theoretical concepts. However, often we fail to use and integrate them in our own teaching activities. Also, lack of field exposure or practical opportunities is a serious drawback. The students should be taken to various types of farms and agri-ventures, producer organizations etc. for exposing them to field realities, while explaining the theoretical concepts. Suppose we want to teach them livestock entrepreneurship, they must get an opportunity to meet and interact with some enterprising farmers including agripreneurs to familiarize with the concept. We can add value to teaching by using games, exercises, role plays etc. Also, in classroom teaching, questioning, listening and responding are three important activities, which need to be encouraged. On many counts in many of the colleges we find majority of teachers in extension education, deficient which could make their teaching effective.

Use Reflections and Feedback

We need to continually reflect on our teaching and be ready to make changes whenever appropriate (e.g., something is not working, we want to try something new, the student population has changed, or there are emerging issues in our fields). We need to critically evaluate our own teaching effectiveness on a continuous basis. Much of this information exists in the form of students' work, previous semesters' course evaluations, dynamics of class participation, etc. We can always seek additional feedback with help from the university teaching center (e.g., interpreting early course evaluations, conducting focus group discussions, designing pre- and post-tests). Based on these, we should modify the learning objectives, content, structure/ format of a course, or otherwise adapt our teaching methods and styles.

We must make it a point to take students' feedback on our teaching. It could be during the class, at the end of the class and finally at the end of the course i.e. on the last day of the session. Proforma to procure written feedback are available online, which should be adapted to the situation.

Way Forward

1. The initiative by ICAR on Common Academic Regulations, Course Curricula and Syllabi

for Post-graduate (Masters' and Doctoral) Education in Agriculture and Allied Sciences including implementation of 5th Dean's Committee report on undergraduate agricultural education is laudable. This could at least come out with uniformity in syllabus, courses, content, rules and regulations. However, these need constant monitoring, changes and updating at least on a 5 yearly basis as requirements are changing rapidly. While restructuring courses and content, the global experiences in this area like the initiatives of GFRAS & MEAS should also be considered towards modernizing EAS.

2. Capacity building of teachers needs serious attention, for which induction training, refresher courses including overseas training at known world-class training academies may be facilitated.
3. Standard text books on extension subjects should be written by experienced and accomplished extensionists. The ICAR has provision for text book writing, but many qualified and experienced professionals do not come forward to avail this provision. May be by enhancing the honorarium, they can attract good authors.
4. Shortage of faculty, coupled with burdening teachers with multiple non-teaching assignments hampers quality of teaching. The SAUs should give attention to faculty recruitment.
5. The faculty and students need wide exposure to different organizations concerned with agriculture & rural development, besides, the farmers' field and agri-preneurs.
6. Instead of seminars and conferences, small group meetings of eminent extensionists and workshops may be organized to have focused discussions on improving, refining, updating methods, tools and techniques of extension teaching and research.

We know most of the teachers in extension education or for that matter in many other disciplines, are not teachers by choice but by default. Whatever might have been the reasons or compulsions to become teacher, once we are a teacher we must do justice to the job we are supposed to perform. We need to work hard on preparing ourselves to be good teachers by

“ Go to the people. Live with them. Learn from them. Love them. Start with what they know. Plan with them. Build with what they have. Teach by showing. Learn by doing. When the best leaders' work is done, the task accomplished, the people will say "we have done it ourselves."

-Lao Tzu, founder of Tao philosophy, 700 B.C. ”

equipping ourselves with the knowledge, skills, art and science of teaching.

Finally, a teacher can Tell, Teach or Inspire!! While teaching in a class. I wish to teach in such a way that I am remembered for my good teaching for many years after the students leave college. Also, when

they are in my class, they should think, if they ever become teachers, they would like to be a teacher like me. If I am successful in giving this feeling to my students then I can feel that I could inspire them and my efforts in teaching were successful. Truly, teaching shouldn't be telling or teaching but INSPIRING!!!

Teaching must inspire!

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05

APPROACHING EXTENSION CURRICULA FROM A DEVELOPMENT PERSPECTIVE

Extension post-graduates in general and agricultural graduates in particular, face several challenges in competing with other development graduates and post-graduates in the job market. In this blog, Sagar Kisan Wadkar, explores the reasons behind this challenge by drawing lessons from courses in the development stream and suggests ways to address the lack of development perspectives in agricultural extension course curricula.

Changing Context of Agriculture and Rural Development

Development is what those who are working for the betterment of people aim for. While at the global level, everyone is trying hard to achieve the UN's "Global Agenda of 2030" i.e., Sustainable Development Goals (SDGs), at the national level, there is an increasing focus on achieving the national agenda of "New Rural India – Doubling Farmers' Income by 2022". This calls for collective action with a common purpose by agencies, having different responsibilities and diverse capabilities that are essential for achieving sustainable growth (Wadkar, 2017).

In rural India agriculture is the main lifeline for transforming the rural economy. However, the agricultural sector faces several unprecedented challenges, especially those related to high price volatility, climate risks, and debt. Since majority of farmers (86%) are small and marginal with declining and fragmented landholdings, they are more vulnerable and risk prone to any type of uncertainty. Moreover, addressing many of these new challenges calls for collective action by farmers and collaboration among different agencies.

New Roles for Extension

Consequently, the demands placed on agricultural extension services have also increased manifold. As the extension system has a crucial role in strengthening and promoting sustainable agricultural practices as well as in enhancing food security and farm income, it needs to enhance its capacities to deal with these new challenges. However, the current course curricula used in extension teaching at the different levels (UG, PG and PhD) in Indian Universities are not supporting students to acquire the necessary competencies to address these types of challenges. Lack of development orientation in the curricula and continued dependence on traditional teaching methods are adversely affecting the job prospects of agriculture graduates and extension post-graduates in the development sector as they face tough competition from graduates and post-graduates from the development stream.

More than a decade back, Leeuwis (2004) pointed that there is a need to reinvent agricultural extension as a professional practice, if it has to remain valid in the changing scenario (Box 1). Since the last two decades, many have been talking about identifying and strengthening core competencies among extension professionals (GFRAS 2012, 2015; Sulaiman et al. 2017). Many have also highlighted the need for revising

extension curricula (Sulaiman 1996; Sulaiman and Van den Ban 2000; Acker and Grieshop 2004) and instructional methods (Chander2017). The need

for redefining the role of social sciences in NARS in general, and agricultural extension scientists in particular, has also been highlighted (NAAS 2015).

Box 1: Changes required for professional extension practice

The valid and relevant changes that may be required in this changing scenario are as follows:

Dealing with collective issues: Management of collective natural resources, chain management, collective input supply and marketing, organization building, multi-functional agriculture and linking farmers to market, value addition, etc.

Co-designing rather than disseminating innovations: Need to play a more active role in the process of innovation design and adaptations.

Matching technical and social dimensions of an innovation: Need for a more pragmatic conception of innovation.

Catering for diverse farming and livelihood strategies: Extension organisations will have to anticipate diversity among farmers, which means that they have to be able to give different advice to different people, and treat diversity as a resource rather than as a burden.

Participation paradox: The extension agent is being squeezed between the farming community and the government system, where actual participation is not taking place in the field. There is still a need to further clarify what exactly participation means in an intervention context, what the role of extensionists can be in participatory processes, and what institutional and funding arrangements may be helpful in ameliorating some of the tensions that extension-cum-development practitioners face.

Coping with dwindling resources: Extension organizations have to devise innovative ways of both working with limited resources as well as accessing new sources of income.

Changing professional identities: The role of the traditional public extension system is now slowly declining and the role of private extension services, Civil Society Organisations (CSOs), Non-Governmental Organisations (NGOs), is gradually increasing. Interestingly, these private players perform extension activities, but they do not consider themselves as 'extension agents', but rather as development workers, or as a marketing employee, an external communication manager, a trainer, a mediator, a process facilitator, a public relation officer, a development consultant, etc.

Source: Leeuwis with van den Ban (2004)

Apart from all these aspects, extension organizations need to formulate a convergence mechanism whereby all relevant stakeholders could come together on one platform to serve people effectively and efficiently. Additionally, students need to acquire a development orientation along with hands-on training in order to build practical skills – to compete with other development graduates.

This would require

- Better understanding of rural livelihoods;
- New and relevant competencies;
- A wider choice of instructional methods that will help in acquiring these competencies.

These are discussed in detail below.

Understanding rural livelihoods

The main aim of 'Extension education' is to assist rural communities in gaining better livelihoods, improved lifestyles, and foster their welfare.

Hence, the first and foremost responsibility of extension professionals is to strengthen and promote sustainable livelihood opportunities for their targeted clientele. Livelihood development is indispensable for eradicating all forms of poverty and to achieve food and nutritional security.

Globally, there are four prominent approaches that underline the sustainable livelihood framework and espouse its principles:

- Sustainable Livelihood Framework by the UK Department for International Development (DFID)¹;
- Household Livelihood Security Approach by the Cooperative for Assistance and Relief (CARE, International NGOs);
- Oxford Committee for Famine Relief (Oxfam) - Sustainable Livelihood Approach;
- United Nations Development Programme (UNDP) - Sustainable Livelihood Approach.

Box 2: Strengthening rural livelihoods

'Livelihood' is about 'the means of gaining a living' (Chambers 1995) and 'a combination of the resources used and the activities undertaken (both on and off-farm) in order to live' (DFID 2001). These means and/or combination of activities undertaken lead to diversified outcomes, and hence, how these activities/strategies affect livelihood pathways or trajectories is an important concern for livelihoods analysis. Thus extension professionals have to understand these perspectives while strategizing sustainable livelihood opportunities for rural people while also keeping in mind their means and resources.

There are two broad approaches to livelihoods, which build on the strength of the rural poor viz., the narrower and the holistic views. The former deals with an economic focus on production, employment and household income, while the latter lays emphasis on the concepts of economic development, vulnerability, and environmental sustainability (Shackleton et al. 2000).

Thus, farmers' socio-economic and bio-physical characteristics, vulnerability context, institutional mechanism, along with the policies and the linkages between rural and urban areas, go into formulating their livelihood strategies. As a result there are differences in interpretation and variations in the livelihood approach, but they all have a common theoretical background, which includes Integrated Rural Development Planning (IRDP) approaches in the 1960s and 1970s; Farming System Research during the 1980s; Rapid Rural Appraisal (RRA); Participatory Rural Appraisal (PRA); Participatory Action and Learning (PLA); Agro-Ecosystem Analysis; Political Ecology; Sustainability and Resilience Studies, etc.

These approach enables us to: a) Identify people's resources/assets, sources of livelihood and what they are already doing to cope with risk and uncertainty; b) Explore the factors that constrain or enhance their livelihoods, and its linkages on the one hand, and policies, processes and institutions in the wider environment; and c) Identify appropriate measures that can strengthen assets, enhance capabilities, and reduce vulnerability. Therefore, the extension professional must know the concept of (sustainable) livelihoods and its components to understand farmers and their environment more competently.

New and Relevant Competencies

To become good development practitioner-cum-extension professionals, one should have the following competencies:

- **Understanding of Self:** to reflect on one's own personality and belief systems as well as one's emotional intelligence;
- **Communication Skills:** counseling, critical thinking, and negotiations, designing media-mix IEC (Information, Education & Communication) strategy for development;
- **Group Behaviour and Dynamics:** power and influence in groups, group decision making, conflict management; understanding leadership and its role in bringing out

positive social change, problem solving skills, etc.

- **Facilitation of Social Capital:** ways to approach villagers, organize meetings and group discussions in the field/villages, sensitization and social mobilization of people, identification of felt & unmet needs of farmers, group formation – need/interest-based groups to address common issues; selection of lead/progressive farmers, etc.
- **Development Programme Planning and Management:** project planning formulation and report writing, logical framework analysis, stakeholder analysis, policy-gap analysis, etc.
- **Livelihood Management:** development of backward-forward linkages, livelihood mapping, (social) entrepreneurship, market linkages, value addition, etc.
- **Documentation and Data Analytics Skills:** developing data collection tools and its administration, evidence-based research, participatory action research, good/best practice writing, qualitative & quantitative data analytics, etc.

The existing curricula used for teaching extension in India, at all levels, do not sufficiently prepare students in acquiring these competencies, due to which agri-graduates and extension professionals often fail while competing with other development

¹See Carney et al., (1999) *Livelihood approaches compared* (Available on: http://www.start.org/Program/advanced_institute3_web/p3_documents_folder/Carney_etal.pdf).

graduates. There could be several reasons for this, but I would like to highlight four, which I consider important.

- Lack of development orientation and guidance on future prospects;
- Lack of field exposure and practical skills;
- Lack of content and methodology to understand and deal with contemporary issues;
- Traditional teaching methodologies.

It is time that extension faculty in universities learn how teaching is organized in development courses offered by other universities/institutions. Given below is the experience from the Tata Institute of Social Sciences (TISS), and I hope some of these experiences might be useful in the context of extension curricula reform in India.

New Ways of Delivering Content

Development Teaching at TISS:

The Tata Institute of Social Sciences is a unique institute of social sciences; it focuses on the humanistic aspects of social sciences that is blended with science to nurture imagination, creativity, and rigorous critical thought (Box 3). In general, with reference to agriculture development, it has courses, such as MA in Social Work in Community Organization & Development Practice, Master's in Social Work in Livelihoods and Entrepreneurship, MA in HRM & Labour Relations, MA in Social Entrepreneurship, MA in Development Studies, MA in Women's Studies, MA/MSc in Climate Change and Sustainability—where students are trained and nurtured to understand the nuances of development.

Box 3: Tata Institute of Social Sciences (TISS)

TISS has 45 centres across 21 schools, and 8 independent centers spread across four campuses (Guwahati, Hyderabad, Mumbai, and Tuljapur) and offers a number of BA, MA/ MSc, MPhil and PhD courses related to social sciences and rural development, such as education, (public) health studies, development studies, habitat studies, management & labour studies, media & cultural studies, disaster studies, public policy & governance, livelihoods & development, gender studies, human ecology; laws, rights and constitutional governance, etc.

All programmes attempt to build skills in facilitating change and transformation in rural areas at the level of individuals, groups and communities. Students are exposed to multiple pedagogies of teaching and learning with a strong emphasis on exposure to engagement, along with guided mentoring by the faculty and field-based organisations, together with group-based experiential learning. It also endeavours to strengthen the capacities of students to develop appropriate skills and talents to make them committed and dedicated development professionals.

Instructional Methodologies: The teaching and academic programmes are well blended with field learning, supported and facilitated by development partners and people's institutions. Field learning activities not only help students to enhance their sensitivity to social realities, but also provide different lenses that enable them to see the linkages between theory and practice in a praxis mode. Diverse pedagogical methods, such as lecture-cum-discussion, case method, group work & presentation, simulation exercises, etc., are in use to enrich the entire learning process for both students and teachers.

- **Lecture-cum-Discussion:** It is a two-way process whereby a teacher and students learn from each other and share different perspectives on a particular issue/concept. Generally it is based on prior shared reading materials (articles, research studies and other relevant literature) as per course content.
- **Case Method:** It gives students the ability to quickly make sense of a complex problem,

rapidly arrive at a reasonable solution, and communicate that solution to others in a succinct and effective manner. It provides a lively context, facilitates learning by having a professional dialogue between participants and thereby empowers students to reflect upon the peculiar demands of their profession.

Internship and Fieldwork: Internship and Fieldwork form an integral component of the course curriculum at both the Bachelor's and Master's levels of the academic programme.

Internship -These are 6-8week internships, where students are interned with various government, non-government, civil society or community organisations in all the major states of India. As per their course/degree programme most of the students focus on themes like rural livelihoods, forestry, water resources, human rights, entrepreneurship, delivery of social protection programmes, decentralised governance, including performance of Panchayats, etc., for

their field work and internship. This learning help students in their overall learning process and in formulating their research dissertations/projects.

Fieldwork - is meant to translate knowledge and techniques learnt during the course into action for practical use. The basic purpose is to maintain equilibrium between the academic level of the students and their working capacities with clients. It is not merely visiting an agency or observing what goes on. It is done under the able supervision of a well-equipped faculty supervisor and also, sometimes, under an agency supervisor at particular field sites/agencies/organisations to coordinate a set of activities. The students are helped through supervision so as to enable them for working in a complex, intricate and composite social environment.

Marketing of the Programme and Students:

TISS has a centralised placement cell, where a dedicated team use a multi-pronged approach to build a composite employability picture for each student by linking their aspirations/career expectations of relevant organisations. The cell also undertakes different career development sessions/tests comprising one-to-one counseling sessions, career identification exercises, competency mapping and development area identification, and career path planning to enhance and strengthen their personality.

Implications for Extension Professionals and Course Curricula

There is an urgent need to redesign extension curricula to enable students to become very capable development professionals.

At the UG level, the main objective could be to enhance their practical extension-related skills, and acquire a development perspective; as well as to orient students on future prospects of the (extension) discipline so that they can make a choice-based selection of extension at the PG level.

At the PG levels, there should be core discipline courses + specialized modules/courses in one of the areas of the discipline (as per student's interest and availability of expertise) along with Internship + Research/ Project.

The PhD level training should be about further development of their field-based skills and critical and reflective understanding of the selected specialization. In addition, we should encourage students to take up field-based (participatory) action research.

Other specific suggestions include:

- **Strengthening theoretical and practical skills related to socio-behavioral sciences:** Extension education discipline is based on behavioral change communication and so the teaching should provide some basic grounding on psychology, sociology, social-psychology and anthropology. However, this aspect is neglected in the present curricula which are mainly theoretical, and thus lacking in relevant field extension practice.
- **Introduce understanding of rural livelihood promotion:** We often use livelihood interchangeably with agriculture, however, the livelihood concept is too broad and complex and the application of knowledge and technology is often constrained by socio-economic, institutional and policy challenges. In such a scenario, the livelihood analysis of any particular area/region helps us to understand these interlinked factors and accordingly an appropriate strategy can be developed. Therefore, these aspects of livelihoods need to be introduced in the extension course curricula.
- **Strengthening process skills:** There is a dire need to develop and strengthen the process skills of students from the perspective of peoples' participation, design and action in development. This enables students to apply participatory approaches in evolving and strengthening community-based, people-centered development initiatives. In this context an 'Institutional and stakeholder analysis' is an essential part of any new planning and management initiative, especially where a greater degree of integration is sought. The nature and operation of institutions, and their mode of decision making, will have major implications for the implementation of any strategy or planning related to the promotion of sustainable development.
- **Promote action research, especially at the PhD level:** Being part of the social science discipline, there is a need to promote action research, which is a blend of theory and practice, which focuses on co-creation of knowledge of practice in the collaborative process of solving field problems, for the purpose of bringing change.
- **Promote learning by doing:** While we teach the importance of learning by doing, the same principle is seldom followed in extension teaching. There is need to lay more emphasis on strengthening practicals and field exposure in extension teaching.

Way Forward

The future of extension as a profession and a discipline depends on us. The process of change has to start with us. Waiting for committees which revisit extension curricula once in a decade is not going to help. We need collective action, starting with all of us to develop more appropriate

content and relevant instructional methods; and I hope the recently formed MANAGE-University Alliance for strengthening extension and advisory services will take a lead in this direction. Let us make our discipline of extension more attractive in order to draw in the best talent; and let us devote ourselves to training and nurturing future extension professionals.

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06

BEYOND ROGERS: DIFFUSION OF INNOVATIONS AND EXTENSION CURRICULA

Though the “diffusion of innovations” paradigm proposed by Everett M Rogers has largely been criticized by many researchers, the current extension curriculum followed in India has not accommodated any of the new insights that have emerged in this area. Neither have any of the alternate theories supplementing this conceptual paradigm been taken up. In this blog, Archana Bhatt presents these new developments and argues for including these in the extension curricula.

Globally, the agriculture sector is getting ready for a technological revolution with cutting edge technologies – it could be robotics, sensory technology or automated machineries. These new technologies, no doubt, can change the future of agriculture but it is also very important to carefully and efficiently promote these to those who are in greatest need of them. Integrating the right technologies at the right time can bring about radical change in the agriculture sector.

Studies on diffusion of innovation, primarily led by Everett M Rogers, have surely provided several new insights on effective dissemination of technologies to potential adopters by extension services. The practice of extension has been primarily guided by Rogers’ ‘Diffusion of Innovations’ tradition. With time there have been advances in diffusion research, but we as extension scholars still fall behind in terms of updating ourselves with the new insights that have come about globally. Though a lot of interesting reading materials are available online that can help us to upgrade ourselves on this topic, many of us still remain stuck to older textbooks on this topic. This has adversely affected our professional contributions as well as the credibility of our discipline. Moreover, lack of exposure on these advances is also affecting the job prospects of extension students. Therefore, enriching the curricula and research traditions in extension with new insights from diffusion studies is absolutely essential. This blog presents some of these new developments in diffusion studies.

Diffusion of Innovations

Everett M Rogers¹ was among the pioneers who contributed to diffusion research and it would not be an exaggeration to call his publications, ‘Diffusion of Innovations’ (Rogers 1962) or ‘Communication of Innovations’ (Rogers and Shoemaker 1971) the Bible of diffusion studies. This model evolved in a particular institutional context, based on well-known case studies, notably the adoption and diffusion of hybrid corn in the USA in the 1950s. These case studies simplified a complex process into a step-wise, linear sequence of activities that was described without reference to the way agendas of different stakeholders were addressed, and how technology priorities were selected and promoted (Sulaiman

¹ Everett M. Rogers (1931–2004) was a communication scholar and a sociologist. He is best known for originating the diffusion of innovations theory that became widely accepted in communications and technology adoption studies. In 2003, Rogers published the 5th edition of his book “Diffusion of Innovations”, The previous editions were published in 1962, 1971, 1983 and 1995.

and Hall 2002). Innovation was understood as a new technology at that time whereas we now have a better understanding of the term 'innovation' – encompassing as it does the factors affecting demand for, and use of, knowledge in novel and useful ways (World Bank 2006). We must not only be aware of these changes but also upgrade our understanding of these from diffusion and innovation studies. These are discussed below.

a. Hype cycle

Gartner Inc., an American research and advisory firm proposed this theory. This theory explains what happens when an innovation is hyped through a trigger and then how it goes through various stages to full acceptance. Unlike the diffusion curve by Rogers, rather than putting the blame on potential adopters or non-adopters this theory talks about the intrinsic value of the innovation. Gartner's hype cycle gives an insight on how an innovation will evolve over time. It represents the maturity, adoption and business application of new technology. The hype cycle commences with the trigger, and is then followed by a peak of inflated expectations, goes through a trough of disillusionment and a slope of enlightenment, and finally arrives at the plateau of productivity (Fig. 1). It is also worth noting that hype cycle curve will be different for different innovations. Each year the firm comes up with various Hype cycles in various domains for emerging technologies. In practice, some researchers even consider it a better method for studying innovations (Gartner Research 2018; Wikipedia 2018).

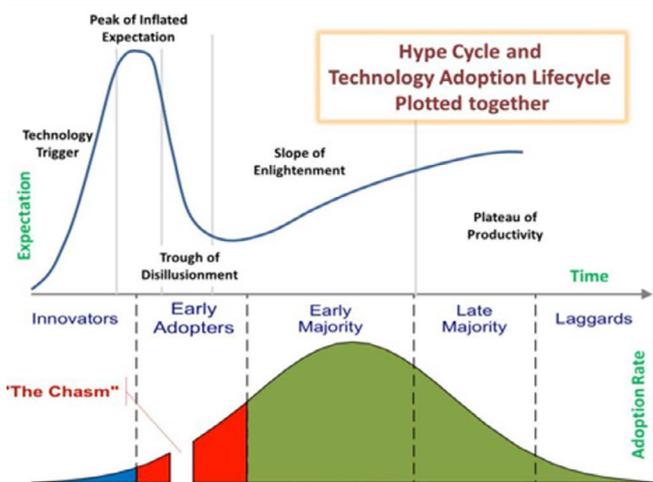


Fig. 1: Hype cycle and technology adoption life cycle plotted together

b. Crossing the chasm

As we look into the bell shaped diffusion curve, the gap lying between the early adopters and the late adopters is termed as the chasm. Geoffrey A Moore (2014) in his book 'Crossing the Chasm', explained that to ensure that an innovation is

taking hold the chasm must be crossed. If the early adopters are able to cross this chasm and help in bridging this critical point then the innovation reaches the tipping point, thus allowing the curve to rise up to where the majority adopt the innovation and then sink again. He also stated that the population lying before the chasm are the people who want the newest things while the population lying after the chasm are the people who want solutions and convenience. The real challenge lies in crossing the chasm, i.e., winning the heart of the 84% who believe in solutions and convenience. Thus, knowing the right time of chasm crossing will certainly help in planning for better adoption of any innovation (Anonymous n.d.).

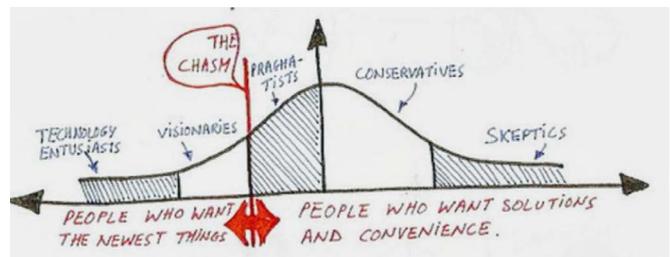


Fig. 2: Crossing the chasm

c. The innovator's dilemma: Sustaining & disruptive innovations

Clayton M Christensen (1997) in his bestselling book 'The Innovator's Dilemma' asks the question as to why successful companies often can't capitalize on the opportunities brought about by major changes in their market. He has mentioned two types of technologies, i.e. sustaining and disrupting technologies. Sustaining technologies are technologies that improve product performance or are the technologies that involve improving an already established product. Disruptive technologies, on the other hand, are innovations that result in worse product performance especially in the near term. He explains that disruptive innovations cause problems as they don't initially satisfy the demands of even the high end market; hence the larger companies ignore them until they become more profitable. These technologies later even surpass the sustainable technologies and satisfy

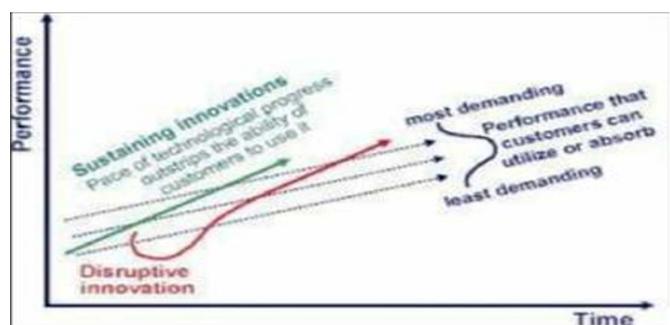


Fig. 3: Innovator's dilemma: Sustaining & disruptive innovations

market demand at lower prices, thus leaving behind the larger companies that didn't invest in disruptive technologies beforehand.

d. The cyclic innovation model

Guus Berkhout conceived of this model and remarked that the successful market introduction of products and services is a cyclic process with interactions between different actors from various disciplines. This model reconciles the 'technology push' model and the 'market pull' model and explains as to why a holistic multi-disciplinary approach is needed to facilitate an effective innovation system (Berkhout 2017).

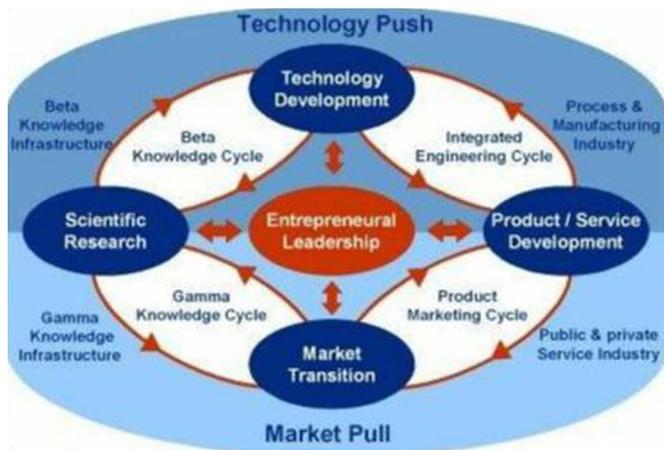


Fig. 4: Cyclic innovation model

e. Open innovation

Henry Chesbrough (2003) in his book 'Open Innovation' describes the transition from the traditional internally focused 'closed' innovation paradigm to an 'open' innovation paradigm. He explains in detail the characteristics of open innovation and the advantages it has over the traditional closed innovation.

f. Maloney's 16% rule

The 'Maloney's 16%' rule is meant for accelerating the diffusion of any innovation. The rule states that once 16% adoption of an innovation has occurred, one must change the media and

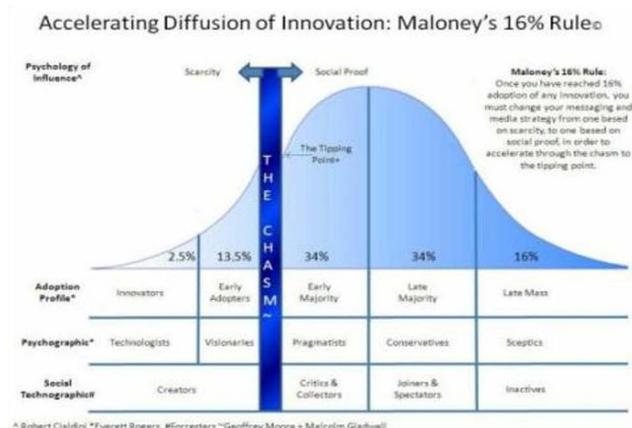


Fig. 5: Accelerating diffusion of innovation: Maloney's 16% rule

messaging strategy from one based on scarcity to one based on social proof in order to accelerate through the chasm to the tipping point (Maloney 2010).

g. Innovation systems

Though originally developed to understand industrial innovation, the innovation systems framework has been increasingly used to understand the process of knowledge generation and used in agriculture. Innovation systems can be defined as 'a network of organisations focussed on bringing new products, new processes and new forms of organisation into social and economic use, together with institutions and policies that affect their behaviour and performance' (World Bank 2006).

Under the framework of Agricultural Innovation Systems (AIS), innovation is currently understood as an interactive process through which knowledge is generated, accessed and put into use. It is not a linear process of science developing new knowledge and transferring it to the extension system for wider dissemination. Innovation requires a combination of technical, organisational and institutional adaptation. New investments and partnerships are required to couple technological innovation with organisational and institutional change (Hall et al, 2010). Central to the innovation process are the interactions among a large number of actors having complementary knowledge and expertise. "This process quite often needs to be facilitated as actors often need an initial push or opportunity to break barriers against joint discussion, action, sharing, and learning (increasingly referred to as brokering) (Klerxx and Leuwis, 2009).

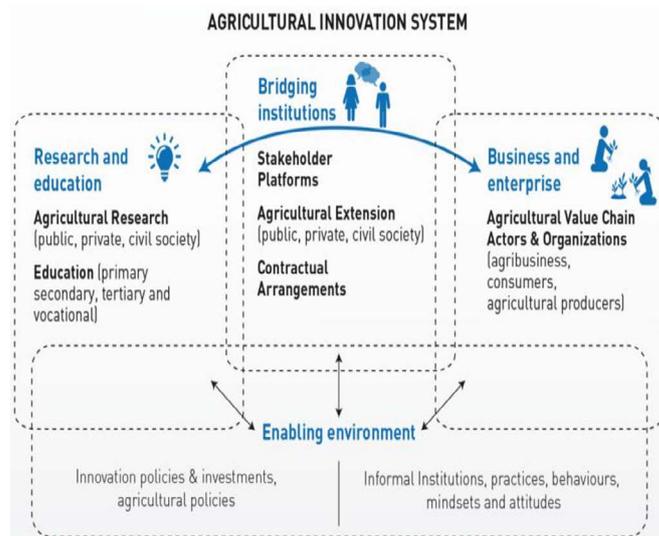


Fig. 6: Agricultural Innovation Systems

Source: Tropical Agriculture Platform (2016)

Extension and advisory services (EAS) are integral to the AIS. Within the AIS, EAS should ideally

play the role of a 'bridging' organization, linking the different bits of knowledge held by different actors, and facilitate its application and use, thereby leading to innovation. But to perform this role, EAS need new capacities at different levels (Sulaiman and Davis 2012). Hence, it becomes pertinent to study AIS when we talk about a particular technology as the adoption of any technology is governed by several other factors, which we generally do not consider under the diffusion of innovations paradigm.

Way Forward

As extension professionals, we need to upgrade and enrich our understanding on diffusion and innovation. Our extension curriculum is currently lagging behind in terms of new insights, from both

the theory as well as the application of diffusion and innovation studies. The existing course on 'diffusion of innovation' for extension scholars doesn't include the current breakthroughs and developments this branch of knowledge has adopted. Curricular reforms in extension are long overdue and these developments in diffusion and innovation studies should figure in such efforts. There are many new topics in extension that have come up recently or been upgraded with, but here I have only touched on the important concepts on diffusion of innovations which I have found useful. As scholars of agriculture extension we should be ready to familiarize ourselves with the ongoing developments in our discipline and share the same with our peers.

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07

DEVELOPING CRITICAL SYSTEMS OF LEARNING COMPETENCE: IS THIS THE WAY OUT?

A few months back, Laxmi Prasad Pant wrote a blog for AESA on learning and innovation competence. Expanding upon the earlier argument on developing 'learning and innovation competence', he developed the framework of 'critical systems of learning and innovation competence'. In this blog, he argues that critical systems of learning and innovation competence involving various levels of thinking and action is equally or more important than mere technological competence.

Albert Einstein's quote goes like this. "We cannot solve our problems with the same level of thinking that created the problem". Our study on critical systems of learning and innovation competence further supports this argument. We found that despite the agro-ecological competitive advantage and modest advancements in agricultural science and technology, Nepal has become a net importer of food grains, and India falls behind the non-conventional mango growers' ability to deliver mango yield, both in terms of quantity as well as quality. Can we address this problem using the same level of thinking that created them? Of course, not! Then what is the way out?

Clearly, the agro-ecological potential of the Indian mango sector and the Nepalese rice sector is not being compromised by the mere lack of advancements in agricultural science and technology in these two countries (and commodities), but more importantly due the failure to engage in critical thinking and action at various levels. Through our decade-long research, we developed the framework of critical systems of learning and innovation competence to address the question about what could be thought and done differently to effectively promote unintended positive consequences of well-meaning interventions, which we here use as examples that entail critical systems of learning competence?

We briefly discuss this key question here using a conceptual framework that have been developed through an expansion of our earlier concept of 'deliberation on dialectical divides' - divides that are more dark and bright than black and white (Pant and Hambly-Odame, 2006). In our newer model, we recommend the use of three levels of deliberation (1) deliberation on development problems, (2) deliberation on the contexts that created the problems, and (3) their philosophical and theoretical underpinnings (Fig. 1).

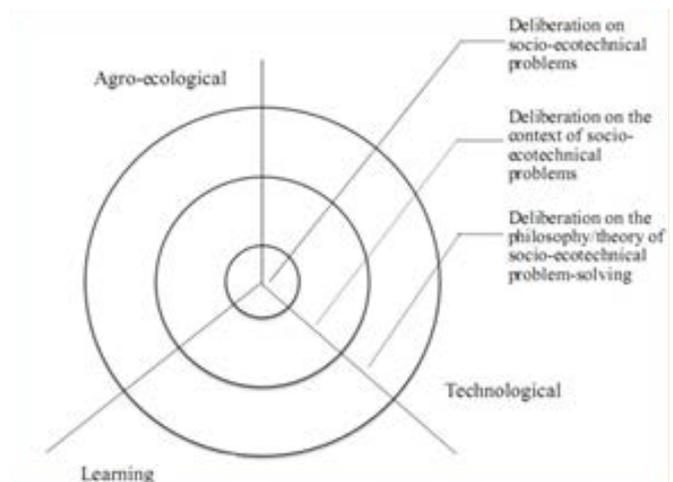


Fig. 1: Multi-level deliberation on dialectical divides

Deliberation on development (socio-eco technical) problems

Here the key development problem is the poor performance of the mango and rice sector, respectively in the Krishna District of Andhra Pradesh, India, and the Chitwan District of Nepal.

The interventions in mango (post-harvest) and participatory rice improvement have generated impressive outputs, such as improved rice varieties, mango post-harvest technology, and outcomes such as change in stakeholder relationships into more critical systems of learning and innovation. A rare human ingenuity was also evident, such as Nepalese farmers' self-motivated initiatives to improve local rice varieties for dry season planting and Indian farmers' exploration of domestic middle-class mango markets to supply premium quality mangoes to emerging super markets (see Pant and Hambly-Odame, 2009 and Pant *et al.*, 2012 for further details).

But we have seen little impact on economic and social welfare of smallholder farmers even under the existing agro-ecological comparative advantage of growing mango and rice, extensive investment on the part of agricultural and rural development, overseas technical assistance and the existence of farmers' organizations designed, *inter alia*, to stimulate technological learning and innovation.

For example, in Nepal, LI-BIRD (Local Initiatives for Biodiversity, Research and Development, Nepal) has been highly effective in facilitating multi-stakeholder deliberation on dialectical divides, such as integrating expert and local knowledge of rice varieties, centralized and participatory rice breeding, modern and local rice varieties, and rice varieties with and without regulatory legitimacy. Similarly, in India APEDA (Agricultural and Processed Food Products Export Development Authority, India) together with the State Department of Marketing facilitated stakeholder relationships to promote agro-ecological competence of using mango diversity bringing together farmers, public sector scientists, policy makers and mango traders albeit mostly on technical service delivery.

Despite these interventions, mango and rice diversity in these countries is still underutilized to enhance food security and national competitiveness. This finding implies that multi-stakeholder deliberation on agricultural biodiversity conservation and development problems *per se* are not enough unless people start questioning the contexts that have created the problems and the broader philosophical and theoretical bases of the problems.

Deliberation of the context of the problems

Although we can argue that multi-stakeholder deliberation on the contexts of the problems of conservation and utilization of agricultural biodiversity was apparently lacking in both cases, thereby seriously compromising agro-ecological competence, some discussions were initiated around the interdependence of technological and institutional issues, and the need for looking at the context of the problems. Despite their modest advancements in agricultural science and technology, stakeholders generally agree that these countries (rather regions in case of India) fail to unleash the technological competence that could more fully utilize the existing crop diversity.

But this was not enough to convince stakeholders from research, policy, extension, and farming domains to deviate from their 'business-as-usual' habits and practices of doing agricultural research and extension, the underlying causes of the problems. What is important to the development of critical systems of learning and innovation competence is the agency of individual and organizational actors to engage in deliberation on dialectical divides, setting up new experiments that are designed to fail, and empowerment of vulnerable actors to challenge the business as usual based on new evidence generated from the new experiments, be they successful or unsuccessful (Ison *et al.*, 2007).

Deliberation on the philosophy and theory of development problems

Stakeholder deliberation not only requires addressing the development problems and their immediate contexts, but it should also look at the higher level of philosophical and theoretical underpinnings. For the purpose of illustration, we bring together independently evolved literature on socio-ecological systems and socio-technical systems.

On the one hand, socio-ecological system thinking has proven important to inform conservation and utilization of agricultural resources. This thinking, however, considers technology as a given entity without necessarily questioning what technology is good for local contexts and communities (van der Brugge & van Raak, 2007; Voß & Bornemann, 2011).

Socio-technical system thinking, on the other hand, explicitly addresses the complexity associated with science, technology and innovation processes with a more recent focus on transition management, particularly about how stakeholder agency for critical learning and innovation interacts with the structure put in place by the socio-technical

regime of a nation, such as National Agricultural Research and Extension Systems (Smith & Stirling, 2010). Moreover, this body of literature focuses on transition experiments that are strategically designed to generate evidence-base to challenge the business as usual of the incumbent regime (Kemp et al, 1998). These experiments can serve as a safe space for critical thinking and radical actions without serious consequences of failure. In classical extension literature, this is akin to the trial phase of adoption process – awareness, interest, trial and adoption, but while the classical adoption process is mostly orchestrated by the incumbent regime, the niche experiments are essentially radical to challenge the business as usual.

As outlined earlier, examples of the radical space of interest in agricultural innovation is the work of the Nepalese farmers who selected rice varieties suitable for dry season production with food quality comparable to the available main season rice varieties, and that of Indian farmers who successfully explored domestic middle-class markets as opposed to increasingly stringent and competitive export markets. Thus, up-scaling of

such local level innovation agency of rural farming communities that are often only possible through strategically designed transition experiments would be important for successfully developing resilient, sovereign and productive local food and agricultural systems. However, up-scaling, if done prematurely, can also wipe out the core values of the niches that have been created by the agency of radical innovators.

To conclude, as implied by the unintended positive consequences of the well-meaning interventions, effectively addressing food insecurity should involve critical systems of learning and innovation, encouraging people to radically question their social, economic, ecological and technical reality – Indian mango growers turned to explore domestic middle-class mango markets, and Nepalese rice farmers challenged university trained plant breeders to select rice varieties for dray season cultivation. Thus, low and middle-income countries that are rich in agricultural resources, irrespective of their economic growth, cannot succeed unless technological competences are complemented by critical systems of 'learning competence'.

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08

50 PUBLICATIONS EVERY EXTENSION PROFESSIONAL SHOULD READ

To remain relevant and to support addressing the rapidly evolving challenges in agriculture, extension professionals need to upgrade their competencies. Sreeram Vishnu and Rasheed Sulaiman V have chosen what they think are the 50 best publications every extension professional should read to enhance their knowledge and skills to remain relevant to the changing times.

The need for performing wider roles by Extension and Advisory Services (EAS) and the need to enhance their capacities to do these well, are well recognized globally (Box 1). Yet there hasn't been much serious efforts in revising the existing extension curricula (both education and training) followed in most countries. Though several new learning resources from the Global Forum for Rural Advisory Services (GFRAS) such as the NewExtensionist Learning Kit (NELK) and Global Good Practice (GGP) Notes are currently available (as freedownloadable resources), new concepts, approaches and tools presented in these publications are yet to find a place in the teachings and trainings of EAS providers. The curricula in most cases remain static and there has been a tendency to continue with the old text books and publications. These to a large extent, constrain the uptake of new and more relevant ideas that could help transforming the extension discipline and develop EAS professionals with skills and knowledge relevant to the current era. The main purpose of this blog therefore is to introduce and promote some relatively newer publications, which we believe every extension professional should read to enhance his/her capacities.

We approached this task by first identifying ten broad themes in extension (relevant to the new challenges and capacities as articulated in Box 1) and then initially thought of selecting one lead resource for each theme. But we realized soon that selecting only one from each theme may result in leaving other equally relevant publications from that theme. So we finally decided to present another four related publications that are also relevant to that particular theme.

While doing this exercise, we noted that some of the publications could be relevant for more than one theme. For instance the NELK and GGP Notes cover a wide range of topics such as gender, entrepreneurship, Agricultural Innovation Systems (AIS), use of different ICTs, etc. Some publications have to be adjusted in a related theme as other publications relevant under that particular theme were not found. For instance, the publication Shaping Change could have ideally been placed under a theme called NRM (Natural Resource Management) extension, but finally we have to place it under the theme climate change as the book is more about dealing with similar increasingly complex challenges.

While we were looking for more recent publications, we also included relatively older, but equally relevant book such as Agricultural Extension by van Den Ban and Hawkins (2002) that serves as a standard text book especially for beginners. With all these challenges, we finally organized the list according to our own professional experience and judgment on the utility and relevance of these publications.

Box 1: New challenges before EAS and new capacities to address these

Extension and Advisory Services (EAS) currently supports farmers in dealing with several new challenges beyond enhancing access to new technologies. Farmers do need support to deal with uncertain markets, changing consumer demands, declining and deteriorating common property resources such as land and water, and adapt better to climate change. International agencies and national governments currently look forward to EAS to support the large number of women engaged in agricultural activities; address nutrition related issues and encourage, support and train rural youth to effectively engage in agriculture. Addressing many of these challenges would mean, supporting farmers to be organized into collectives (farmer groups, producer organizations etc.) at different levels.

Ideas around communication and innovation have considerably evolved over the past two decades. Innovation is no longer considered as a linear process of science developing new knowledge and transferring it on to extension for wider dissemination. Innovation is currently understood as an interactive process through which knowledge is generated, accessed and put to use. If EAS have to meaningfully support farmers in addressing the above challenges, EAS need to widen their agenda and emerge as a “bridging organization” linking several actors in the Agricultural Innovation Systems (AIS) rather than being an intermediary between research and farmers. Apart from these new insights, EAS providers must be aware of the changing tools and approaches to extension, the use of wide range of Information Communication Technologies (ICTs) and be able to assess and select the appropriate ones to suit the conditions they work in.

With the increasing participation of private sector and civil society organizations, EAS delivery has become pluralistic in many countries. While pluralism brought new capacities and additional funding for EAS, it has also brought new challenges for EAS, mainly related to co-ordination, knowledge management, policy alignment and sustainable financing. All these would involve developing capacities of EAS at the individual, the organizational and the enabling environment levels as articulated in the GFRAS (2012) Position Paper, “The New Extensionist”. Apart from these, extension professionals need new insights and learning to sharpen and enhance their knowledge and skills for effectively solving both field problems and operational challenges and this would involve strengthening research and evaluation in EAS.

1. Basic Concepts, Approaches and Tools in Extension

Lead Source

The New Extensionist Learning Kit (NELK)

NELK is a learning resource, developed by GFRAS (2017)¹ for individual extension field staff, managers and lecturers. It focuses on functional skills and contains 13 modules that have been identified by the GFRAS Consortium on Extension Education and Training as core competencies for individual extension agents. The aim of this kit is to produce or equip extension professional who can effectively interact and work with all different actors within the AIS with an ultimate aim of benefitting producers and related actors. While the contents of the learning kit will be primarily aimed at self-directed learners, it is also suitable for use in face to face settings. The materials can be downloaded and used for face to face and blended learning. The learning kit can help top up the knowledge of existing professionals, but also be taken up by learning institutions as foundational course material for the certificates or degree.

Other Important Source

The Rural Extension Series by Hoffman *et al.*, (2009)² is published in three volumes. The first



in the series is *Basics Concepts and Methods in Extension* which gives specialists the opportunity to supplement their training by acquiring the fundamentals of the methodology and theory of agricultural extension. The volume two basically deals with *Examples and Background Material* like case studies, checklists and practical guidelines. Last in the series, *Training concepts and Tools* is dedicated exclusively to the training needs of both staff members at various levels of extension advisory services and students in higher education.

Agricultural Extension by van den Ban and Hawkins (2002)³ is a thorough, practical handbook that explains the purpose, importance and far-reaching effects of agricultural extension

throughout the world. It covers a range of topics from different extension philosophies, the functions of extension agencies, strategies and methods appropriate to rural development in less industrialized countries, through theories underlying extension processes to professional ethics for extension workers.

The publication, **What Every Extension Worker Should Know: The Core Competency Handbook**, by Suvedi and Kaplowitz (2016)⁴ is designed as a reference manual for front-line extension staff to use in their day-to-day work. It offers a set of tools for effective communication, program planning and evaluation.

The FAO publication, **A Decision Guide for Rural Advisory Methods** by David and Cofini (2017)⁵ is intended to help extension professionals and their organizations make informed decisions about which extension method and approach to use for providing information, technologies and services to rural producers and to facilitate interactions and knowledge flow. Expected users include field-based rural advisors, extension managers and programme planners.

2. Extension and Innovation

Lead Source

The “New Extensionist”: Roles, Strategies and Capacities to Strengthen Extension and Advisory Services

This GFRAS position paper from Sulaiman and Davis (2012)⁶ presents a global view of extension and advisory services (EAS) and it reinvents and clearly articulates the role of EAS in the rapidly-changing rural context. It argues for an expanded role for EAS within agricultural innovation systems (AIS) and development of new capacities at different levels (individual, organizational and system levels) to play this role. The paper also discusses ways of developing capacities needed for operationalizing this vision at these levels.



Other Important Source

Communication for Rural Innovation (Rethinking Agricultural Extension) by Leeuw and van den Ban (2004)⁷ broadened the traditional communication functions of extension. The role of the communicator has shifted from, initially that of a disseminator of information to subsequently that of a facilitator of interaction and more recently, as a broker or an agent playing a wider range of intermediation tasks at a range of interfaces situated within (and between) networks of stakeholders operating in different societal spheres. The book discusses in detail the major roles communication can play in supporting the three essential processes relevant to innovation: network building, supporting social learning and dealing with dynamics of power and conflict.

Agricultural Innovation System: An Investment Sourcebook (World Bank, 2012)⁸ is an important resource for those interested in understanding the role of extension within the AIS. Module 3 of this source book on investment in extension and advisory services as part of agricultural innovation systems” (Davis and Heemskerk, 2012)⁹ describes key principles for developing demand driven, pluralistic advisory services (including the technical, entrepreneurial and organizational aspects of this process) capable of supporting the heterogeneous client base of an AIS.

The World Bank publication, **Agricultural Innovation Systems: From Diagnostics Toward Operational Practices** by Rajalahti *et al.*, (2008)¹⁰ presents the emerging agenda for an AIS approach, through a set of case studies and other materials that illuminates the important contextual factors affecting the innovation process. It builds on the World Bank (2006)¹¹ paper, **Enhancing Agricultural Innovation: How to Go beyond Strengthening Research Systems** and the converging views of participants of an international workshop on AIS organized by the Agriculture and Rural Development Department of the World Bank in 2007.

The CTA publication **Innovation Systems: Towards Effective Strategies in Support of Small holder Farmers** by Francis *et al.*, (2016)¹², provides a collection of papers, commentaries, expert opinions and reflections on state-of-the-art innovation systems thinking and approaches in agriculture. It attempts to respond to perplexing questions which continue to dominate the agricultural innovation agenda, particularly in the context of smallholder farming systems.

3. Climate Change and EAS

Lead Source

Climate Smart Agriculture (CSA) Sourcebook C-3 module of the FAO (2017)¹³ Climate Smart Agriculture Sourcebook, Supporting Rural Producers with Knowledge of CSA by Chuluunbaatar *et al.*, (2017)¹⁴ highlights the key role EAS can play in promoting climate-smart agriculture and provides some guidance on how, through strategic capacity development, they can better carry out this role. Currently EAS is unable to meet these new demands. Access to adequate EAS is crucial for ensuring that agricultural producers are sufficiently informed about changing conditions and can adopt sustainable agricultural practices. EAS will require increased institutional and financial support, and their capacities will need to be upgraded to support agricultural producers in reducing climate-related risks.



Other Important Source

Adaptation Under the “New normal” of Climate Change: The Future of Agricultural Extension and Advisory Services by Simpson and Burpee (2014)¹⁵ outlines the nature of the adaptation challenge, identifies past and present points of EAS engagement, and proposes future responses. The paper focuses on the constraints and conditions of smallholder farmers in the tropics, as well as the natural resource base upon which agriculture depends.

The pocket guide, **Extension Practice for Agricultural Adaptation** by Simpson (2016)¹⁶, details out the concepts, information and practices meant to support working with farm families in helping them to reduce their risks from changes in the weather. Also it details practical methods that meet the objectives outlined by the UNFAO for climate-smart agriculture. It provides examples of practices that illustrate important principles and adaptive options that are meant to be used by extension field agents.

The book, **Shaping Change: Natural Resource Management, Agriculture and the Role of Extension**, by Jennings *et al.*, (2011)¹⁷ provides fresh perspectives and practices to extension professionals who have to adjust to the rapidly changing demands of natural resource management and agro-food industry. Though written from the perspectives of challenges primarily faced in the Australasia Pacific Region, the chapters offer several new insights for students and practitioners of extension on principles and practices for enabling change, and building social capital to deal with the new challenges.

The manual, **Gender and Inclusion Toolbox: Participatory Research in Climate Change and Agriculture** by Ferdous and Spicer (2014)¹⁸ introduces a wide range of participatory strategies and tools for research to guide the implementation of CSA and is intended for NGO practitioners and program designers interested in diagnostic and action research for gender sensitive and socially inclusive climate change programs.

4. Linking Farmers to Markets

Lead Source

Linking Smallholder Farmers to Markets and the Implications for Extension and Advisory Services

The MEAS discussion paper by Ferris *et al.*, (2014)¹⁹ contains a review of EAS best practices drawn from the global body of experience in successfully reaching out to resource-limited farmers. Further, this paper explores the changing role of agricultural extension services and the growing focus on marketing and business needs of smallholder farmers. Key issues in this debate include finding better means of coordinating and sustaining services, and generating policies that build farmers capabilities to raise incomes by linking to various types of markets — including informal domestic and regional markets, traditional cash crop market, formal and higher



value markets, and emerging food aid and structured public markets.

Other Important Source

The Business of Agricultural Business Service: Working with Smallholders in Africa, by Wongtschowski *et al.*, (2014)²⁰ identifies different ways that the public and private sectors have been working together and sheds light on the pluralistic extension system. Practitioners working in the value chain and enterprise development, development partners who finance projects and policy makers will find this book useful for orienting their support to the agricultural sector.

A Guide to Strengthening Business Development Services in Rural Areas by Best *et al.*, (2015)²¹ demonstrates how a variety of support services not only improve the performance of individual producer organizations and agro-enterprises, but how they also strengthen entire agricultural sub-sectors and market chains and fuel new employment opportunities in rural areas.

Market-oriented Advisory Services in Asia – a Review and Lessons Learned, by Kahan (2011)²² presents the findings of a regional study in Asia on the design and delivery of Market Oriented Advisory Services (MOAS) to farmers and rural entrepreneurs. The publication is directed at those institutions involved in extension, value chain/market linkages and business development.

The book, **Knowledge Driven Development: Private Extension and Global Lessons**, by Zhou and Babu (2015)²³ uses actual cases written specifically to study the role and capacity of private companies in knowledge sharing and intensification through agricultural extension. Descriptions of specific models and approaches are teased out of complex situations exhibiting a range of agricultural, regulatory, socio-economic variables. Illustrative cases focus on a particular agricultural value chain and elaborate the special feature of the associated private extension system.

5. Producer Organizations in EAS

Lead Source

Producer Organizations in Rural Advisory Services: Evidences and Experiences

This position paper from GFRAS (2012)²⁴ was written to raise awareness on the roles of producer organizations in rural advisory services. Further discussion is built upon, how their effectiveness in these roles can be increased so that they contribute to improved livelihoods and poverty reduction. The position paper also

presents examples of the different ways that producer organizations are involved in the supply of and demand for rural advisory services. The paper ends with a series of recommendations to different actors involved in the provision of rural advisory services about how to strengthen producer organizations and make them more demand-oriented.

Other Important Source

The MEAS discussion paper, **Farmer Organizations and Modernizing Extension and Advisory Services: A Framework and Reflection on Cases from Sub-Saharan Africa** by Bingen and Simpson (2015)²⁵ discusses cases from sub-Saharan Africa and strives to give a better understanding of the role of farmer organizations in development outcomes which are critical to identifying options and strategies for promoting successful rural advisory services (RAS).



Organizing and Managing Farmers' Groups, jointly published by CRS and MEAS (2015)²⁶ presents an integrated and sequential approach to building vulnerable farmers' capacity to link with markets. The guide is intended for use by development facilitators, field extension agents and community leaders working with poor rural communities and it aims to provide them with a broader understanding and the skills needed to help local people work together, manage their resources and understand how to develop a sustainable and profitable agro-enterprise.

The case study-based publication **Good Practices in Building Innovative Rural Institutions to Increase Food Security** by Herbel *et al.*, (2012)²⁷, presents a collection of thirty-five cases of successful small-scale producer innovative organizations and institutional arrangements, from different regions in the world. While highlighting the success factors for small producer organizations to thrive, these good practices allow development practitioners and other stakeholders to learn from successful

initiatives in various countries, to support and replicate them.

The paper, **Making Change Happen - What can Governments do to Strengthen Forest Producer Organizations?** By deMarsh *et al.*, (2014)²⁸ explores the factors that help build constructive relationships with government counterparts, and the policy and institutional conditions that encourage or hinder forest producer organizations (FPO) development.

6. Addressing Gender and Nutrition by EAS

Lead Source

Integration of Nutrition into Extension and Advisory Services: A Synthesis of Experiences, Lessons and Recommendations

The need for nutrition-sensitive agriculture is well recognized and of growing interest to global development players. This report by Fanzo *et al.*, (2013)²⁹ summarizes the current state of knowledge on the role of nutrition in EAS, resulting from an extensive literature review, analyzing survey responses and conducting interviews with actors from worldwide development organizations, governmental agencies, educational and research institutions, and the private sector. Also the paper analyzed and documented past, current and future role of EAS, with regard to human nutrition.

Other Important Source



The publication, **Gender in Agriculture: Sourcebook** jointly developed by World Bank, UNFAO and IFAD (2009)³⁰, aims to deliver practical advice, guidelines, principles and descriptions and illustrations of approaches that have worked so far to achieve the goal of effective gender mainstreaming in the agricultural operations of development agencies. Module 7 of the source book is particularly relevant to EAS stakeholders as it covers the topics like

Gender in Extension Organizations, Gender and participatory Research, Gender Approaches in Agricultural Extension and Training as well as well documented case studies.

The INGENAES publication, **Assessing How Agricultural Technologies can Change Gender Dynamics and Food Security** by Manfre *et al.*, (2017)³¹ introduces a framework that considers the social context of the agricultural technologies and the specific challenges that women and men farmers face in using the technology. The *first part* of the toolkit discusses the relationships between gender, nutrition and agricultural technologies. The *second part* introduces a framework that considers the social context of the agricultural technologies and the specific challenges that women and men farmers face in using the technology and the *third part* is a guide for facilitators to design and conduct a workshop on the methodology, including slides and exercises.

The occasional paper from FAO, **Enhancing the Potential of Family Farming for Poverty Reduction and Food Security Through Gender-sensitive Rural Advisory Services** by Petrics *et al.*, (2015)³², offers a reflection on actions needed to ensure that good practices and lessons learnt, translate into the design and provision of a demand-driven and gender-sensitive RAS, for improved food security and poverty reduction.

The MEAS discussion paper, **Reducing the Gender gap in Agricultural Extension and Advisory Services: How to Find the Best Fit for Men and Women Farmers** by Manfre *et al.*, (2013)³³, talks about the importance of reducing the gender inequalities in EAS, as it is important not only for poverty reduction and food security but also for more efficient EAS practices.

7. Research and Evaluation in EAS

Lead Source

Manual on Good Practices in Extension Research & Evaluation

This joint publication from the ICAR-NAARM, CRISP, AESA, ICAR-CTCRI and MANAGE by Sivakumar *et al.*, (2017)³⁴ is developed as hands on reference manual to help young researchers, research students and field extension functionaries in choosing the right research methods for conducting quality research and evaluation in extension. It covers basic aspects of extension research process, various qualitative and quantitative methods with appropriate statistical tools and advanced modeling techniques with practical guidelines in choosing and using various methods. Researchers could

use to refine and update their knowledge on how to approach research in extension in a more systematic and scientific manner.

Other Important Source



Research Methodology: A Step-by-Step Guide for Beginners, by Kumar (2014)³⁵ is written specifically for those with no previous experience of research or research methodology. Written in a logical and accessible style and providing helpful techniques and examples, it breaks the process of designing and doing a research project into eight manageable operational steps.

The book, **Multivariate Data Analysis** by Hair *et al.*, (2009)³⁶, provides an applications-oriented introduction to multivariate analysis. By reducing heavy statistical research into fundamental concepts, the text explains how to understand and make use of the results from specific statistical techniques. In this Seventh Edition, new chapters have been added on structural equations modeling, and all sections have been updated to reflect advances in technology, capability, and mathematical techniques.

The purpose of the guide, **Evaluating Rural Extension** by Christoplos *et al.*, (2012)³⁷, is to support those involved in extension evaluation to choose how to conduct more comprehensive, rigorous, credible and useful evaluations. It helps the readers to understand different types of evaluation, to make decisions on what is most appropriate for their circumstances and to access further sources of theoretical and practical information.

The purpose of the MEAS training module, **Evaluation of Agricultural Extension and Advisory Services**³⁸ by Suvedi (2011) attempts to expose national level policy makers, project managers and funding agency personnel to various models and theories of program evaluation. With exposure to evaluation methods and procedures, they could contribute significantly in guiding program evaluation and

use the results to improve future programs.

8. ICTs and Knowledge management in EAS

Lead Source

ICT in Agriculture: Connecting Smallholders to Knowledge, Networks and Institutions

This World Bank publication by George *et al.*, (2017)³⁹ is designed to support practitioners, decision-makers and development partners who work at the intersection of ICT and agriculture. It is a practical guide in understanding current trends, implementing appropriate interventions and evaluating the impact of those programs. Extension professionals would find Module 6 (ICTs, Digital tools and Agricultural Knowledge and Information Systems) of this publication especially interesting. This module discusses the use and impact of ICT and digital tools in research, extension and advisory services, and activities related to agricultural learning.

Other Important Source



Improved availability of and access to information and communication technologies (ICTs) – especially mobile phones, computers, radio, internet and social media – has provided many more opportunities for collection, processing, storage, retrieval, managing and sharing of information in multiple formats. However, the high number and rapidly changing availability of ICTs may leave extension managers confused as to which methods are available and when to use them. The GFRAS Good Practice note, **Navigating ICTs for Extension and Advisory Services** by Saravanan *et al.*, (2016)⁴⁰, explains how to navigate the many types and gives tips on when to use them. In addition to this, many other good practice notes are published by GFRAS, on other strands of ICT applications like social media, m-extension and web portals for RAS.

The guide, **Effective Tools for Knowledge Management and Learning in Agriculture**

and Rural Development by Bheenick and Bionyi (2017)⁴¹ helps to understand Knowledge Management (KM), various KM methods and tools, providing a useful starting point for beginning KM practitioners. It also complements the resources on KM4ARD which CTA is making available through its knowledge management blog at <http://km4ard.cta.int>.

The paper, **Harnessing ICT for Agricultural Extension** from Royal Tropical Institute by Barber *et al.*, (2016)⁴² summarizes key issues, challenges and lessons derived from literature, case studies and practice, concerning the role ICT can play in extension systems. It elaborates on recurring issues and describes innovative experiences and emerging practices that enhance the delivery of timely information fitting the needs of farmers.

The MEAS publication **Options and Strategies for Information and Communication Technologies within Agricultural Extension and Advisory Services**, by Vignare (2013)⁴³ highlights the important role of ICT in the provision of EAS and give critical insights for practitioners to understand ICT so that they can align technology options and strategies to design effective communication for farmers.

9. Financing, Policy, Pluralism and Governance in EAS

Lead Source

Policy Compendium on Rural Extension and Advisory Services



For all those working on and advocating for an enabling policy environment for RAS, the Policy Compendium on Rural Extension and Advisory Services from GFRAS (2014)⁴⁴ is a very good resource. It is intended to be a one-stop shop for those working on, advocating for and implementing extension policy and provides background information, inputs, ideas and hands-on guidance for decision-making and facilitation of successful policy processes for RAS.

Other Important Source

For development planners and analysts, particularly at the level where decision-makers consider agricultural development policy and strategy within a country, it is critical to ask, "How is it best to finance extension activities?" Answering this question well within a given country is key to having a sustainable system of extension that delivers essential extension services to the targeted groups to meet the country's agricultural development goals. The MEAS discussion paper, **A Review of Sustainable Financing of Extension Services in Developing Countries** by McNamara (2014)⁴⁵, attempts to answer this vital question by reviewing various financing options operational in the developing countries.

The working paper **Governance of Agricultural Extension Systems** by Bitzer *et al.*, (2016)⁴⁶, from Royal Tropical Institute (KIT) provides an overview of the governance structure and processes of extension services dominant in many developing countries, including the most governance failures, recent efforts targeted at governance reform and promising processes in strengthening governance (public coordination, public-private partnerships and farmer involvement in extension service provision).

The publication from FAO and KIT, **Towards inclusive Pluralistic Service Systems - Insights for Innovative Thinking** by Bitzer *et al.*, (2016)⁴⁷ examines the need for demand-driven service provision, the diverse providers and approaches to service delivery, the policy considerations and institutional challenges constraining the operation of inclusive pluralistic service systems. FAO and KIT jointly organized an expert consultation on this topic in 2016 and a synthesis of deliberation, policy recommendations and priority actions for strengthening pluralistic service systems are also currently available⁴⁸.

The publication, **Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming and Evaluating Extension Systems** by Swanson and Rajalahti (2010)⁴⁹ discusses about comparative analysis of different extension strategies, organizational models, institutional innovations and resource constraints, and how an extension system might be transformed and strengthened through specific policy and organizational changes as well as needed investments.

10. Professionalism and Capacity Development of EAS

Lead Source

Advancing Agricultural Knowledge: Improving the Professionalism of Rural Advisory Services

Many countries are seeking to professionalize their extension and advisory services and they need strengthened capacities to initiate this process. This GFRAS publication by Terblanche (2017)⁵⁰ is based on a scoping study to examine the current levels of professionalism in its 11 regional networks. The aim was to provide evidence that would guide the activities and tools offered by GFRAS as well as to promote inter-regional learning and information exchange with a specific focus on training, talent and career



development, performance incentives, certification and registration and, mentoring and standards.

Other Important Source

The CRISP publication, **Assessing Capacity Needs of Extension and Advisory Services: A Guide for Facilitators**, by Mittal *et al.*, (2016)⁵¹ is a stand-alone document / procedure to assist facilitators in conducting a workshop with EAS providers for assessing the capacity needs.

The trainer's manual, **Facilitating Capacity Needs Assessment**, by D'Aquino *et al.*, (2017)⁵² was prepared under the project Capacity Development for Agricultural Innovation

Systems (CDAIS), a global partnership that aims to strengthen the capacity of countries and key stakeholders to innovate in complex agricultural systems, thereby achieving improved rural livelihoods. Elements of the manual such as the facilitation tools may also be useful in other contexts and the modular design allows for parts of it to be extracted and adapted for use as necessary.

The TAP publication, **Common Framework on Capacity Development for Agricultural Innovation Systems** (FAO, 2016)⁵³, promotes a shift of mindsets and attitudes among the main actors and provides concepts, principles, methodologies and tools to understand better the architecture of AIS, to assess capacity development needs and to plan, implement, monitor and evaluate capacity development interventions.

The publication, **Assessment of Core Competencies of Livestock Extension Professionals in India**, by Sasidhar and Suvedi (2016)⁵⁴, operationalized and assessed the core competencies of livestock extension professionals in India through a survey. This publication could be of great interest to those who are keen to do similar type of assessment elsewhere. The key survey questions were on the core areas viz. specific livestock extension and subject matter competencies, technical subject matter application competencies, livestock extension program development, implementation and evaluation competencies, communication, education and informational technology competencies, personal, professional development and diversity competencies.

Way Forward

Though some of you may fault us for not including some publications which you would like to see in a list like this, we believe that there will be very little disagreement on the publications we selected in this blog as a "must-read" for all extension professionals.

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09

SKILLS, SCALE AND SPEED: HARNESSING MOOCS FOR LARGE SCALE CAPACITY DEVELOPMENT

Many agencies are experimenting with MOOCs (Massive Open Online Courses) for enhancing the capacities of rural communities and knowledge intermediaries. MOOCs offer huge potential for enhancing the capacities of extension and advisory service providers. In this blog, V Balaji shares his experience of using MOOCs in the area of Mobiles for Development.

Skills development is a policy priority in all countries irrespective of their status in the global economy. Not only should skills be developed, they should be developed at scale and at speed, as articulated by the Prime Minister of India recently. MOOCs have showed the potential for delivering learning to hundreds of thousands of people in a single offering. There is a need to build prototypes and programs to harness them in enhancing the capacities of farmers and the intermediaries in the farm to market value chain.

Box 1: What is MOOC?

The MOOC (Massive Open Online Course) is a recent development in the area of technology mediated learning. It is, in its fundamentals, an internet technology. It combines a host of online content management techniques with a host of workflows, and further provides components of social networking. An important advantage of the MOOC is its scale: a single course offering can be availed with the course duration by literally hundreds of thousands of people. With the MOOC, a handful of people- the instructor and a group of teaching assistants -can offer a course to thousands of learners in a single offering.

The first MOOC was offered in Canada in 2007 to a couple of thousand individuals. However, it received wider notice, especially in global media, only in the year 2012 when a MOOC offered by the Massachusetts Institute of Technology (MIT) on an advanced topic in digital circuits had attracted about 200,000 joiners. The same course, in a classroom setting, would have enrolled less than 100 students. Globally renowned research universities such as the MIT, Harvard and Stanford have been pioneers in developing MOOCs.

The media coverage and scholarly analysis tend to create a broad view that MOOCs are branded services, requiring elite research universities and venture capital-driven Internet companies to organize and offer them. Secondly, these analyses have tended to look at the MOOC as a development affecting only the Higher Education sector, that too, only in North America. However, MOOC has huge potential in other sectors too.

MOOC and COL

In Commonwealth of Learning (COL), we observed the scene closely and arrived at a view that MOOC is primarily a collection of Internet technologies. The brands were unimportant since any capable group can similarly put relevant Internet technologies together. The scale advantage in the MOOC was an attraction, for it can potentially be used to reach out thousands if not tens of thousands of learners that lacked training and capacity building services. Thus, MOOC could be used in support of human development if the components can be put together and scaled up in an affordable manner.

Box 2: Commonwealth of Learning

Hosted by the Government of Canada and headquartered in Vancouver, Canada, the Commonwealth of Learning (COL) is the world's only intergovernmental organisation solely concerned with the promotion and development of distance education and open learning. COL was created by Commonwealth Heads of Government to encourage the development and sharing of open learning/distance education knowledge, resources and technologies.

The Commonwealth of Learning helps governments and institutions to expand the scope, scale and quality of learning by using new approaches. COL promotes policies and systems to make innovation sustainable and works with international partners to build models, create materials, enhance organisational capacity and nurture networks that facilitate learning in support of development goals (www.col.org)

We worked closely with Professor TV Prabhakar of Indian Institute of Technology Kanpur arriving at this understanding. Professor Prabhakar further proposed that we consider the MOOC as the equivalent of an event, a media event especially and to work with it as a virtual conference rather than as a virtual classroom.

In a parallel track, COL had been consulting development partners in various countries about the role of mobile communication technology in producing viable benefits for human development. Two consultations were organized in India during 2012-13 and they both revealed that partners in development felt the need for a neutral platform to learn about key issues and developments in that area of technology that can have an influence on human development. Thus, we decided that it would be useful to organize a MOOC on Mobiles for Development (M4D).

We invited IITK to partner with us and take the lead in designing and offering this MOOC. Since certification is important for learners that invest their own time and resources (such as costs of accessing Internet from their homes, offices and other workplaces), the course team sought to offer certificates of participation or competence to eligible participants. IITK (Center for Continuing Education) and COL agreed to co-sign the certificates.

Mooc on Mobiles for development (M4D)

The course, in English, was offered during Oct-Nov 2013 and the efforts to market it started in late August 2013. At the start of the course, there were 2282 joiners from 116 countries. The top five countries were India, Nepal, Mauritius, Grenada and South Africa. Almost 500 joiners were from countries in the Africa-Caribbean-Pacific regions. About 200 joiners were from OECD countries and from the Eastern European region.

Core faculty

The course, led by Professor Prabhakar, was designed as a knowledge enrichment course in

technology topics for non-technology people. IITK faculty covered the core technology topics. Topics related to education, banking/financial inclusion and agricultural extension were also covered during the course. The Agropedia/vKVK team at IITK also covered topics in mobiles in agriculture. Professor Mohamed Ally, an internationally renowned expert in m-learning based at the Athabasca University, served as the lead for the section on mobiles in education. A group of experts from the National Institute of Bank Management, India, covered the topics on financial inclusion. COL led the marketing of the MOOC and coordinated participation of non-IITK faculty. IITK which led the course also managed the platform and technology components.

Methodology

The course material was delivered as videos. These were supplemented by PPT slides and scripts of video talks (to help offset accent variations). Those who could not access the online videos consistently were able to use the PPT slides and scripts. The MOOC provided for a chat room where any learner could post a comment or a question. There was a forum available online with tracks for specific topics.

The participants were expected to spend about four hours per week for six weeks to gain a reasonable knowledge of mobiles in development. In all, a total of 92 videos (ranging in length from two to 25 minutes) were generated, along with all the associated PPT slides and scripts. These have been released as Open Education Resources once the course was over and are meant for re-use and adaptation by any interested individual or organization anywhere.

Out of the joiners, a total of 1461 individuals or about 62% of joiners were active through the course. There were frequent assignments and two quizzes were offered. Instructors joined the chat room and discussion forums on a daily basis and answered queries and wrote individual participants that needed help. They also were available once a week for real-time chats. Since the participants came from 18 time zones, the

instructors joined in at different times in India and Canada to support as many participants as possible.

Participants who had viewed a minimum percentage of videos and PPT were eligible for a participation certificate; those who participated above minimum and received scores above a certain percentage in the quizzes were eligible to receive a competence certificate. At the conclusion of the MOOC, a total of 333 certificates were issued (244 competence certificates and 89 participation certificates). Of these just over 90% were from developing countries.

Feedback

A survey of participants after the course revealed very high levels of satisfaction. The content was rated relevant and the competence of instructors also received an excellent rating. More than 90 percent of the participants stated that they would recommend the course to others if offered again. An external evaluation of this MOOC from a pedagogic perspective was carried out during March-April 2014. This evaluation noted that the "M4D online course demonstrated that a low-cost, open source software delivery platform combined with open educational resources (OER) could be used effectively to provide a hybrid MOOC environment that served over 1,400 learners" (COL, 2014). The report of this evaluation has been published as an Open Access document on COL's web site.

LEARNING from MOOCS for M4D

Needs own flexible pedagogy

To be effective, MOOC requires its own pedagogy. MOOC is a new medium in learning technology and is still an emerging area. IITK team had organized a previous MOOC in software topics and was able to use that learning, along

with COL expertise in instructional design, in building an effective pedagogy. A key aspect of this is the "chunking" of content, avoiding long "talking heads" videos. Faculty from research universities need time to ingrain this teaching attitude. Weekly summaries were provided to participants via email. Cross-media approaches were adopted: for example, when three groups of participants in Sierra Leone, Zambia and Nepal had difficulty in Internet access, the course team couriered the material on DVDs. These groups were then able to attempt the quizzes.

New topics for MOOCS

The participants from the MOOC on M4D suggested the following topics for coverage in future MOOCs:

- **Educational topics:** instructional design, applications of mobile technologies for teaching and for use in libraries
- **Agricultural topics:** GPS, GIS, meteorology, fuzzy logic, mobile use in agriculture with expanded cases studies from other areas of the world
- **Management:** knowledge management, management skills, technology transfer
- **Research:** research methods, research methods employing mobile technologies
- **Digital media:** web development, media production, HTML5, media storage preservation
- **Entrepreneurship:** small business development, small business development in rural settings
- **Finance:** banking, alternative banking systems, micro-finance, organization and management of cooperatives
- **Gender:** gender equity, gender issues



Mobiles for Development
a Massive Open Online Course (MOOC) by IIT Kanpur and COL



Up-scaling MOOC

COL organized a brain storming session with the National Academy of Agricultural Sciences (NAAS), New Delhi, on the relevance of MOOCs in Indian agriculture (March 2014).

The participants recommended that MOOC-for-Development should be a movement in India and that MOOCs should be built from the perspective of skills development in agriculture at all levels. It is also useful to note that the BRICS summit in Brazil decided to form a Network University of BRICS while the Prime Minister of India, in his speech in the same context, identified MOOC as a channel for Youth Engagement. The policy environment thus is favorable to build a paradigm of MOOC for Development, covering agriculture and food, rural development and well-being of farmers.

It is possible that further efforts in MOOC for Development are more likely to be led by national agencies or NARES than by international agencies. The latter have, for over a decade, de-emphasized training and capacity strengthening as autonomous activities that contribute to creating institutional impact. Training is viewed as a component of research programs, thus diminishing incentives for deploying pedagogic

and process-oriented innovations in capacity development. There are no clear incentives for the for-profit international organizations in agriculture to engage in training and capacity building where definite revenue streams are unavailable.

MOOC on MOOC

COL and IITK are organizing a MOOC on MOOC (<http://mooconmooc.org/>) aimed at educators and policy makers in development institutions who are interested in creating social and economic impact through mass training. This course is partly an outcome of the discussions organized with the NAAS in India earlier in 2014. The course is meant to acquaint the learner with all the basic concepts, processes and procedures associated with the MOOC and will give a flavor of the technology matters. It is meant for teachers in any institution of higher education at any level, for administrators of colleges and universities and students and professionals who wish to take advantage of MOOC for career development. This course will be in English. It starts on 5th September 2014 and will run for four weeks. Learners are expected to commit up to four hours per week. Registration is free and open to anyone interested and there are no pre-requisites.



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10

MASSIVE OPPORTUNITIES FOR KNOWLEDGE UPSCALING: THE UNHARNESSED POTENTIAL OF MASSIVE OPEN ONLINE COURSES (MOOCS)

Breaking the barriers of space, time, and cost, MOOCs redefined the global educational landscape by making content more universal. Though the debate is still going on regarding the success of MOOCs in addressing the knowledge divide, they are surely undervalued by the present agricultural curricula and underutilized by the student community. In this blog, Sreeram Vishnu makes an attempt to highlight the present status of MOOCs and compiles some of the interesting and informative MOOCs offered by some of the popular MOOC platforms that are relevant to social science professionals in agriculture.

The term Massive Open Online Courses (MOOCs) is not new to most of us. Simply stated they are a form of creative disruption in the field of education (Box 1). Hailed as an educational revolution, MOOC describes an evolving ecosystem of open online learning environments, encompassing a spectrum of course designs (Emanuel 2013; Rodriguez 2012). MOOCs are a model of learning that offer open enrolment free of cost, which can lead to 'massive' levels of participation in terms of numbers and diversity. On an average, the shortest MOOCs are two weeks in duration, and the longest, sixteen weeks. The modus operandi of most of the MOOC platforms is simple – learners can access all the content free of charge, but need to pay a fee to access assignments and get the necessary certification for the course (Mallya 2017; Higher Education Academy 2017). Essentially, they challenge the conventional learning evaluation practices that rate course completion as greater than the quality of learning (Higher Education Academy 2017). Disruptions created by MOOCs in the global educational arena even prompted The New York Times to name 2012 as the 'Year of MOOCs' (New York Times 2012).

Box 1: Massive Open Online Courses (MOOCs)

Who and Where

The term 'MOOC' was originally articulated by Dave Cormier (University of Prince Edward Island, Canada) to describe a course developed by George Siemens and Stephen Downes on 'Connectivism and Connectivity in Knowledge' in 2008.

When

Though the origins of MOOCs can be traced back to the early 2000s when open source, open access and open courseware movements appeared (Zawacki-Richter & Naidu 2016), it was in 2008, when the first MOOC was started, which is hailed as a landmark for networked learning.

Why

MOOCs evolved from the open educational resources (OER) movement as a way to connect open access digital materials to networks of learners, and may be considered a continuation in the development of distance education (Daniel 2014).

How

Every course is taught by highly-qualified instructors in a format that may include recorded video lectures, graded assignments, quizzes, discussion forums, and peer-to-peer/peer-to-instructor learning.

The disruptions created by MOOCs in the field of distance education are huge. MOOCs are now more ubiquitous in the sense that they have covered each and every corner of the knowledge sphere, like Science, Art, Religion, Culture, Education, Language, and Technology. Apart from the expected learning, outcomes vary greatly in MOOCs – depending on whether it is designed for language learning, machine learning, for development of soft skills, or with a focus on pure academic topics. So each MOOC is designed uniquely, driven by a particular pedagogical approach, teaching style and content. Interestingly, MOOCs have moved beyond pure academic

topics and ventured into fields, such as Film industry (Hollywood: History, Industry, Art on the EdX platform), Business (Digital marketing on the Coursera platform), Tourism (Tourism and travel management on the EdX platform), Automobile industry (Electric cars: Introduction on the EdX platform), Governance (Improving leadership and governance in nonprofit organizations on the Coursera platform) and Religion (Buddhism through its scriptures on the EdX platform). However, MOOCs are basically categorized into two, based on the pedagogical principles followed, which in itself is an interesting topic. It is briefly discussed Box 2 below.

Box 2: Types of MOOCs

A review of the whole discourse on MOOCs is dominated by two terms, viz., cMOOCs and xMOOCs (Bayne and Ross 2014). Connectivist MOOCs (cMOOCs) are considered as primitive forms, which are loosely structured, built around the interaction of the participants and based on the connectivist pedagogical principles of learning socially from others, within distributed networks. xMOOCs are more advanced, designed and launched by many commercial platforms (Coursera, EdX, Udacity) by sensing the possibilities for teaching and learning on scale. They are distinct from the cMOOCs in that they follow the instructivist pedagogy. They rely heavily on short videos and quiz assessments with limited interaction between learners. However, high dropout rates of the participants and uncertain business models considerably stymied the smooth progress of MOOCs. This led some of the universities to redesign their online courses, which were then directed towards a smaller audience with restricted access, that was named as Small Private Online Courses (SPOCs) (Higher Education Academy 2017). Another example are blended MOOCs, a hybrid proposal that offers both online and classroom teaching (Olazabalaga et al. 2016).

Harnessing the Potential of MOOCs

In this blog, I have tried to compile some of the useful courses relevant to the agricultural social science professionals from two major MOOC Platforms, viz., Coursera and EdX. The courses are put under various categories so that those interested can sign in to the platform, figure out the desired courses and get enrolled easily. Besides, upon registration with these MOOC platforms, we can stay tuned with the latest courses offered by them through regular email notifications.

Coursera¹

Coursera, founded in 2012 by Stanford professors Daphne Koller and Andrew NG, is an online education company that now offers courses, specialisations, and degrees from 150 of the world's top universities and educational institutions (Mallya 2017). Logging into the respective course pages would give a brief account of the course, with an overview, a syllabus and other FAQs, including the pricing and prerequisites to attend the course, if any. Some of the interesting courses from this platform are listed below.

¹ <https://www.coursera.org/>

Table 1: Courses offered by Coursera relevant to social scientists

Category of course	Course title
Economics	1. Agriculture, Economics and Nature (https://www.coursera.org/learn/agriculture-economics-nature) 2. The Economics of Agro food value chains (https://www.coursera.org/learn/valuechains)
Education	1. What future for education? (https://www.coursera.org/learn/future-education) 2. Introduction to multilingual and multicultural education (https://www.coursera.org/learn/multilingual-multicultural-education) 3. Assessment in Higher Education: Professional Development for Teachers (https://www.coursera.org/learn/assessment-higher-education) 4. Powerful Tools for Teaching and Learning: Web 2.0 Tools (https://www.coursera.org/learn/teaching-learning-tools)
Governance and Society	1. Methods and Statistics in Social Sciences Specialization (https://www.coursera.org/specializations/social-science) 2. Become a Journalist: Report the News! Specialization (https://www.coursera.org/specializations/become-a-journalist)
Psychology	1. Foundations of Positive Psychology Specialization (https://www.coursera.org/specializations/positivepsychology) 2. Positive Psychology: Applications and Interventions (https://www.coursera.org/learn/positive-psychology-applications)
Philosophy	1. Philosophy, Science and Religion: Science and Philosophy (https://www.coursera.org/learn/philosophy-science-religion-1) 2. Philosophy and the Sciences: Introduction to the Philosophy of Cognitive Sciences (https://www.coursera.org/learn/philosophy-cognitive-sciences)
Personal Development	1. Effective Communication in the Globalised Workplace Specialization (https://www.coursera.org/specializations/effective-communication) 2. Photography Techniques: Light, Content, and Sharing (https://www.coursera.org/learn/photography-techniques) 3. Creative Problem Solving (https://www.coursera.org/learn/creative-problem-solving) 4. Leadership in 21st Century Organizations (https://www.coursera.org/learn/leadership-21st-century) 5. Coaching Skills for Managers Specialization (https://www.coursera.org/specializations/coaching-skills-manager) 6. Presentation Skills: Designing Presentation Slides (https://www.coursera.org/learn/slides) 7. Learning How to Learn: Powerful mental tools to help you master tough subjects (https://www.coursera.org/learn/learning-how-to-learn) 8. Conflict Transformation (https://www.coursera.org/learn/conflict-transformation) 9. Teamwork Skills: Communicating Effectively in Groups (https://www.coursera.org/learn/teamwork-skills-effective-communication) 10. Creating Innovation (https://www.coursera.org/learn/creating-innovation) 11. Virtual Teacher Specialization (https://www.coursera.org/specializations/virtual-teacher)
Data Science	1. Data Analysis and Interpretation Specialization (https://www.coursera.org/specializations/data-analysis) 2. Exploratory Data Analysis (https://www.coursera.org/learn/exploratory-data-analysis) 3. Introduction to Data Analysis Using Excel (https://www.coursera.org/learn/excel-data-analysis)

Probability and Statistics	1. Methods and Statistics in Social Sciences Specialization (https://www.coursera.org/specializations/social-science)
	2. Regression Modeling in Practice (https://www.coursera.org/learn/regression-modeling-practice)
	3. Statistical Reasoning for Public Health 1: Estimation, Inference, & Interpretation (https://www.coursera.org/learn/statistical-reasoning-1)
	4. Introduction to Probability and Data (https://www.coursera.org/learn/probability-intro)

Note: The courses listed are presently announced in the Coursera website. However, this list is not exhaustive, as Coursera introduces and updates courses periodically.

Nowadays, MOOC developers are closely taking into account the demands and needs of their user community. One such example that comes to mind is a MOOC on Coursera, which is particularly dedicated to provide better insights on how to apply to Universities in the United States². The platform even launched an online course in entrepreneurship, titled 'Master's in Innovation and Entrepreneurship' (OMIE), which demands teamwork from the participants and mentoring support from experienced entrepreneurs. Successful graduates were eligible to get seed funding from HEC Paris, the course partner of Coursera, and can then work at the HEC's incubator. In 2016, Coursera diversified its focus from individual learners to new arenas – 'Coursera for Business' and 'Coursera for Governments

and Non-profits' – where it aims to work with startups and enterprises, and local governments, respectively. The platform even invested heavily on developing mobile-friendly platforms for those who don't have access to desktops (Mallya 2017).

EdX³

Founded by Harvard University and MIT in 2012, EdX is the only leading MOOC provider that is both non-profit and open source. EdX courses are powered by the open sources platform, Open Edx, which allows educators to build learning tools and add new features to the platform, creating novel solutions for the learners (EdX 2012). Given below are some of the courses offered by EdX, found to be useful to social science researchers/scholars.

Table 2: Courses offered by edX relevant to social scientists

Category of course	Course title
Data Analysis and Statistics	1. Statistics and R (https://www.edx.org/course/statistics-r-harvardx-ph525-1x-1)
	2. Data Visualization for All (https://www.edx.org/course/data-visualization-all-trinityx-t005x)
	3. Big Data Analytics (https://www.edx.org/course/big-data-analytics-adelaidex-analyticsx)
	4. Big Data Fundamentals (https://www.edx.org/course/big-data-fundamentals-adelaidex-bigdatax)
	5. Analytics for Decision Making (https://www.edx.org/course/analytics-decision-making-babsonx-bpet-statx-0)
	6. Analytics for the Classroom Teacher (https://www.edx.org/course/analytics-classroom-teacher-curtinx-edu1x-0)
	7. Analyzing and Visualizing Data with Excel (https://www.edx.org/course/analyzing-and-visualizing-data-with-excel)
	8. Cluster Analysis (https://www.edx.org/course/cluster-analysis-utarlingtonx-link-la-cax)
	9. Theory of Change for Development (https://www.edx.org/course/theory-change-development-witsx-tocx)
	10. Introduction to Statistics: Descriptive Statistics (https://www.edx.org/course/introduction-statistics-descriptive-uc-berkeleyx-stat2-1x)

²With over 4,000 universities and no standard application system, the U.S. admission process can be confusing for everyone, especially for students applying from other countries. This course will help international students to navigate the U.S. university admission process by offering practical information about the documents and sections that make up a U.S. university application. (<https://www.coursera.org/learn/study-in-usa>).

³ <https://www.edx.org/>

Business and Management	<ol style="list-style-type: none"> 1. Project Management for Development (https://www.edx.org/course/project-management-techniques-for-development-professionals) 2. Communication Skills and Teamwork (https://www.edx.org/course/communication-skills-and-teamwork) 3. Problem Solving and Critical Thinking Skills (https://www.edx.org/course/problem-solving-and-critical-thinking-skill) 4. Business and Data Analysis Skills (https://www.edx.org/course/business-and-data-analysis-skills) 5. Supply Chain Management: A Decision-Making Framework (https://www.edx.org/course/supply-chain-management-a-decision-making-framework) 6. Entrepreneurship in Emerging Economies (https://www.edx.org/course/entrepreneurship-in-emerging-economies) 7. Business Communication (https://www.edx.org/course/business-communication-ritx-skills101x-0) 8. Project Risk Assessment (https://www.edx.org/course/project-risk-assessment-michiganx-fin402x) 9. Visual Presentation (https://www.edx.org/course/visual-presentation-ritx-skills106x-0) 10. Writing for Social Media (https://www.edx.org/course/writing-social-media-uc-berkeleyx-buswri3x)
Economics and Finance	<ol style="list-style-type: none"> 1. Data for Effective Policy Making (https://www.edx.org/course/data-for-effective-policy-making) 2. Intellectual Property Law and Policy (https://www.edx.org/course/intellectual-property-law-policy-part-2-pennx-iplaw2x-0) 3. Introduction to Project Management (https://www.edx.org/course/introduction-project-management-adelaide-x-project101x) 4. Behavioural Economics in Action (https://www.edx.org/course/behavioural-economics-in-action) 5. Global Sociology (https://www.edx.org/course/global-sociology-wellesleyx-soc101x) 6. Foundations of Development Policy (https://www.edx.org/course/foundations-of-development-policy) 7. Data Analysis for Social Scientists (https://www.edx.org/course/data-analysis-for-social-scientists) 8. Evaluating Social Programs (https://www.edx.org/course/evaluating-social-programs-mitx-jpal101x-6) 9. AGRIMONITOR: Agricultural Policy, Food Security and Climate Change (https://www.edx.org/course/agrimonitor-agricultural-policy-food-idbx-idb13-1x-0)
Humanities	<ol style="list-style-type: none"> 1. Critical Development Perspectives (https://www.edx.org/course/critical-development-perspectives-uqx-igdm4x-1) 2. Working in Teams: A Practical Guide (https://www.edx.org/course/working-teams-practical-guide-uqx-teams101x-2) 3. How Media Got Social (https://www.edx.org/course/how-media-got-social-curtinx-net1x)
Biology and Life Sciences	<ol style="list-style-type: none"> 1. Introduction to Psychology (https://www.edx.org/course/introduction-psychology-st-margarets-episcopal-school-psych101x-0) 2. Sustainable Food Security: The Value of Systems Thinking (https://www.edx.org/course/sustainable-food-security-the-value-of-systems-thinking)

Note: The courses listed are presently announced in the Coursera website. However, this list is not exhaustive, as Coursera introduces and updates courses periodically.

level. Any academic institution in India can offer up to 20 percent of its catalog in a particular program via *Swayam*. Hence, there is ample scope for integrating selected MOOCs with the course syllabus so as to supplement and enhance knowledge and skills of the learners.

MOOCs: Still an Underutilized Resource in Agricultural Education?

Though MOOCs offer a variety of courses useful to the scholars of a variety of disciplines, it is still debatable whether they have been utilized to the fullest possible extent. If we look at the present curricula in agricultural universities, we can safely conclude that the potential of MOOCs have still not been realized. Usually the curricula for the different courses would give a set of suggested readings, helpful for understanding the topic in depth. At this juncture, it would add to the experience if MOOCs were also listed as these would supplement the reading and impart associated skills to the respective course. For instance, the online course, 'Digital Story Telling' offered by Michigan State University (in the Coursera platform) can be made a suggested MOOC for the students of e-extension. This course teaches how to make attractive teaching videos –

starting with story board writing – and facilitate the learning by showing demonstration videos. The course also covers various open source platforms of music files and high quality images for use in making the videos and publishing guidelines. The learning will also be assessed by a compulsory practical, in which the learners are required to make and publish a small video for evaluation. Hence, by the end of the course, a scholar of e-extension would get a clear idea on how to make a teaching video and would be equipped to make one by himself/herself. Similarly, the MOOC, 'Survey, Data Collection and Analytics' (<https://www.coursera.org/specializations/data-collection>) offered by Michigan State University through Coursera is a course that many agricultural social science scholars may be looking for, before commencing their research study.

Recently a MOOC run by NPTEL on 'Mobile Applications' generated huge interest among the audience as evident from the waiting list of candidates for registration in the programme. Figure 1 shows the upward trend over the years on Google search with respect to MOOC-related terms, worldwide. If this trend is any indication, the interest in MOOCs is peaking across the globe.

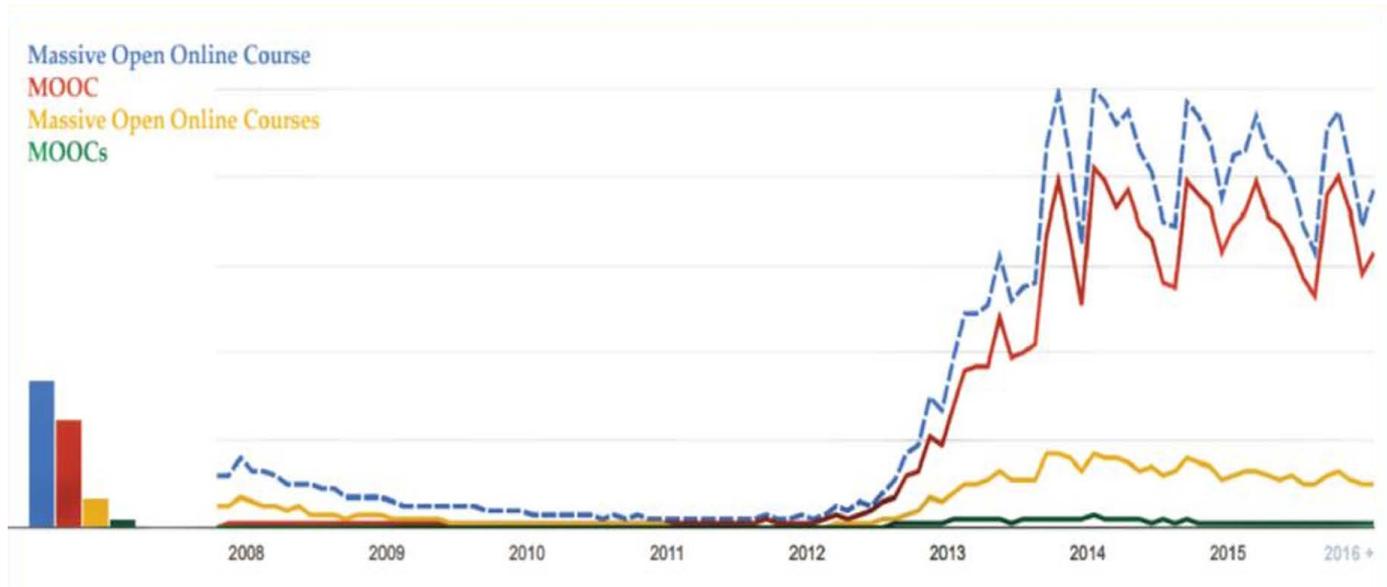


Fig. 1: Google Trends for MOOC-related keywords

Source: Bozkurt et al. (2016)

MOOCs were basically introduced to cater to the educational needs of the masses, who are otherwise disadvantaged. However, a survey of active MOOC users in more than 200 countries revealed that most people signing up to do free online courses were already highly educated and

80 percent of them already held a degree. This strengthens the argument that MOOCs seem to be reinforcing the advantages of the 'haves' rather than educating the 'have-nots' (Emanuel 2013). According to this survey, India is one among those countries where, almost 80 percent of MOOC

students come from the wealthiest and most well-educated six percent of the population. In other words, MOOCs have fallen short of democratizing education, and instead, have widened the gaps in access to education instead of shrinking them, at least for the time being (Hollands and Tirthali 2014). Access to internet, recent trends in commercializing MOOCs by putting a price on accessing course content, etc., are some of the other issues, which question the very rationale of MOOCs itself.

Way Forward

MOOCs are not an isolated development, but rather form part of a wider landscape of changes in higher education to supplement classroom teaching, which should possibly be aimed at specific targets, namely, university students with a chance to validate credits, professional development courses for teachers, or as a channel for corporate training (Yuan and Powell 2013; Hollands and Tirthali 2014). Unfortunately, the present curricula has not accorded due emphasis to MOOC-based learning or utilizing them as supplementary learning materials. Giving incentives (credit requirements, weightage in the score cards, etc.) would motivate young scholars to enroll into more MOOC programmes and acquire new skills. The concerned departments in each university can prepare a database of various MOOCs relevant to their courses, and make them

a part of the curricula. However, course pricing may be a deterrent factor for many of the learners, especially young scholars. In order to overcome the cost factor, ICAR organizations can start their own MOOCs with assured quality to rival the global MOOC platforms. Thereby, common courses can be developed across these institutions, which can be shared, and these MOOC materials can be used multiple times. However, the courses should be designed based on the demand from the user community, and quality of the content should be certified for better learning outcomes.

Already, organizations like MANAGE and NAARM, have launched their own MOOC platforms. Furthermore, radical changes witnessed in the telecom sector, such as access to internet data at nominal prices and its universal coverage in the country, is expected to give a big boost to the progress of MOOCs. The advances related to improvements in technological solutions, such as machine learning, natural language processing, human-computer interaction, adapting machines in line with the student's progress, or the development of new tools such as video annotations, which allow for greater multimedia interaction and collaboration between students, are surely expected to revolutionize MOOC-based learning in the coming days (Vargas 2014; Monedero, Cebrián and Desenne 2015).

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11

WHAT IS WRONG WITH OUR FORESTRY EDUCATION?

New courses related to socio-economic faculties including extension needs to be developed and promoted in forestry education, argues Binoo P Bonny.

Forestry forms the second largest land use category in India after agriculture, catering to 16% of the human and 18% of the cattle population needs. The Indian population directly dependent on forests is roughly estimated at 275 million (27%) which include both tribal and non-tribal forest users (World Bank, 2002). This covers the 200,000 Indian villages declared as forests dependent for timber and non-timber forest products (NTFP) for their livelihood (Raveendranath and Sudha, 2004). Forests also meet about 40% of the energy needs including more than 80% of the rural energy requirements mostly in the form of fuel wood. However, the challenges of growing population and rapid industrialization have skewed the demand – supply curve against forest resources leading to over-harvesting and degradation of ecosystems. Poor conservation outcomes have forced planners to reconsider the role of the forest community in resource use and conservation through policy revisions and enactments with little tangible outcome.

The Challenge

In fact, most of the forests and forests management problems in India can be categorized under the class of human problems which Hardin (1968) called as no-technical solution problems. No-technical solution problems demand change in human values or attitudes and requires little change in techniques of the natural sciences. Unfortunately the underlying philosophy that guides contemporary forestry research and education has been based on bionomics of forests. It remains skewed towards conservation, ecosystem management and resource use optimization. The research domains remain dictated by the economic theory of natural resource utilization that are owned in common and exploited under conditions of individualistic competition. The model lacks integration with behavioral components of the forest dependent population and matching soft skill competencies in the regulatory systems.

The mismatch emanates from the fact that historically Indian forest policies followed an exclusive management regime in which adaptive livelihood use of forest and grazing land were not tolerated. Moreover, the general attitudinal disposition favors forests resources as free goods for the individual but scarce goods for the society. Therefore it involves social, political and economic dimensions that shape behavior, opportunities, rights and power relations of people concerned. The challenge is to evolve institutional innovations that have inbuilt mechanisms to resolve the problems related to tenure rights, ownership, control and management of forest resources at local level. The responsibility rests predominantly

with the regulatory system that involves officials of the public sector Forest Department and to some extent nongovernmental organizations working in this sector.

Forest Research & Education System in India

Indian Council of Forest Research and Education (ICFRE), the apex autonomous body under the Ministry of Environment and Forests (MOEF)

governs the National Forestry Research and Education System. It is aimed at developing holistic forestry research through planning, promoting, conducting and coordinating research, education and extension on all aspects of forestry for ensuring scientific management of forest, tree improvement, and forestry productivity. An overview of the major institutions that forms components of the national forestry system is illustrated in Fig 1.

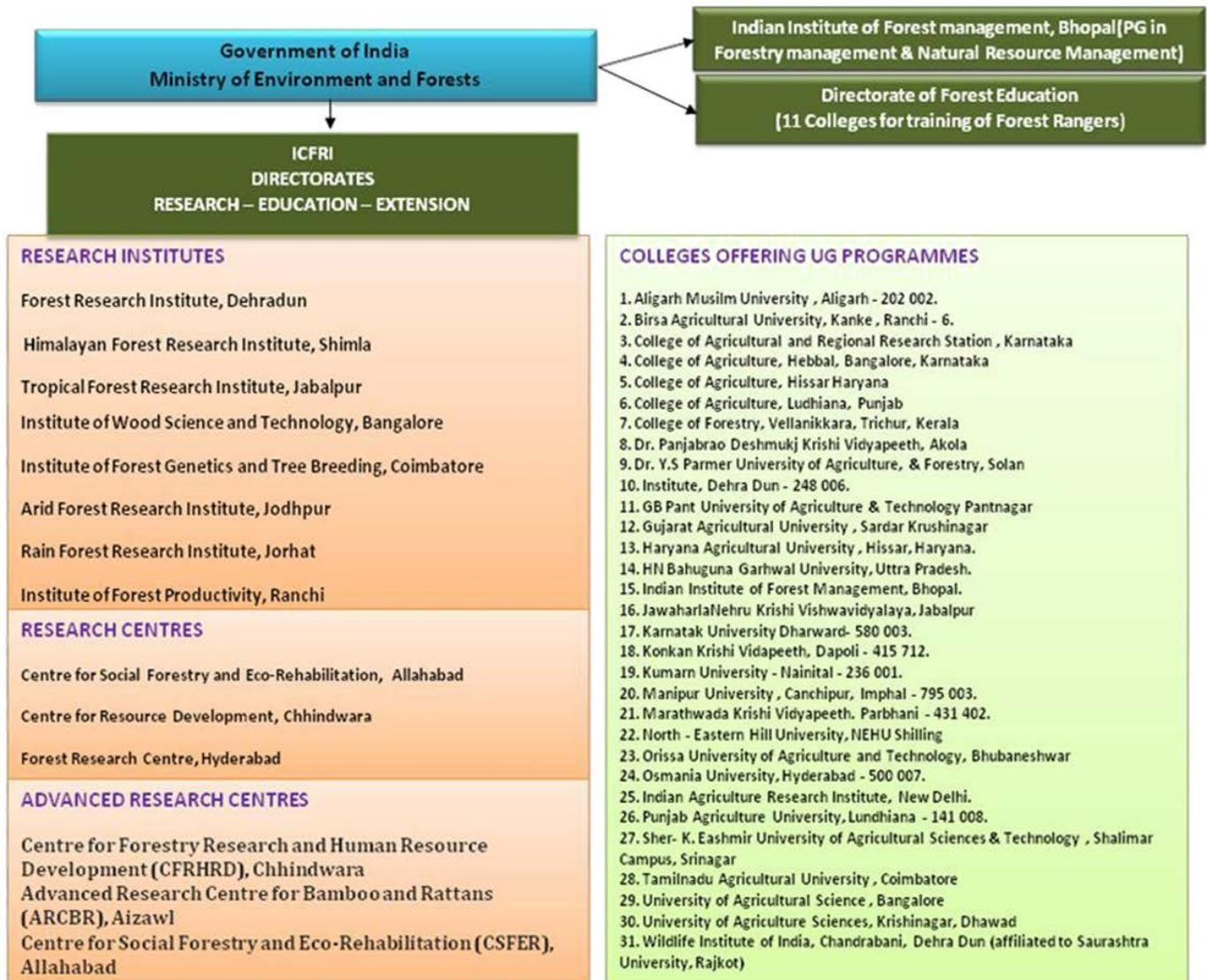


Fig. 1: Forestry Research and Education Institutions in India

The Directorate of Forest Education (under the MOEF) is involved in induction and in-service training of State Forest Officers. There are four colleges under the Union government and four colleges under the various State governments. Indian Institute of Forest Management (IIFM) is another premier autonomous Institute under the MOEF established in 1982. The Institute has four main activities, namely research, teaching, training and consulting in the forestry and allied sectors. It offers Post Graduate courses in Forestry Management and Natural Resource Management.

The UG programmes in Forestry are run by Colleges affiliated to various Universities and receive grant-in-aid from ICFRE for development of facilities and infrastructure.

“Extension” in Forestry

Though Research, Education and Extension form the three main building blocks (along with several other actors) of the National Forestry Innovation System, Extension continues to remain as one of its weakest links. Right from the days of colonial rule that enacted the first Indian Forest Act of

1865, attempt has been to establish government's claims over forests. All local rights on forests were abolished and even those accepted were treated as privileges offered under law (ADB, 2009). No effective mechanism has been evolved that could disseminate the adaptable research findings to the user groups including farming community. Even adaptation of research to suit the local needs could not be pursued due to absence of a proper dissemination mechanism including trained and skilled extension staff.

The onus of the scenario rests mostly with the traditional forestry education model emulated

from other nations (Ratnasingam et al, 2011). The system appears to be ill equipped to produce human capital with necessary skills to cope with the challenges. The stakeholders in the forestry sector, especially the change agents in the sector who work more closely at the ground level need to be equipped with required expertise and skills in promoting linkages & collaboration; organizing awareness campaigns & demonstrations and co-coordinating the forestry innovation system. To develop these skills and expertise, Forestry Extension Education and related disciplines should form a major constituency of forestry education. However, in reality, this is not the case.

Box 1: Forestry Research & Education in India - A brief history

Scientific forest management in India started in 1864 with the appointment of Sir Dietrich Brandis as the first Inspector General of Forests (Aggarwal, 1954). Following his recommendations, trained foresters from Germany and France were appointed to manage the country's forests, and the Imperial Forest Service was initiated in 1866. However the history of professional forestry education in India starts with the establishment of the Forest School for training rangers and foresters at Dehra Dun in 1878 by the British Provisional Government. It offered a two year Ranger Course for over thirty years which was the highest degree in forestry offered in India at that time. The Forest School was transferred to the Government of India in 1884 and became the Imperial Forest College and later the Indian Council of Forest Research and Education (ICFRE).

The first Forest Research Institute came into being as an adjunct to the Imperial Forest College in 1906. With the opening of recruitment for the Provincial Gazetted Services to Indians in 1912, the Forest Research Institute started offering Provincial Forestry Course. Though of two year duration, it was of higher standard and only graduates in science with a good university record was eligible for it (Ranganathan, 2000).

In 1920 Indian Forests Services too (IFS) were made open to Indians. However, the probationary training of these IFS officers was done in British universities till 1926 when it was started at Dehra Dun. The Provincial Forest Service Course was terminated and replaced with the new Indian Forest Service Course, which too ended in 1932 due to lack of demand and political uncertainties that existed at that time. The Indian Forest College was started in 1938 to train personnel for the gazetted forest services in the provinces and states and has since been evolved to meet the forestry research and education demands of the country and was renamed as Indira Gandhi National Forest Academy (IGNFA) in 1987.

The curriculum

The present course content especially at the undergraduate level of B Sc (Hons) in Forestry mostly covers topics on forest biology and regulatory and protective methods designed for the conservation of forest stock. In the total class room credits of 132 hrs spread in 8 semesters, courses related to socio-economic faculties comprise a meager 6.8% (KAU, 2007). There is only one course in Forestry Extension Education of 2 credits in the sixth semester.

The sea change in policy reforms from the regulatory regimes of the Forest Policy of 1894 to the participatory reforms through Forest Rights Act of 2006 is rarely reflected in the course content. This forms a major constraint in the development of human capital in forestry sector that requires knowledge and skill sets suitable to translate participatory management and cost sharing policies into main stream forest management strategy. Even the successes reported in joint and

participatory forest management, eco-tourism and forest based entrepreneurial development remain as ad-hoc cases of sporadic individual or team efforts. In fact the challenge is to incorporate technical competence along with business, advocacy and organizational capabilities through effective curriculum revision and reorientation.

Curricula Reforms

To develop effective and relevant human resources in forestry, the current curriculum of forestry science undergraduate courses needs thorough revision. New courses that can build on human faculties from an expert regulatory role to a facilitation role need to be promoted. Courses on property rights and land tenure statuses including group tenure practices in primitive societies, community and group property rights on indigenous knowledge has to be included (rather than extending the blue prints of successful activities from agriculture and related sectors which follow different property

rights and tenure regimes). This will be important in developing unique strategies in forestry. Yet the complementarities of non-farm activities like forest use and pastoralism with agriculture on rural livelihoods need to be retained.

Apart from these, specialized courses on group dynamics and conflict management; micro-finance and credit linkages; development communication; and basics of forest policies, laws/enactments and enforcement issues need to be included in the curriculum. Emphasis on climate smart integrated models of forests and family farms; Public Private Partnerships (PPPs) in ecotourism; concepts and experiences of forest based producer organizations; indigenous knowledge in biodiversity conservation; project evaluation and monitoring techniques; and participatory need assessment also have to be promoted.

Way Forward

The growing crisis of forest loss and related problems seem to be aggravated by the

command and control bureaucratic model followed by the Indian forest department. Demand for meeting the mutually exclusive goals of environment, economy and society has made forestry a multidisciplinary domain where coordination and collaboration skills have unprecedented importance. Though the Joint Forest Management (JFM) initiatives (since the early 80's) tried to legitimize participatory rights of local population in profit sharing from forest resources, it failed in institutionalizing the rights. Even the implementation of Forest Right Act (FRA) as an enabling legislation (to redress the historical deprivations) depend on the capacity of Forest Department to play facilitation roles and evolve strategies to organize and institutionalize the reforms utilizing formal and informal sources of local power including Panchayat Raj institutions. The implementation process requires dynamic leadership, substantial resourcing and academic training in related social science faculties and soft skills along with technical competence.



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12

DICHOTOMIES IN VETERINARY EDUCATION AND SERVICES DELIVERY – IMPLICATIONS FOR POLICY DECISIONS IN INDIA

There are several dichotomies which often interfere in the process of 'making veterinarians' and delivery of services by them. These dichotomies need correction for smooth functioning of veterinary institutions in the country and for producing quality veterinary graduates and postgraduates as per the requirement of different stakeholders, argue SVN Rao, PVK Sasidhar and D Thammi Raju in this blog post.

Veterinarians perform several roles including those of field veterinarians, teachers, researchers, extension agents, civil servants, defence personnel, entrepreneurs and so on. The extent to which they are able to perform these roles depends on:

- The way they are groomed in veterinary colleges
- The aptitude of the individual concerned
- The ethos/philosophy of the organisation they serve.

Several dichotomies however interfere in the process of 'making veterinarians' and delivery of services by them.

A distinct division of things or ideas into two contradictory parts is usually referred to as dichotomy. In the academic field, dichotomies are a subject of interest as the contradicting divisions may lead to uncertainty (Box 1).

Box 1: Dichotomy

The term dichotomy is derived from the Greek 'dichotomia', which means 'dividing in two'. A dichotomy is a partition of a whole or a set into two parts/subsets. In other words, this couple of parts must be jointly exhaustive: everything must belong to one part or the other, and mutually exclusive: nothing can belong simultaneously to both parts. Such a partition is also frequently called a bipartition. The two parts thus formed are complements. In logic, the partitions are opposites if there exists a proposition such that it holds over one and not the other.
(<https://en.wikipedia.org/wiki/Dichotomy>)

Discussed below are some of the dichotomies that need correction for smooth functioning of veterinary institutions in the country and for producing quality veterinary graduates and postgraduates as per the requirement of different stakeholders.

1. **Two Regulatory Bodies - Veterinary Council of India and Indian Council of Agricultural Research**

There are two regulatory bodies for veterinary education in India: the Veterinary Council of India (VCI) and the Indian Council of Agricultural Research (ICAR) (Boxes 2 & 3) for graduate and postgraduate education, respectively. The VCI enforces minimum standards of veterinary education; i.e. 2016 regulations for the degree course Bachelor of Veterinary Science and Animal Husbandry (BVSc & AH) which include faculty, infrastructure needed, course curriculum, syllabus etc. to be adopted by all the veterinary colleges in the country. It deputes veterinary inspectors

consisting of veterinary academicians of repute to inspect the veterinary colleges to see if they have the required facilities to impart graduate veterinary education as envisaged by the VCI. Based on inspection reports, the VCI either accords recognition or suggests improvements or provides conditional recognition to the colleges. The VCI also prescribes the number of students to be admitted to a college based on availability of faculty and infrastructure. It has the authority to derecognise a college if prescribed minimum standards are not adopted. As of today, there are 48 veterinary colleges recognised by the VCI, including three colleges (in the states of Punjab and Rajasthan) in the private sector. In addition, the Indian Veterinary Research Institute has also started offering an undergraduate programme (UG) from the academic year 2015-16 with an idea to develop a model veterinary college in the country. In India, except for two institutions – the Rajiv Gandhi Institute of Veterinary Education and Research, wholly funded by the Govt. of Puducherry and affiliated to Central University, Pondicherry; and the College

of Veterinary Science and Animal Husbandry, Agartala, affiliated to Tripura Central University – all veterinary colleges are either affiliated to the State Agricultural Universities (SAUs), State Veterinary Universities (SVUs) or Central Agricultural Universities (CAUs). There are 13 SVUs in the country today catering to the educational, research and extension requirements in the domain of Veterinary, Animal Husbandry, Dairy and Fishery Sciences.

The VCI also selects candidates based on the All India Common Entrance Examination conducted by it to fill 15 % of the total seats in recognised colleges. However, during the current academic year the VCI quota is being filled with the candidates based on their NEET score. The rest of the 85 % seats are filled by state entrance tests and/or marks in higher secondary examination or equivalent. Although the VCI has full authority to streamline veterinary education at graduate level in the country, it is not empowered to sanction grants or aid to the colleges.

Box 2: Veterinary Council of India

Indian Veterinary Council Act, 1984 (52 of 1984) was enacted in 1984 and was published in the Extraordinary Gazette of India dated 21st August, 1984 to regulate veterinary practice and to provide for that purpose, for the establishment of Veterinary Council of India and State Veterinary Councils and maintenance of Registers of veterinary practitioners and for matters connected therewith.

Subsequent to enactment of the Indian Veterinary Council Act, 1984, the Central Government (Ministry of Agriculture) vide Gazette Notification dated 2nd August, 1989 for the first time constituted the Veterinary Council of India by nominating the Members as per the provisions of section 4 read with section 3 of the Act. Further, nominations were made by the Central Government from time to time, to fill up the vacancies (www.vci.nic.in).

The ICAR is the apex body for coordinating, guiding and managing research and education in agriculture, including veterinary and animal sciences, dairy, horticulture, home science and fisheries in the entire country (ICAR, 2009). SAUs, SVUs and CAUs are accredited by the ICAR based on self-evaluation reports submitted by the respective colleges and also on the recommendations of accreditation committees deputed by the ICAR. The ICAR conducts entrance examinations for Junior and Senior

Research Fellowships to select talented candidates to pursue Masters and Doctoral research in the selected disciplines in ICAR institutes or SAUs, SVUs and CAUs. Although agriculture education falls under the state subject, ICAR has the authority to prescribe the syllabus, and faculty and infrastructure requirements for postgraduate (PG) courses. The ICAR sanctions grants for the development of veterinary colleges in addition to financing various schemes in SAUs/SVUs.

Box 3: Indian Council of Agricultural Research

The ICAR is an autonomous organisation under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India. Formerly known as Imperial Council of Agricultural Research, it was established on 16 July 1929 as a registered society under the Societies Registration Act, 1860 in pursuance of the report of the Royal Commission on Agriculture. The ICAR is the apex body for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country. The ICAR has its headquarters at New Delhi. With 101 ICAR institutes and 71 agricultural universities spread across the country, this is one of the largest national agricultural systems in the world (www.icar.org)

The dichotomy here is that veterinary colleges have to get recognition from VCI for the undergraduate (UG) programme and from ICAR for the PG programme. Also, the bone of contention between the VCI and the ICAR is on who should conduct the common entrance examination for filling up 15% seats for BVSc & AH programme in the veterinary colleges and for formulating syllabus and curriculum for the UG and PG programmes. Another dichotomy in the pipeline is that although currently ICAR is

regulating veterinary PG programmes, in 2015, VCI also revised minimum standards of PG veterinary education regulations, which are yet to be notified (VCI, 2015).

2. Animal Health Vs Animal Production

Dichotomy in this context means two major facets of the subject are dealt with at the undergraduate level. The first is veterinary sciences and the second is animal sciences. The third minor facet is social sciences (Box 4).

Box 4: Subjects Covered in BVSc & AH Degree Course

Veterinary Sciences

- Veterinary Anatomy
- Veterinary Physiology
- Veterinary Biochemistry
- Veterinary Pharmacology and Toxicology
- Veterinary Parasitology
- Veterinary Microbiology
- Veterinary Pathology
- Veterinary Public Health and Epidemiology
- Veterinary Gynaecology and Obstetrics
- Veterinary Surgery and Radiology
- Veterinary Medicine
- Veterinary Clinical Practices

Animal Sciences

- Animal Nutrition
- Animal Genetics and Breeding
- Livestock Production Management
- Livestock Products Technology
- Livestock Farm Practices.

Social Sciences

Veterinary and Animal Husbandry Extension Education

The degree awarded to the graduates is BVSc & AH as the focus is on both animal health as well as animal production. The course is very comprehensive, covering several aspects of livestock production and management, preparation of livestock products, disease diagnosis and veterinary health care in addition to livestock extension and economics of livestock farms with an idea to develop a vet into a "Jack of all trades and master of none". This five-and-a-half-year course (including internship programme) is basically to develop skills in both animal production and animal health as the country cannot afford to have two streams of graduates, one for production and the other for animal health, as is in vogue in many developed nations.

Unlike human medicine, where productive life is not the deciding factor while giving treatment, in the case of animals being maintained mostly for production (other than pet animals) the animal owners certainly look for economics before proceeding to get their animals treated. Animal owners, barring a few with emotional attachment to animals, would like to maintain productive animals and dispose of the animals when their production is zero or very low as in the case of cows with mastitis (all teats are blind); old animals not in production; very sick animal with grave prognosis; animals suffering from chronic diseases such as tuberculosis (TB) and Johne's disease (JD) ;

and recumbent animals due to accidents or injuries etc. Hence, the productivity of the animal is a very important consideration; animal owners are prepared to spend on treatment of diseases only when they perceive that their sick animals are likely to recover and regain production capacity.

The rate of knowledge explosion in veterinary and animal sciences is making it difficult to incorporate all the emerging aspects in the five-and-a-half-year-long programme during curricular revisions.

The dichotomy here is to continue offering the BVSc & AH degree programme with equal emphasis on animal health and production without increasing the duration of the programme.

3. Establishing New Veterinary Universities/Colleges Vs Strengthening Established Veterinary Universities/Colleges

In the recent past, many state governments have either established new veterinary colleges or converted the established veterinary colleges into veterinary universities without concomitant increase in the faculty, infrastructure or budgets. The new veterinary universities were carved out of existing agricultural universities. Some of the new colleges are yet to get recognition from VCI for want of faculty, deficiencies in infrastructure or both. There were instances where temporary transfers of the faculty and equipment from the

old colleges (already recognised by the VCI) to new colleges were attempted in a bid to satisfy the observers of the VCI and to get recognition by the VCI. Due to paucity of funds, some of the colleges are unable to fill the required posts with qualified teachers. This spurt in the new universities and colleges is mostly at the cost of the old or established colleges which led to the dilution of the standards and compromised the quality of the students coming out of the portals of these academic institutions.

The dichotomy here is whether to strengthen the existing colleges instead of diverting the limited funds for the establishment of new colleges or establish new colleges (mostly out of political considerations) at the cost of the old colleges.

4. Public or Private Sector Veterinary Colleges

Although there is no ban on establishing private veterinary colleges, there is very little interest shown by the entrepreneurs in setting up veterinary colleges in the private sector. Many entrepreneurs are of the opinion that it may not be economically sound to set up veterinary colleges in the private sector as it becomes very expensive to satisfy the VCI minimum requirements prescribed (VCI, 2017). As a result there are only three veterinary colleges under private sector as against 45 colleges in public sector. Ironically, some of the veterinary colleges/SVUs (RIVER, TANUVAS, KVASU

etc) admit students under NRI/NRI sponsored quota by charging from Rs. 8 lakhs to Rs. 30 lakhs for the entire course in addition to regular fee and other charges. This NRI quota for every college is fixed at a maximum of 5 % of the total seats approved by the VCI and is permitted in order to encourage colleges to generate revenue for improving their infrastructure.

Private colleges have a grouse that VCI is soft on public sector veterinary colleges in enforcing the standards, compared to private colleges, indirectly indicting the VCI that the latter is discouraging privatisation of veterinary education in the country, although there is a lot of scope for privatisation. There is a severe shortage of veterinarians in the country. India needs about 72,000 veterinarians as against the availability of 43,000. It was suggested that the intake of students in existing colleges be increased and establishment of veterinary colleges under public-private partnership be encouraged (Rao *et al.*, 2015). The situation demands that, as in the case of medical, technical and management education, private entrepreneurs need to be motivated to participate in veterinary education (Chaudhary, 2009).

The dichotomy here is that on the one hand, several reports recommend private sector participation, while on the other, prescribe very expensive conditions to satisfy the VCI minimum requirements, which are summarised in Box 5.

Box 5: Requirements to Establish a Veterinary College

- Resources to establish and maintain College and Teaching Veterinary Hospital (in single contiguous plot of land) & Instructional Livestock Farm Complex (within a 20-km radius) as per VCI 2016 regulations.
- Recruit teaching & non-teaching staff for the first academic year and prepare a manpower programme for implementation after receipt of the letter of permission.
- Fixed deposit proof for an amount equivalent to salaries payable to the teaching staff for the second academic year.
- Bank guarantee for Rs. 5 crores in favour of VCI.
- Recommendation from an advisory committee comprising a member from ICAR, VCs of two Universities, Dean or Associate Dean of a recognized Veterinary College and Principal Secretary, AHD of the concerned state.
- 15 acres of land (owned/on 30-year lease) for college of which 5 acres for fodder production.
- Administrative block, departments, labs and equipment (phased manner), lecture halls, hostels, play ground, transport vehicles, and manpower as per VCI 2016 standards.

Source: VCI, 2017

5. Theory vs. Practice

Instructive lectures in veterinary colleges provide knowledge relating to both veterinary and animal sciences, whereas the practical/clinical cases and field exposure provide from day-one the skills needed for jobs, primarily in AHDs. Students, with assistance from faculty, are expected to make links between these two and develop the ability

to apply their knowledge and skills to job needs. The VCI curriculum no doubt provides good theoretical knowledge, but technical skills relating to veterinary and animal sciences vary across 48 colleges across the country due to several reasons.

The dichotomy in this context is that the veterinary colleges have been devoting time to the technical content of the curriculum rather than providing

adequate practical hands-on experiences needed for entry-level job and self-employment ventures. This is resulting in another dichotomy of job preference by the graduates towards government jobs compared to private jobs.

6. Government Jobs vs Private Enterprises

It is a common observation that a majority of veterinary graduates want to be 'job seekers' rather than 'job givers'. Most graduates join AHDs as field veterinarians for reasons of job security, no risk of investment, stable income and the scope of working in the same state/district to which they belong. As there are lot of vacancies in the AHDs, the prospects of getting the graduates employed in the departments without much of a waiting period (maximum of two to three years) are high.

On the contrary, the number of graduates venturing to establish their own enterprises (livestock farms, processing units, private clinics, manufacturing units etc.) is negligible. This is due to lack of confidence among fresh graduates owing to lack of proper exposure in the colleges. Although, 'earn while you learn' projects are made compulsory in the course curriculum, the scale of operation (number of animals, number of cases attended, quantum of product processed, etc.) is so small that the experience with such small-scale projects fail to develop the required confidence among the students. It is unfortunate that many colleges fail to establish the livestock farm complex with large number of animals of different species as prescribed by the VCI. Similarly, the Teaching Veterinary Clinical Complex is also deficient in getting more number of different types of cases of both large and small animals required for

providing good exposure to the students.

Unless students get good initial exposure to management practices being followed in the livestock farm of the college (from egg to layer bird; from calf to cow) and to different cases in the teaching hospital of the college, they cannot acquire skills during the one- year internship programme (Earlier the internship was of six months' duration, which has now been raised to one year under the new regulations). This problem is accentuated where teaching hospitals located in urban areas do not get many large animal cases (as opposed to pet animal cases) resulting in poor exposure to large animal cases, including animals in heat for Artificial Insemination (AI) and for pregnancy diagnosis. Realising this, VCI introduced a course 'Livestock Entrepreneurship' in the 2008 regulations and the same is continued in 2016 as well in order to orient the UG students towards various aspects of entrepreneurship (Box 6).

Hence, it is necessary to provide an option to the interns going for the one-year internship programme to choose between farm training and veterinary hospital training, so as to enable them to opt for production jobs (farm manager, advisor etc.) or veterinary health jobs (disease diagnosis, clinician etc.). This long duration of internship also helps the graduates develop confidence in establishing livestock farms or animal health centres as entrepreneurs.

This one-year mandatory internship programme needs to be reoriented, taking into consideration the aptitude of the students and the infrastructure facilities available in the colleges and nearby organised farms.

Box 6: Entrepreneurship Orientation in Veterinary and Animal Science Education

The changing nature of livestock service delivery, manpower requirements and opportunities in the private sector provide both push and pull dynamics for veterinary graduates to engage in entrepreneurial, public and private service activities. Unfortunately, the support given by veterinary colleges is inadequate in this transition by integrating entrepreneurship and private service orientation in the curriculum.

Examples:

1. Clinical subjects are taught, but not how to establish a private veterinary clinic.
2. Students are taught how to manage and improve the production of livestock, but not how to establish a poultry/dairy farm.
3. Biochemistry and para-clinical subjects are taught, but not how to establish a veterinary disease diagnostic laboratory.

This transition is a quite challenging task, as the core content of the VCI curriculum consists of basic, production, para-clinical and clinical subjects with little emphasis on entrepreneurship aspects. Merely introducing a one-off intervention such as a semester course on entrepreneurship may not be sufficient. What is required is a two-pronged integrative approach: i) introduce the functional entrepreneurship discipline into curriculum; and ii) integrate the entrepreneurial and private service philosophy into each of the production, para-clinical and clinical courses. This integrative approach is expected to produce graduates as job givers rather than job seekers by mastering both the science of veterinary and animal husbandry and the art of entrepreneurship (Sasidhar and Van den ban, 2006).

The dichotomy here is that in spite of several entrepreneurial opportunities, the majority of veterinary graduates are trained as job seekers rather than job givers because instructional design and curriculum transaction is more on theoretical aspects than practical hands-on experiences.

7. Producer (Veterinary Colleges/Universities) vs Consumer (AHDs)

Veterinary Colleges/Universities are responsible for producing quality veterinary graduates by adopting the minimum standards of veterinary education and the syllabus of VCI. All the colleges put together produce about 1707 graduates in a year whereas the demand for graduates is about 2500/year – a shortfall of 31.72 % (Sasidhar and Reddy,

2013). A majority of these graduates are absorbed as field veterinarians in the AHDs. The AHDs perceive the training given to veterinary graduates in colleges/universities is not in tune with the job responsibilities of the field veterinarians (Rao *et al.*, 2015). The field vets are involved in implementation of various Central-/State-sponsored schemes to promote animal production as well as helping the livestock owners improve their income through increased production. The field vets lack enough knowledge and skill in these areas. Likewise, they are likely to face emergency situations during natural calamities such as drought and floods which have a serious negative impact on animal health and production; unfortunately, they have little or no knowledge/skills in such cases (Box 7).

Box 7: Perception of Field Veterinarians on Course Curriculum

There was a general perception amongst many stakeholders in the livestock sector that fresh graduates emerging from veterinary colleges do not have opportunities to understand many of the important challenges in the livestock sector such as disease control and eradication, quarantine, certification and veterinary public health. The education is believed to be more geared towards "securing government jobs and for clinical practice". Important topics such as livestock-environment interactions, participatory processes, gender-balanced development, farmers' traditional wisdom, herbal medicine and the role as extension agents for small livestock farmers are also not covered adequately. The need to establish a well-balanced livestock service delivery system through a combination of public and private actors and the efforts to equip them to deliver effective services to the farmers also deserve an enhanced attention (Rao *et al.*, 2008).

The colleges argue that the graduates will be trained as per the VCI syllabus and guidelines. If need arises, the graduates need to attend refresher courses on specific topics. Unfortunately both colleges and AHDs lack the desired coordination

which is affecting the delivery of services to the livestock owners, the common target group for both these institutions. Several of the contentious issues between them could be sorted out through open discussion across the table by (Box 8).

Box 8: Collaboration – The Missing Link in Refresher Trainings

The Planning Commission (Now NITI Aayog) emphasized that re-training of the field veterinarians to brace for the recent developments is paramount and they should attend mandatory refresher courses every five years during their career (Planning Commission, 2012). To impart refresher training in technical areas to field veterinarians, the AHDs have regional training centres in each state. In addition, veterinary colleges/animal science research institutes of ICAR also impart refresher technical trainings. Therefore, proper coordination is required between AHDs, Veterinary Colleges and ICAR Animal Science Institutes in capacity building of field veterinarians. To strengthen refresher training, there is a need to establish regional academic staff colleges exclusively to build up the skills and competence of field veterinarians, which was also recommended in an earlier study (Rao *et al.*, 2015).

The VCI curriculum was first formulated in 1992 and was revised two times – in 2008 (VCI, 2008) and latter in 2016 (VCI, 2016) but the revision did not serve its purpose adequately. The revision was done by organising meetings with academicians (mostly researchers) who were not associated with UG teaching. It was done without taking into consideration the views of other stakeholders. As per the new regulations the duration of the course is five-and-a-half complete professional years (earlier it was five years) including a compulsory

internship of one year duration undertaken after successful completion of all credits as prescribed in the syllabus. Curriculum and syllabus revision is a professional job and it needs to be handled by professionals who have expertise in such areas.

The dichotomy here is that training given to the veterinary graduates in the colleges is not in tune with the job responsibilities of the field veterinarians due to inadequate reflection of AHD's requirements during curriculum revisions.



8. Field Veterinarians Vs Para-veterinarians

Veterinarians are the product of veterinary colleges whereas the para-veterinarians are trained by the AHDs. There is uniformity in the duration and course content/syllabus for veterinary graduates; however, training duration for para-veterinarians ranges from six months (Gopalmitras/Lay inseminators working under State Livestock Development Agencies) to 2 years (Veterinary Assistants). There is always conflict between the field veterinarians and para-veterinarians in attending to the cases. The para-veterinarians are basically trained to perform AI and vaccinations, and to provide first aid to the animals. Para-veterinarians are introduced in the field to provide these services to mitigate the problem arising out of the severe shortage of field veterinarians and also to assist the latter in delivery of cases. The Para-veterinarians are usually posted in their respective or nearby villages to enable them to provide the basic services and charge from the livestock owners. They are not supposed to handle any other cases which need the attention of the qualified veterinarian. Unfortunately, reports indicate that the para-veterinarians do attend to all the cases, including complex cases like dystokia, mastitis, retention of placenta etc resulting in spoiling the cases and sometimes the death of the animals (Ravikumar 2017). This is mainly because para-veterinarians cannot sustain by charging for only AI and first aid cases.

Para-veterinarians being from the same locality are accessible to the livestock owners on all the days (24 x7) and their charges are less compared to the veterinarians for treatment of cases. There is a conflict of interest in attending to cases other than AI and first aid. Amidst this conflict, there is a severe shortage of para-veterinarians as well, which is hampering the delivery of veterinary services in the country and also increasing the cost

of veterinary health care to the animal owners. This calls for improving the number and quality of veterinarians as well as para-veterinarians to enhance the coverage and effectiveness in the delivery of veterinary services.

The dichotomy here is conflict between veterinarians and para-veterinarians on attending cases based on qualifications and availability or non-availability of them in villages during need of the hour.

9. Gender Dichotomy

Livestock services are generally provided by men for men, despite key roles that women play in livestock farming (Matthewman and Ashley, 1996). A few decades ago there were hardly any women opting for the veterinary science course, and thus, the focus was on men, resulting in producing mostly male veterinarians whose access to women livestock owners was very weak. Training programmes were designed for male livestock owners although most of the livestock-related activities are generally performed by women. Nowadays, in most veterinary colleges, the number of women students is more than their male counterparts and this is a welcome sign as the accessibility to women veterinarians to interact with the women livestock owners is very high.

For this reason, in many places the women veterinarians turn out to be good livestock advisors. But the AHD administration in many states are finding it difficult to post women veterinarians in the rural centres for a variety of reasons such as lack of basic amenities for women in the villages, family obligations forcing the women to prefer urban centres, difficulty for women veterinarians to attend emergency calls in odd hours of the day, etc. It is also not possible for the administration to provide jobs for all the women veterinarians in the urban centres (Disease

diagnostic labs, Polyclinics etc.). For these reasons, many women veterinarians prefer to opt for teaching faculty positions in the colleges which are located in urban areas.

The dichotomy here is that on one side, there is lot of scope for women veterinarians to become effective livestock advisors in the rural areas, while on the other side neither the administration nor the women veterinarians (with few exceptions) wish to work in the rural areas for the above-mentioned reasons. Hence, it is suggested to take an undertaking from the students (irrespective of the gender) before joining the veterinary course that they need to serve in the rural areas at least for three years after their graduation and this needs to be adhered without succumbing to pulls and pressures.

10. Veterinary Services Free or Paid

In India, veterinary services delivery have been traditionally funded, managed and delivered by the public sector till the early 1990s. However, the veterinary service delivery system promoted by public sector often provides a limited support to large majority of smallholder livestock farmers, with the latter seeking alternatives for rescuing them from hardships. This assumes more significance in the prevailing scenario of globalization and liberalization, with the consequence of opened economy. Of late private or public-private partnership interventions were found effective in providing these services, prompting Governments to encourage, legalize and regularize these service providers. Also, several studies conducted in different states clearly indicated that farmers were not satisfied with the services provided by the public sector and they are willing to pay for effective and timely services.

Dichotomy in this context means that, in the years to come the government sector presence in the veterinary service delivery is inevitable in India in view of the social welfare obligations and interests of the millions of small and landless livestock keepers. On the other hand, private sector's participation is equally important in view of economic and operational reasons. Therefore, the technical framework for rational delivery of services under public, private and public-private partnerships should take into account this dichotomy.

Way Forward and Implications for Policy Decisions

Some of the important dichotomies plaguing veterinary colleges/universities are discussed with a view to focus the attention of policy makers to take appropriate decisions for the smooth functioning of these institutions. A few suggestions have

been put forth for their consideration which, if accepted and implemented, may help in resolving dichotomies concerning veterinary education and service delivery in the country.

1. The Ministry of Agriculture, GOI, may entrust the total responsibility of ensuring quality standards in veterinary education to the Veterinary Council of India as is the case with Medical Council of India. Indian Council of Agricultural Research (ICAR) must focus on providing guidance on research and extend financial support to veterinary colleges and universities in strengthening the infrastructure. It is necessary to strengthen the VCI to enable it to enforce standards in veterinary education and veterinary practice in the country.
2. The scores of NEET may be considered for admitting students to UG programme under VCI quota in future also.
3. It is necessary to constitute a committee of professionals to recommend whether to "develop a jack-of-all-trades and master-of-none veterinarian" giving equal emphasis on both animal production and health, or to separate the two streams at the graduation level as electives.
4. As there is severe shortage of veterinarians in the country, it is time for the GOI to encourage private sector participation in veterinary education without compromising the standards of education. As establishing veterinary colleges involve huge expenditure in terms of land, animals and building and equipment etc., in addition to maintenance of the required staff, the Government may consider PPP mode in establishing new colleges.
5. It is easier and better to strengthen old colleges by infusing more human resources and material, instead of diverting the funds for the establishment of new institutions as the development of the latter will take a lot of time and resources (land, labour and capital). Once the old institutions are strengthened, the intake of the students could be increased; this would help in reducing the gap between the demand and supply of the veterinary graduates.
6. The curriculum and syllabus of the BVSc & AH course must match the job requirements of field veterinarians. Designing an appropriate course curriculum is a challenging and time-consuming process and must be assigned to a professional group well versed with such tasks. It does not serve purpose in simply revising the course curriculum and syllabus in a hurried manner without taking into consideration the views of all the concerned stakeholders.

7. Although, the VCI emphasizes on practice rather than theory, the fact is that the new regulations diluted standards, resulting in producing graduates with theoretical knowledge (classroom teaching, the easiest one) but poor in skills which require competent teachers, better infrastructural facilities in terms of good labs, better livestock farm complex with more number of animals and more cases in the teaching veterinary hospitals. It is advisable to provide liberal grants to veterinary colleges to improve the existing infrastructure in terms of both human and material resources.
8. One idea worth trying out is of providing an option to interns before the start of one-year internship programme to choose between farm training and veterinary hospital training, so as to enable them to opt for production jobs (farm manager, advisor etc.) or veterinary

health (disease diagnosis, clinician etc.). This one-year duration of internship (newly introduced) also helps in satisfying the aptitude of the graduates and also in developing confidence in establishing livestock farms or vet clinics/ diagnostic centres as entrepreneurs.

9. Need-,based refresher training programmes including continuing veterinary education, must be organised by the colleges at regular intervals to improve the capacity of the working veterinarians and enable them to face the emerging challenges in livestock sector. Similarly, there must be a good coordination between the AHDs and the Veterinary Universities in identifying areas of collaboration and to improve the delivery of veterinary services to the livestock owners, the ultimate objective of these two important veterinary institutions.



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THE GOVERNANCE OF EXTENSION AND ADVISORY SERVICES

02

13

REFORMING GOVERNANCE TO IMPROVE EXTENSION SERVICE DELIVERY

Public delivery of extension services has not kept pace with the emerging expectations and challenges faced by farmers. Administrative, structural and legal reforms in extension governance are long overdue, argues RM Prasad.

Improving public service delivery is one of the biggest challenges world-wide. Organizing public service provision is deemed to be a core function of governance (Box 1).

Box 1: Governance

Though governance and administration are related, there is distinct difference between these two concepts. World Bank (2002) defined governance as “the manner in which power is exercised in the management of a country’s economic and social resources for development”. Governance is the brain that creates various aspects of society and identifies the functions, whereas administration is the act of implementing the end results of governance.

Extension is a public service in most developing countries and its failure to effectively support rural producers has led to its reform (Box 2).

Box 2: Reforms in Governance

When we refer to reforms, it is evident that there are both supply side reforms as well as demand side reforms.

Supply side reforms relate to public, private and third sector service provision and financing, administrative and fiscal decentralisation, capacity strengthening and budgeting.

Demand side reforms relate to the principles of participatory planning and implementation. For ensuring good governance, it is necessary that proper reforms are adopted, in relation to administrative reforms, structural reforms and legal reforms.

Administrative reforms seek to focus on issues related to people and systems / processes. Administrative reforms are defined as comprising reforms in three important elements, viz. Human Resources Development and Personnel Management; Internal Systems and Processes; and Citizen Interface Systems and Processes.

Structural reforms refer to changes in the structure and function of institutions as a result of structural or technological changes.

Legal reforms refer to changes in the function of institutions as a result of policy changes or changes effected by law or legislation.

Reforms in Extension

There are many reasons for perceived failure of extension services, which call for reforms in extension service delivery. In the context of governance, administrative reforms focus on

access in terms of inclusion, extension service delivery. In the context of governance, administrative reforms focus on access in terms of *inclusion*, structural reforms focus on technological advances in terms of innovation and legal reforms focus on quality of services in terms of *incentivization*. Extension programmes are shifting from a delivery model that prescribes

technological practices to one that focus on building capacity among farmers to empower them to identify and take advantage of available technological and economic opportunities. Extension reforms, therefore, need to address three types of extension, namely clinical extension, livelihood extension and entrepreneurial extension (Table 1).

Table 1: Reforms-extension matrix

	Administrative Reforms (access) Inclusion	Structural Reforms (technological advances) Innovation	Legal Reforms (quality) Incentivization
Clinical Extension	Counselling	Facilitation	Farm & Rural Legal Service
Livelihood Extension	Access to Resources	Structural Adjustment related to Climate & Market	Policy on Food and Nutrition Security
Entrepreneurial Extension	Value Chain Development	Innovation	Regulatory and Quality Assurance Services

Clinical Extension

Clinical extension should be based on a thorough differential diagnosis, followed by an appropriate treatment regime. Clinical extension needs an overhaul in order to be much more like modern medicine, a profession of rigour, insight and practicality. The extension personnel have to adopt a strategy to meet the differential needs of the various categories of farmers. For instance, farmers in distress require a range of different resources and services to be provided by the extension system, such as financial counselling, legal advice, social support, personal guidance, emotional counselling, etc.

Counselling

Extension personnel have to be properly oriented to serve as counsellors, who are professionally trained to relate with, and empower farmers. They have to be trained and provided knowledge and experience on dealing with people who face stress. Farmers often need crisis counselling to tide over crisis situations in farming and to deal with risks and uncertainties involved. Similarly credit counselling is important for farmers to deal with debt and to compare different options to manage credit.

Facilitation

Facilitation refers to the process of developing an enabling environment for farmers to proactively participate in different extension services. Capacity building programmes may be organised with the help of domain experts to assist farmers to acquire practical skills to improve their access to resources

and to create space for their actions by playing supporting and enabling roles.

Extension personnel have to engage in three categories of facilitation:

- Technological facilitation for productivity and profitability enhancement,
- Process facilitation in the contents and quality of extension service with focus on competitiveness, social sensitivity, environmental concern and sustainability, and
- Empowerment facilitation for new skills and competence for improved livelihoods.

Farm and Rural Legal Service

There is need to provide legal help to primary producers who are experiencing financial hardships related to their business. There is an absolute need to frame a policy to benefit small farmers so that they do not lose out in the windfall gains made by the corporate, the rich and the powerful in the urbanisation process currently underway. There is a growing trend of 'farming out' agricultural land (send out or subcontract work to other people) to realtors, which needs to be addressed.



Livelihood Extension

A livelihood comprises the capabilities, assets and activities required as a means to a living. Extension should contribute to sustainable livelihoods among rural communities. Analysis of existing livelihood patterns can help extension in organising the needed support. Extension should consider how different activities 'fit' with livelihoods rather than how it aligns spectral programmes (agriculture, animal husbandry, fisheries etc) or with academic disciplines and this would require a shift in the way programmes are currently designed.

Access to resources and services

Women, youth and the landless are often at a disadvantage in terms of access to both resources and services, and therefore it is necessary that the extension services pay particular attention to reaching and supporting these unreached groups. Governments face constraints in terms of how much they can and should spend on different sectors depending on its finances. Constraints can also be gender-linked. For instances, constraints to increased productivity are often the result of gender-linked differences in access to inputs and resources.

Adjustment related to climate and market

Climate change is perhaps the most serious environmental risk impacting agricultural productivity. Agriculture is a major provider of environmental services and it plays an important role in sequestering carbon, managing watersheds and preserving biodiversity. At the same time, agriculture is also a major user and polluter of natural resources contributing to underground water depletion, agrochemical pollution of soil and water, exhaustion of soils and thereby also contribute to climate change. Agricultural extension personnel should have knowledge related to adaptation to climate change and also knowledge on ways of reducing the contribution of agriculture to climate change.

Policy on food and nutrition security

Extension policy is not just about policies towards extension agencies, per se. The roles of agricultural extension agencies need to be defined within policies that facilitate the involvement of different activities involved in livelihood extension. The audience for 'pro-poor extension' comprises of subsistence farmers, small farmers struggling to increase their commercial production, those who lack sufficient land, labour or markets to engage much in farming and they need support in combining agricultural activities with an array of other livelihood options.

Entrepreneurial Extension

Entrepreneurial Extension should focus on enhancing value to the efforts of individuals and groups involved in farming by bringing together resources to develop and deliver projects while simultaneously pursuing financial sustainability of the project. The three underlying dimensions of entrepreneurship are: innovativeness, risk-taking, and pro-activeness, which could be summarized simply as an entrepreneurial attitude and behaviour.

Value chain development

Value addition and efficient marketing determine the success of most of the production-oriented development programmes. Efficient backward and forward linkages play a significant role in lowering the cost of production and ensuring higher price realisation, resulting in higher returns. An ideal value chain should bring all the stakeholders engaged in the production system on a common platform to contribute their best, while ensuring fair deal and transparency. The value chain will include all the input suppliers, service providers, knowledge intermediaries such as research and extension agencies and all those that are involved in capacity development and linking different agencies. Agencies like financial institutions and market information centres are also part of the value chain. Efficient linkage of these various stakeholders potentially improves production, price realisation and profitability.

Innovation

Extension services enable farmers to take up innovations, improve production, and protect the environment. Enhancing individual and collective capabilities, ensuring farmers participation in innovation networks and value chains and influencing the enabling environment to be more supportive of innovation are critical for innovation. There is need to effectively link new knowledge with user communities such as farmers and enterprises. Developing an innovation strategy can potentially enhance innovation culture within extension organisations and also in identifying ways of enhancing innovation among farmers.

Regulatory services in extension

Regulatory services protect the state from exotic and invasive species, ensure that pesticides are used safely, regulate the input industry, monitor quality of inputs, certify products against standards including organic products, provide diagnosis of pest and disease infestation and ensure readiness to respond to catastrophic events impacting the state's agriculture. The presence of a legal

and policy framework will help streamline the confusion currently existing in the efficient and effective delivery of extension services to farmers, particularly in the areas of service provision and networking and enhancing the capabilities of extension service providers.

Way Forward

1. Farmers in different contexts require different set of support and services from the extension system. Extension services therefore should have staff with good understanding of technical knowledge plus skills to manage social processes.
2. To ensure good governance, the reforms should focus on administrative, structural and legal aspects of extension provision. Improving governance of extension and enhancing capacities at the organisational level to deal with these aspects should be the main focus of

policy reforms in extension.

3. Extension should broaden its services from technology dissemination to facilitation, provision of legal services, inclusion of disadvantaged groups, improving accountability and supporting farmers to deal with climate and market risks.



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14

GOVERNANCE: THE MISSING PIECE IN KVK REFORMS

Krishi Vigyan Kendras (KVKs) do face a number of governance challenges. Addressing these issues is important to enhance the contribution and impact of KVKs argues PN Ananth.

Establishment of KVKs was an important institutional innovation by the Indian Council of Agricultural Research (ICAR). Over the past four decades, the number of KVKs has expanded to 642. While its role and contribution to agricultural technology assessment and dissemination is widely appreciated, it has also received an equal share of criticism. No other agricultural system large or small in the world has such a frontline decentralized research capacity at the district level. Recent reviews on KVK (ICAR, 2013) have raised several concerns on its performance. But several issues related to Governance of KVKs remain unrecognised over the years. This blog discusses some of these issues.

Governance: The Missing Piece

The AESA Blog 46 (Chander, 2015) discussed in detail the evolution of KVKs. KVKs face a number of challenges. This blog deals with the governance of KVKs which hasn't received enough attention so far, though NARS is discussing about Good Governance in Agriculture for some time (Box 1). I feel that the performance of KVKs directly depends on the quality of its governance.

Box 1: Good Governance in Agriculture

Governance is defined as the way a system or organisation is guided and steered. From the perspective of NARS (National Agricultural Research System), governance is related to guiding, actuating and steering its research; education and extension functions towards growth and improved performance. Growth and improved performance depend upon an enabling environment to perform (internal processes i.e., rules and procedures) and generation of S&T (Science & Technology) goods with relevance and utility to all stakeholders. Good governance certainly rises above the routine application of internal administrative and financial rules and procedures in managing the affairs of organisations.

Good governance framework is built around three dimensions—internal mechanisms, performance and accountability.

- The internal mechanisms relate to how decision-making roles and responsibilities are defined, accepted and applied to establish overall work culture.
- Performance dimension—a key external variable of good governance—relates to the use of resource inputs with product outputs.
- Accountability—an external dimension of good governance, is defined as responsibility for performing those tasks or achieving those results for which the individual or the organisation is delegated the necessary authority.

Source: NAAS (2002)

The major issues related to governance that affects the performance of KVKs are discussed below.

Support from Host Institution

The success of a KVK ultimately depends on the quality of support it receives from the host institution. KVKs are hosted by different types of organisations such as ICAR Institutes, State Agricultural Universities, NGOs and even agriculture and other development departments. The host institutions at first need to fully understand the mandate of KVK and should have adequate resources to support the functioning of the KVK. While resources are available, there are cases where these are not extended to KVKs. There are several instances where host institution deploys the staff of KVKs to handle other jobs and responsibilities in the host institution. The Programme Coordinator of the KVK has little control on his staff in such situations. This is affecting the performance of the KVKs and there should be a mechanism to address this issue at the earliest.

My personal experiences with the host institution managing one of the KVK hosted by the NGO helped me to fully understand the critical role of host institution in the performance of KVK. The host institution rarely comes forward to support the KVK financially whenever there are delays in fund transfer from ICAR. While working as Training Organiser with that KVK, all my staff including myself used to get salary at the end of each month only for 6-7 months. Later, we used to get it together after 4 to 5 months due to the delay in fund transfer to the KVK. The same situation prevails even today. Sometimes I wonder what other sacrifices KVK personnel need to do to support this system? Even in KVKs under the ICAR institutes, it is hard to get the powers of a Programme Coordinator fully delegated from the Institute. All these highlight the need for addressing some of these issues so as to provide the right environment for KVK personnel to perform better. Often host institutes utilise the expertise of KVKs in mobilising farmer groups for their work and allot duties based on their priorities, but rarely support the KVK in delivering its mandate. Without the full support of the host institution, it is difficult for KVKs to perform up to their potential.

Capabilities of KVK

As a team, KVK is competent to manage its mandate, as the administrative and financial guidelines regarding its management are clear. The KVK personnel are also capable of

organising any type of training including training of extension functionaries, etc. The Programme Coordinator and SMS (Subject Matter Specialist) are aware of the prevailing situations, farmer needs, technologies in the market and what not. Moreover, the trainers of KVK are as equally qualified as any academic faculty from the SAU and any Scientist of ICAR. Unfortunately, the capability of professionals is assessed by their place of posting. Many believe that the training of extension functionaries should be handled by the scientists of SAUs or ICAR only (though they have little field experience) and not by the KVK faculty.

Moreover, while the KVK personnel often have the same level of educational qualification and years of experience within the system, they are placed in lower grades than people working in the research centres. Though many call KVK personnel as KVK scientists, officially they don't belong to the scientific category (except the Programme Coordinator). We need to look at these issues too while we reform KVKs. The High Power Committee on Management of KVKs has recommended converting the SMS positions in KVKs to the scientific cadre (ICAR, 2014). I hope a decision on this would be taken soon.

Issues on Technology Assessment

One of the major features of KVK (which really differentiates its functions from the state line departments such as Department of Agriculture, Horticulture, etc) is its mandate on technology assessment and refinement. (But unfortunately many consider KVKs as merely training centres). But whether the KVKs have real capability to assess and refine technologies is an important question? Do they have a concrete mechanism to pass on assessment results to the research system though they report annually to controlling agencies? Every year, KVKs search for new technologies to be tested for its micro location specificity and many KVKs are constrained in obtaining these technologies for testing and also for demonstration. Invariably ICAR institutes demand KVKs to pay for these technologies. In some cases, for instance, getting good hybrid seeds for assessment and demonstration from public sector is extremely difficult.

Visibility Crisis of KVK

Many talk about the poor visibility of KVKs at the district level and they expect every farmer in the district to know about the KVK. A KVK with 16 staff members cannot do wonders in a district on its own. Until and unless it collaborates with the mainstream extension machinery of the state and organises proper assessment and communication

of technologies its effectiveness and visibility will always be questioned.

Every year a KVK is set with a target of 24 On-farm trails, 24 Front Line Demonstrations and 72 trainings by its six experts. To perform these activities each KVK is approximately provided with INR 6-10 lakh. Cost of all critical inputs for trials and demonstrations, cost of fuel, post, telephone, teaching materials, food charges during training and other daily expenses in each KVK have to be met from this meagre operational budget. Keeping in view this limitation, KVKs should avoid the temptation to initiate larger development interventions in the district to show its impact. KVKs should focus on technology assessment and supporting agricultural planning in the district.

As noted in one of the good practice note from KVK shared through AESA web portal (www.aesanetwork.org) "while the KVK demonstrations could convince several farmers to use a package of scientific practices and learn from their impacts (reduced use of inputs, less pollution, higher profits and enhanced climate resilience), the upscaling of the technology package was possible only through the concerted efforts of the Department of Agriculture, ATMA, Local Self Governments and input agencies" (Muralidharan, 2015). Despite the guidelines to work together, there is lack of partnership between KVK and ATMA (Glendenning, et al 2010; Babu et al, 2013). Exceptions do exist but these are mostly driven by individual interests.

Box 2: Successful impact of collaboration: KVK-Puducherry

Apparently, farmers in Sorapattu village of Mannadipattu in Puducherry have a lot of information on using integrated pest management (IPM) for protecting their crops rather than using chemical pesticides for the same. The emphasis on IPM in the region is in practice since 1994, in order to bring down the indiscriminate usage of pesticides to contain crop pests and diseases while conserving and protecting natural insects in crop ecosystem. Perunthalaivar Kamaraj Krishi Vigyan Kendra (PKKVK), Puducherry, in co-ordination with the agriculture department is responsible for bringing this tremendous change in the attitude of the farmers towards this method. Pesticide consumption in this region has come down significantly from 163 metric tonnes in 1990-91 to 40.92 tonnes in 2013-2014, resulting in a two-thirds reduction in its consumption. Similarly, the number of pesticides outlets has decreased from 196 in 1990-1991 to 115 in 2013-2014, nearly a 30 percent decrease.

<http://www.thehindu.com/sci-tech/science/an-entire-village-shuns-using-chemicals-for-growing-crops/article6809021.ece>.

Partnership Experience from KVK-Khordha

To enhance the contribution and impacts KVK-Khordha under ICAR-Central Institute of Freshwater Aquaculture started an initiative called "People and Partnership". The initiative helped it in developing strong networks with more than

10 organisations having similar mandates in the district. Partners started seeking help from the KVK in different ways to work in tandem for the development of agriculture in the district and it helped the KVK to increase its reach from 7000 to 14,000 farmers/year. Certain partners provided funds and others provided manpower for larger development (Table 1).



Table 1: People and Partnership at KVK, Khorda-An Analysis

Partners	Role of KVK	Benefits to KVK	Reach of activities	Provision of
State Employment Mission, Government of Odisha	Entrepreneurship development through skill development	KVK entered into entrepreneurship mode in freshwater aquaculture Strong link with State Department of Fisheries; KVK poses technical resources in local language	250 Entrepreneurs from three districts in fisheries	Finance
Odisha Community Tank Management Project	Joint implementation of Agricultural Livelihood Support services component	Community mobilization through Pani Panchayati. e Water Users Association; Additional manpower to KVK; Extensive outreach of activities by KVK; Experience in Farmer field school approach; Envisaged farmer to farmer extension model	Developed operational infrastructure for KVK at two blocks; Strengthened the footing in four blocks; 7556 ha benefitting 6000 farmers in agriculture/ horticulture, 2000 in livestock and 500 households in fisheries in the command villages.	Finance, Manpower
Odisha Watershed Mission	Training on off season vegetables; Training on rural livelihoods	Sharing experience to farmers of Nuapada district; Developed local language training modules on off season vegetable cultivation; Established link with Department of Horticulture with Orissa University of Science and Technology; Trained 140 extension workers of mission on rural livelihoods	Extended services to farmers of Nuapada district; Trained 140 watershed Management Teams on rural livelihoods	Finance, Manpower
ATMA-Khordha	Technical Backstopping, varietal trials and Skill Development Training	Massive coverage of paddy land under line transplanting; Concluded varietal trials	10,000 ha of paddy land under line transplanting; 5921 farmers benefitted over four years	Finance

KVKs do convergence not only with ATMA but others too. But some organisations only want to sub-contract a few set of activities (e.g.: Training) without engaging in sharing expertise and experiences which may not be ideal. A lot more needs to be done to promote sustainable and mutually rewarding partnerships at the KVK level.

Reporting

While KVKs do a lot of interesting and innovative work, they have been generally poor at reporting, reflecting and sharing their experiences. The current reporting requirements do not appreciate documenting best practices and preparing quality case studies. For instance, Programme Coordinators of KVKs working under ICAR institutes have too many to report and these include, Controlling Officer of the host institute, Director, Extension of the concerned state agricultural university, Zonal Project Directors

of the concerned Zone and at times even to the District Magistrate/Collector. Day-to-day reporting has become very cumbersome and apart from this many other works are also entrusted to KVKs. This also needs review. Fortunately we currently have an e-platform like AESA (Agricultural Extension in South Asia) which is keen to publish good practices of KVKs. However, KVKs do need more support and encouragement to document, analyse and promote their innovative experiences.

Way Forward

KVKs are viewed as one of India's important institutional innovation inspiring the world in the 21st Century (ICAR, 2012). This institutional innovation is also likely to spread to other parts of the world like Africa (Kumar, 2013). If KVKs have to contribute effectively, their roles need to be clarified and their relationships with the host

institute needs to be streamlined. KVKs should have the freedom to decide on its functioning without getting involved in the activities of the host institute which are not in line with the mandates set for the former. Powers to implement the approved technical programme of the KVK should be fully delegated to the PC. KVKs being a field oriented organisation need a different type of management which is different from the way a research institute is managed.

KVK personnel working in the host institutions have to be brought back and existing vacant posts in KVKs should be filled up urgently. The recommendations of the High Power Committee on Management of KVKs should be implemented without any further delay. Without addressing these types of governance challenges, one shouldn't be expecting any major impact from the KVKs.

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15

DEMAND-DRIVEN EXTENSION: NEED FOR PUBLIC EXTENSION TO TURNAROUND

“Is it not strange that agriculture in India has transformed itself, while the public extension has lost its way? The supply-driven extension, now regarded as largely inaccessible, ineffective and irrelevant, should make way for a more dynamic ‘demand driven’ extension system”, argues Arun Balamatti.

Public extension indeed had a lead role during the Green Revolution (GR). Post GR, however, everything else about agriculture has changed. The nature of farming has changed from being self-reliant to externalized farming; the purpose of farming has changed from largely subsistence to market-oriented; traditional, yet confident, self-contained farmers as a community are now operating as individuals; are disillusioned and seem to have lost confidence. Public extension system that worked with the eagerness and energy to act as a springboard for farmers to adopt high yielding varieties (HYVs), hybrids, chemical fertilizers and irrigation technologies during GR is no more the same.

Loss of farmers’ seed sovereignty, exploitative markets and new challenges like climate change seem to have unsettled the public extension system. The government’s desire to double farmers’ income by 2022 comes in as an added pressure on the public extension system. Improving productivity as well as profitability is the name of the game, today. Is the present public extension system prepared to live up to the challenge? It seems highly unlikely, unless the public extension system recognizes, that it has not only lost its way, but also that it must turn around and change its orientation.

Farmers Missed the Change that Everyone else Embraced

The constant research and technology development efforts are impacting our life significantly, including the food we eat, the clothes we wear, the means of our transport, the communication we do and the gadgets like computer, television, mobile phones that we use every day. Similarly, research and technology developments have brought enormous changes in the field of agriculture, in the crops, varieties, farm machinery and the agronomic practices. Unfortunately, majority of the farmers are not able to adopt the new technologies and practices. There are many reasons why farmers are unable to access and adopt new technologies, such as: the diversity in agricultural ecosystems and in the range of crops being grown, the direct and indirect influences of biodiversity on diverse cropping systems, language and cultural heterogeneity. These reasons aside, the ‘information gap’ is also a major constraint, which is reflected in the lack of awareness about new and relevant technologies due to lack of a suitable, responsive and comprehensive ‘agricultural extension system’. Therefore, the gap between generation of technological innovations and their ‘utilization’ is constantly widening.

Agricultural extension system, traditionally, has had two main functions: imparting knowledge and developing attitude and skills, so that farmers can use the new knowledge. Agricultural extension today, known as Rural Advisory Services (RAS), has an extended scope that includes provision of information, services and skills to farmers, including recognition of multiple players involved in the process such as public, private and civil society organizations. Delivering knowledge is relatively easy in the information era that we live in, today. However, building the necessary attitude and skills among a vast majority of farm families is a difficult task. Many farm technologies are being developed, often beyond the comprehension of an average farmer. Since the end users of the technological advancements are farmers, their capacity building, although inevitable, has largely remained inadequate due to absence of effective institutional mechanisms and inadequate human resources under the present agricultural extension system. An alternative system of agriculture is imperative.

Agricultural Extension: The Current Supply-Oriented System

The system in operation in India and many developing countries is essentially a 'supply-oriented agricultural extension'. The National Agricultural Research System (NARS), headed by the Indian Council of Agriculture Research (ICAR) through its country-wide research institutions and the State Agricultural Universities (SAUs), undertakes research to develop technologies on crops, varieties, nutrients, pesticides, agronomic practices, farm implements and equipment etc. The Department of Agriculture (DoA), under the aegis of the state governments, has the mandate of transferring the technologies to farmers, along with its various development departments.

The Research and the Development agencies operate in the context of agro-climatic zones and their technology development and RAS are aimed at farmers and farming. On the other hand, private input agencies who sell seeds, fertilizers, pesticides, farm machinery, irrigation equipment and so on. While the end beneficiaries of research, extension and input trade are the same - the farmers - there seems to be little coordination between the actors involved in research, extension and input trade. In the process, farmers are left with no choice but to seek different agencies for different purposes.

Inadequacies in the supply-oriented extension system

There are certain fundamental inadequacies in the present 'supply-oriented agricultural

extension system'. Extension is designed to be a public service system. While public extension is mainly the mandate of the DoA, the SAUs focus more on research and teaching and hence have limited contact with farmers through their limited extension activities. The DoA, on the other hand, working under pressure to deliver government's welfare schemes and subsidies, has reduced itself from being an 'agency of technology transfer' to a 'subsidy shop'. Various reports and studies say, that the information flow within the public sector moves linearly, with content focusing on the transfer of technology for increasing crop production.

A wider definition of agricultural extension, beyond improving crop productivity, has not been embraced. Information flow is supply-driven and not need-based or area-specific, so farmers see the quality of information provided by the public extension staff as a major shortcoming. This is due to the static and inflexible nature of the organization, where a top-down hierarchical approach continues. Access to extension is also an issue, because of the low level of outreach by public extension services. This is partly due to the public staff being overburdened with implementing state and centralized schemes, which are also not easily modified to suit local needs and conditions.

Under these circumstances, as the public agencies are moving far and away from farmers, private traders of seeds, fertilizers, pesticides and farm implements are coming closer to farmers, often through aggressive marketing strategies. It is these private traders who are now deciding what the farmers should use - the inputs, their quantity, quality and even the time of use of inputs (See Box 1).

Therefore, it is not the problem in the crops or the perceived requirements by farmers, but it is the corporate interests of private players that persuade and influence farmers' decision. The farmers, in this 'supply-oriented agricultural extension system' have become hapless consumers rather than being the 'end users of technologies'.

The Need for Demand-Driven Extension Services

Today, farming is no longer a means of subsistence but an enterprise. Farming requires not just the successful cultivation of a crop, but also demands a reasonable price for the farmer to succeed in the complex 'marketplace'. This complexity is a challenge to farmers of all socio-economic status, be it big farmer, smallholder, literate or illiterate. Every farmer needs to put together the available knowledge, technology and financial resources

in addition to other essential inputs like seeds, fertilizers, pesticides etc. The key to success here lies in farmers acquiring quality inputs at competitive prices, putting them into use on their fields appropriately, harvesting a good crop and selling for profit. Thus, farmers are required to be skillful and shrewd managers. Unfortunately, many farmers are good at cultivation, but have limited managerial skills, especially on the market front, hence, even the best of the farmers are losing in the market.

The term 'demand' is defined as what people ask for, need and value to an extent that they

are willing to invest their resources, such as time and money, in order to receive the service (Chipeta 2006). Demand-driven extension (Box 2) involves, extension clients actively identifying which advisory and educational services are needed. However, this note is not about collectives where farmers organize in to farmer producer organizations (FPOs), watershed associations (WAs), water user groups (WUGs) etc., where the collectives are in a position to assert or bargain for information, services and products based on the sheer strength of their unity. Such collectives are few and sporadic.

Box 1: Farmers access to information

The latest Situation Assessment Survey of Agricultural Households in India (NSSO, 70th round), based on a countrywide survey (July 2012-June 2013) of nearly 35,000 households revealed that "farmers continue to remain far removed from new technologies and guidance from state run research institutes including KVKs (Krishi Vigyan Kendra)" (NSSO, 2014). Over 59% of the farm households received no assistance from either government or private extension services. Of the 40.6% households who received extension assistance, only 11% of the services came from the government machinery - extension agents, KVKs and agricultural universities.

More farmers depended on other progressive farmers (20%), media including radio, TV, newspaper (19.6%) and private commercial agents (7.4%). *Source: NSSO (2014)*

Glendenning et al. (2010) concluded from a review of agricultural extension in India, that despite the variety of agricultural extension approaches that operate in parallel and sometimes duplicate one another, the majority of farmers in India do not have access to any source of information; this lack of access severely limit their ability to increase productivity, income and reduce vulnerability. *Source: Glendenning, et al (2010)*

Box 2: Demand driven extension

Demand-driven extension / agricultural advisory services represent a break from the earlier understanding of agricultural producers as beneficiaries of services. Instead, in demand-driven extension the users' demands define the content, quality, and mode of delivery.

Its main principles are:

- Services are based on user demand,
- Service providers are accountable to users, particularly on content and quality,
- Users have a choice of service providers.

Source: Blum M and Chipeta S (2016)

Demand-driven extension service in this note emphasizes the needs of those unorganized individual farmers, who, in their pursuit of farming, approach private traders seeking inputs and products. In doing so, they invest their resources, such as time and money, but are not as assertive as a collective could be. As they are alone and often ignorant, they become vulnerable to exploitation and this calls for a need to safeguard their interests.

The market, in agriculture, has two dimensions. The middlemen dominated 'produce market' is a familiar one where the farmer is a constant loser; the other less familiar dimension, is the 'input market' where the farmer must buy various

inputs. Farmers constantly struggle to choose and procure the right quantity and quality of seeds, fertilizers, pesticides, and farm machinery. Only those farmers succeed who can deal with input as well as output markets. Unfortunately, overwhelming majority of the farmers does not have the knowledge, skills and capacities to cope with these challenges. While there is a wide recognition of the exploitative practices of middlemen and the poor prices for crops, the difficulties in accessing technology and proper inputs are not adequately debated. While the call for demand-driven extension has existed for several decades now, new modes of reaching out to farmers could have significant impact in India, as they might better reflect the local information

needs of farmers (Gupta and Shinde, 2013).

All farmers require advice on the following aspects:

- **What to grow?** Choosing the right crop, variety and agronomic practices;
- **How to finance?** Accessing low interest loan from banks or borrow from money lenders at high rates of interest (often, this is the case with majority farmers),
- **What inputs to use?** Harnessing seeds, fertilizers, herbicides, pesticides etc., from the DoA at subsidized prices or struggle to procure them from the open market without being sure about the quality and price,
- **Where and how to sell?** Selling their produce in the market at competitive price defying the clutches of the money lenders.

Often, majority of the farmers either do not approach or do not get what they need from public agencies and hence end up at private input traders. In the present system, when farmers approach the SAU, they might get good information on crops, variety and agronomic practices but they are directed to either the DoA or traders for acquiring the required inputs. When farmers do approach the DoA or a trader, they find out the inputs suggested by the SAU are either not available or are too expensive. The traders then offer alternatives to farmers as they deal in products harnessed from both public and private sources, further complicating farmers' decisions. The farmers are relieved of their dilemma eventually by the traders deciding for them and thus the farmers are deprived of making 'informed choices'.

It should be noted here that such a failure is not of the farmers but of the extension system. For every citizen to have food, nutrition and progress, farmers must succeed. When the farmers' access and abilities are inadequate, it

is the 'system' which should enable them and because the supply-oriented system is failing to meet the demands of 'market-oriented farmers and farming', there is a need to reorient the extension system in a way the system addresses farmers' needs from the market point of view. However, because farmers' welfare cannot be relegated to the 'profit oriented input traders and output buyers', it may be appropriate for a public agency to experiment with a 'social enterprise model'. Thus, to enable farmers to meet the growing challenges, there is now a need for reorienting the present supply-oriented system into 'Demand-driven rural advisory services'.

Way Forward

In the conventional 'supply-oriented extension system', the public research institutes are developing technologies, the public extension agencies are striving for transferring such technologies and the farmers are expected to utilize new technologies. This system is being rendered ineffective due to various limitations, and hence, the private input traders are becoming decision makers for the farmers. This is affecting both 'productivity' as well as 'profitability'. Productivity gets affected by wrong choices and use of inputs and technologies whereas indiscriminate use of agro-chemicals adds to production costs while exerting pressure on the environment.

The nation is looking beyond food security to ensure nutrition security and sustainability. Without addressing the deterrents like climate challenges and growing disillusionment among farmers, these goals will remain beyond reach. This demands a turnaround in the way the public extension system operates. While continuing to work towards improving productivity, the system should address enhancing profitability by helping farmers reduce their production costs and offering them remunerative prices.



Apparently, such a system transformation can only be thought of through policy shift. More of the same hasn't been very helpful. The policy shift should look at reorienting public extension system to make it dynamic and demand-driven. Extension agencies that can offer information, services and inputs as demanded by the farmers should be designed and nurtured. A public agency like KVK, for instance, may take over the role of extending technology as well as

input delivery, provided the mandates, staff structuring and other support systems of KVKs are redesigned to meet the change. Individual farmers could benefit from a competent and trustworthy agency like KVK, should they succeed in winning the confidence of few farmers to begin with. At the same time, farmer collectives like FPOs, WAs and WUGs could make better use of KVKs by playing the intermediary role between farmers and service providers.



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AGRICULTURE EXTENSION SERVICE DELIVERY IN FEDERAL NEPAL: ISSUES AND CHALLENGES

Nepal's agricultural extension service delivery system is currently at the crossroads as it tries to adjust to the changing institutional and policy context imposed by the new federal structure. In this blog post Kamal Devkota and Dhanej Thapa discuss some of these challenges and its implications for strengthening extension delivery in Nepal.

The new Constitution of Nepal 2015 has initiated federal, provincial and local governments in Nepal, each bestowed with respective rights, responsibilities and power. The erstwhile development regions, zones, municipalities and village development committees have been dismantled to form seven provinces and 753 local government units. The number of districts has increased from 75 to 77, with the division of Nawarparasi and Rukum districts. However, the districts remain administratively the same but with significant curtailment in power and authority. Along with this administrative restructuring, the governing mechanism has been changed as well. While developing the new mechanism of governance, the Constitution has given tremendous authority and responsibility to local governments, which is unprecedented and has never been experienced before in the history of Nepal.

After federalism came into operation, elections for this three-tier government were held successfully in 2017 with overwhelming participation from the people and the elected representatives have assumed their roles with huge excitement, renewed commitment and enthusiasm. At the same time, there are increased expectations from the general public, especially in terms of easy service delivery, infrastructure development, economic wellbeing, and local prosperity. Expectations on service delivery for agricultural development, which is considered as an engine of economic growth, is relatively higher.

Federalism and Agricultural Extension

Agricultural development relies heavily on an effective agriculture extension system. Nepal's agricultural extension system used to have a strong bureaucratic chain with high vertical accountability but less to farmers. But federalization has opened up an opportunity for making agricultural policies at the province and local government level and thus rise above bureaucratic control. This changing context has also brought in multiple challenges while achieving agricultural development goals envisioned in Agriculture Development Strategy 2015. This blog highlights the emerging issues and challenges in the changing institutional and policy context. It also briefly traces the gaps in the current extension model and discusses those issues where efforts should focus – to design a better agricultural extension service system in Nepal.

1. Inconsistent Institutional Structure

The initiatives with regard to implementation of federalism have already started with the

restructuring of institutions at national, district, and local levels. The apex body for agriculture development, the Ministry of Agriculture and Livestock Development (MOAD), has been split and then merged time and time again. Currently, the Federal Ministry of Agriculture and Livestock Development (MOAD), is comprised of three central departments, central laboratories, and commodity development centers, along with national priority projects such as the Prime Minister Agriculture Modernization Project (PMAMP).

At the province level, the Ministry of Land Management, Agriculture and Cooperative has been established. This ministry operates agriculture and livestock development-related Directorates, province-level laboratories,

Agriculture Knowledge Centre, Veterinary Hospital and Livestock Expert Centers at the district level. Agriculture and Livestock Learning Centers were recently formed in the district by replacing the District Agriculture Development Office (DADO) and District Livestock Service Office (DLSO). As per the new constitution, district level sectoral organizations including DADO and DLSO, were supposed to transfer into the local government offices. It was expected that farmers can get expert services within their villages. But these district offices remain within the district under different names and slightly changed mandates and authorities.

At the local level, a few agriculture staff members have been assigned to deliver agricultural services under local government. In each local government, there are separate sections for agriculture, livestock, and fisheries development. However, these sections lack adequate staff to cater to the needs of a large number of farming households. Apart from this, the extension agents working in those sections have limited technical expertise, with poor linkage mechanisms to provincial-level agriculture development offices. Thus, it seems that the ongoing practices of institutional restructuring of agricultural services in federal system is inconsistent with the spirit of the constitution, which envisages delivery of quick, quality and adequate services to people at the local level. Hence, Nepalese agriculture extension service delivery has been facing difficulties in transforming itself in the changed context.

2. Overlapping Power, Authority, and Jurisdiction

Article 51 of the Constitution of Nepal established the policies on agriculture and land reform. It aims at scientific land reform by ending dual ownership

of land, and promoting the rights and interests of farmers. It has prioritized the preferential right of the local community to protect, promote, and make environment friendly and sustainable use of natural resources available in the country. Similarly, the constitution has guaranteed the right of farmers to have access to lands for agricultural activities, select and protect local seeds and biodiversity that have been used and pursued traditionally, in accordance with law. The ultimate objective is to enhance production and productivity. For the implementation of these provisions, clear roles, responsibilities, power, and authority at different levels of government is needed. However, agriculture has been under the concurrent right of all levels of government – federal, provincial, and local. Agriculture and livestock has been allocated under the authority of provincial government whereas local governments are responsible for agriculture and animal husbandry, agro-products management, animal health, and cooperatives. Farmers can take services from all three tiers of the government. There is no clear demarcation as regards the power, authority, roles and responsibilities among the different levels of government. Currently restructured agriculture entities are operating under short-term working guidelines and are yet to be finalized vis-à-vis their terms of reference so as to avoid duplications of programmes and services. This has created confusion on mandates and sharing of authority. Quite likely there are deficiencies and duplications in the programs.

3. Weak Human Resource Capacity

People's expectations from the newly elected representatives with regard to development and provision of services is high, and the elected officials have already been feeling intense pressure. However, newly established institutions not only lack experience and expertise on agriculture service delivery, they also experience shortages of human resources with the necessary technical expertise. Agriculture extension officers are not willing to go to the local government offices and offer their services as they do not see better career opportunities and financial incentives. There is a general tendency to stay within the central or provincial offices and bypass the local government offices. Hence, the numbers of extension agents deputed to these local governments are far less than the required number for quality service delivery.

This has created multiple challenges in extension service delivery at the local level. For instance, Pokhara metropolitan city allocated more than one million dollars during the last fiscal year

for the agriculture sector, however, more than half of the budget remained unspent due to the limited human resources available to mobilize the fund. If a metropolitan city like Pokhara is facing such a human resource crisis, what about rural municipalities? They face even more challenges in offering extension services. Hence it must be said that the limited human resources available at the local government level have been impeding the expected agriculture extension service delivery in the changed context.

4. Shifting Policy Regime

Agriculture Development Strategy (ADS) 2015 is the main guiding document that presents the overall strategy, including action plan and roadmap, for the agricultural sector in Nepal. It was prepared under top-down planning of the earlier administrative structure with the assumptions of the central control and coordination system. It was supposed to support the implementation of the Local Self-Governance Act of 1999, which has since been replaced by the Local Government Operation Act 2017.

This strategy was formulated and harmonized in keeping with the principles of decentralization, local self-governance, and participatory planning and is most likely to remain valid in the future. However, the federal governance structure was not envisaged in the strategy. After the execution of the federal democratic structure, ADS 2015 seems paralyzed. Several provisions of ADS need to be amended in the new administrative structure. For instance, the strategy perceived DADO and DLSO based in districts as the key extension service providers and provisioned their capacity building mechanism in the strategy. However, the DADO and DLSO both are not in operation now. With the

dismantling of DADOs and DLSOs, responsibilities of agriculture services delivery has congregated under local agriculture units at municipalities and rural municipalities, which are not as envisioned in the ADS. There are many such features affected by the federal structure.

Way Forward

Nepal's current agriculture extension service delivery system is passing through several challenges – institutional inconsistencies, conflicting power, authorities and jurisdiction among multiple institutions across the scale, weak human resources specifically at the local level, and a shifting policy regime. Further, there are poor functional linkages amidst agriculture institutions at different levels of government.

With federalism coming into operation and the state having been restructured, agricultural institutional restructuring needs to be in line with the new state mechanism. Given that the constitution has greatly empowered local governments with power and authority, the agricultural institutional structure at local levels also need to be made equally powerful with sufficient human and financial resources. These restructured institutions need to have clear mandates, power, and authority so that they can make their respective plans and programs avoiding confusion and duplication. A clear incentive plan for extension workers may motivate them to go to the local government offices and provide their services to the farmers. These may include career and financial incentives, exposure, further study plans, social security, etc. Similarly, a bridging policy provision for ADS in the new federal context could be useful for linking with new structures.



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ACTORS, PROGRAMMES AND POLICIES: SRI IN TRIPURA

Harnessing the potential of other actors, programme and policies should be an important strategy for extension and advisory services. Suchiradipta Bhattacharjee and R Saravanan illustrate the importance of these aspects in the context of SRI promotion in Tripura.

Agriculture is the only livelihood option for most of the rural communities in Tripura. A large majority of farmers are engaged in paddy cultivation. Though more than 75% of Tripura's cultivated area is under Paddy, it was dependent on other states for meeting its food grain consumption as the paddy productivity was very low. In 2001 the Government of Tripura launched its 'Perspective Plan for Self-Sufficiency in Food grains by 2010'. Achieving self-sufficient in rice by 2011-'12 was a major goal and the Government of Tripura gave all support to promote SRI (Systems of Rice Intensification) in the state. While initial efforts by the state Department of Agriculture in promoting SRI failed, it partnered with the Panchayat Raj Institutions (PRIs) to promote SRI. This collaboration was a great success and the area under Paddy grown under SRI increased many fold since then.

Box 1: System of Rice Intensification

System of Rice Intensification (SRI) evolved through participatory on-farm research in Madagascar during 1980s by Father Henry de Laulanie. It is a system rather than one specific technology because it is not a fixed set of practices. It uses certain management practices or principles like transplanting single, young seedlings in wide spacing and square patterns, keeping soil moist rather than flooding, weeding by mechanical weeder and using organic inputs. But they are not absolute in character and should be tested according to local conditions rather than simply adopted. For more specific information on SRI, see <http://agritech.tnau.ac.in/sri.html>. An e-learning course on SRI is available at: <https://www.youtube.com/watch?v=XdjoIpK0B4>.



Table 1: SRI vs. Conventional method of rice cultivation

Parameters	SRI	Conventional
Seed rate (kg/ha)	5-6	40-50
Seedling age (days)	10-12	25-30
Spacing (Row x Plant) cm	25 x 25	20x20
Seedling/hill	1	2
NPK + FYM	20:15:10 kg/ha + 10t/ha	120:60:40 kg/ha + 12t/ha
Water management	Only moist condition	Continuous flooding
Water requirement (mm)	900	1800
Weed management	Incorporated in field by weeder	Manual weeding/herbicides
Grain yield (t/ha)	6.0 – 6.5	4.5 – 5.0

(Source: Patel et al., 2008)

SRI in Tripura

Experiments on suitability of SRI in Tripura were taken up by the State Agricultural Research Station (SARS) under the leadership of Dr. Baharul Islam Majumdar in the beginning of 2000. After getting favourable and encouraging results on the experimental farms for around two years, field demonstration was started in 2002-03. Farmers were not keen to try SRI initially due to the widely different principles of SRI that contradicted the conventional techniques of growing paddy which the farmers have been practising for long. The only advocate of SRI in those initial years was the Department of Agriculture, Government of Tripura (DoA, GoT) which conducted on-farm demonstrations to make the farmers aware of the benefits of practising SRI.

Initial years of SRI promotion

Only a handful of farmers took up SRI but the number was mostly negligible compared to the large number of farmers cultivating rice and most of these farmers were very sceptical about SRI. The productivity of rice around that time (2005-06) was about 2635 kg/ha. Though the state extension system tried hard to educate farmers through (method demonstrations and result demonstrations) about the benefits of SRI, the farmers were not willing to take them up. The farmers were not convinced to take up transplanting rice seedling one at a time in wide spacing and in lines with water drained from the field at intervals as promoted by extension officials. The DoA/GoT soon realised the need for a different approach to promoting SRI.

New initiatives

Renewed efforts to promote SRI were built around inter-departmental and inter-organizational collaboration, especially with the Panchayati

Raj Institutions (PRIs). The state (like the rest of India) has a three tiered PRI system with the Gram Panchayat at the village level, Panchayat Samiti at the block level and Zilla Parishad at the district level (block and district are administrative levels in India). PRI are generally concerned with implementation of rural development programmes. But in Tripura, they took a lead in dissemination of agricultural technologies such as SRI in collaboration with DoA/GoT.

Since 2006-2007, the DoA, GoT started extensive dissemination of SRI with the help of PRIs. Hoardings and yellow flags, the characteristic feature of SRI farmlands of Tripura, were used to draw the attention of the farmers. In addition to these, leaflets and pamphlets were distributed among the farmers on market days in each and every village and audio visual presentations were given in the markets (once a week) on market days to create awareness among people. Regular meetings were also conducted with farmers to make them aware about SRI and its benefits.

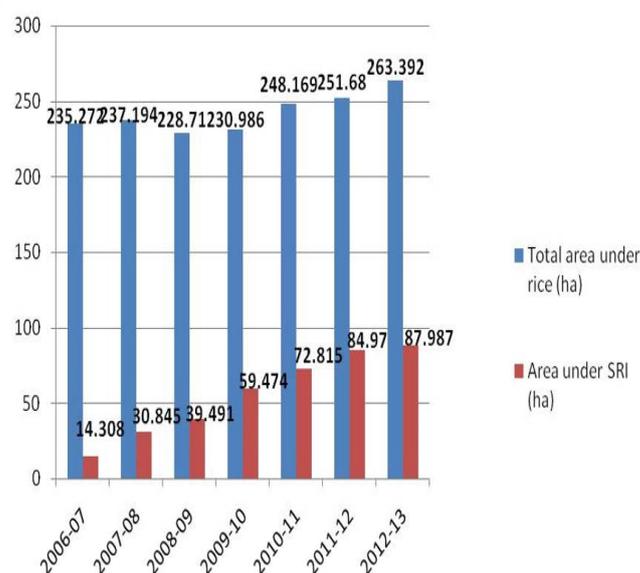


Fig. 1: Area under SRI in Tripura

The Gaon Pradhans (Village Panchayat heads) themselves took up SRI to set an example to the people so that they will follow. The village level workers of DoA, GoT went to the fields of the farmers and demonstrated the methods for field preparation, sowing and transplanting paddy as given in the SRI method. The PRI started selecting beneficiaries who would be given assistance in cash and kind by DoA, GoT for growing rice in SRI method. All these efforts started to pay off after a continuous and tireless campaign for around two years and SRI began to be adopted by several farmers in Tripura (Fig. 1)

What Made the Difference?

Two specific aspects led to the successful adoption of SRI

Collaboration with PRIs

The Panchayat members were themselves farmers mostly and SRI is something that they could personally relate to and they decided to try out this in their own field. When they adopted the method, it became a reference point for other farmers in the locality. The Gaon Pradhan and members are elected by the people from the villages and so they have a great rapport with the masses. Most of the elected members and Pradhans are full time or part time farmers and hence they could better connect with other farmers in the village. With SRI they took up the risk of adopting SRI and also took special interest to turn SRI's technological success into a people's movement. And they could do it because they are empathetic to the needs and concerns of the common masses.

Much has been talked about for developing empathy in extension personnel to make them more effective while working with farming communities. PRI members of Tripura proved how important it is in dissemination of a technology. While SRI has been promoted widely across the country by many including Agriculture Departments, State Agricultural Universities, Self Help Groups, and Non Governmental Organizations, the involvement of grassroot level democratic administrative units such as PRI was a unique feature of SRI dissemination in Tripura.

The SRI farmers reported that they visit Panchayat Office as frequently as they visit the Village Level Worker VLW Circle Office in the villages. They keep in touch with Gaon Pradhan and members not just because they are men of power but because they are one of them on whom they can rely on for any advice. The Gram Pradhans also in their monthly meetings with Superintendents of Agriculture of the Agricultural sub-divisions try to discuss all the problems of the farmers. And being

one of them, they are the best to decide what is appropriate in their contexts. Keeping these factors in view the DoA, GoT along with the Farm Science Centre (under it) worked very closed with PRIs to promote SRI.

Importance of complimentary and coordinated efforts

The Government of Tripura effectively used other programmes promoted by the Central Government such as Macro Management in Agriculture Scheme (MMAS), Rashtriya Krishi Vikas Yojana (RKVY) and National Food Security Mission (NFSM) to promote agricultural development in general and SRI in particular. For instance, during the initial stages of SRI in the state, the funds for research and promotion was taken from the funds received from MMAS. Since 2008-09, RKVY funds were allocated for the purpose of promoting SRI. Under RKVY, Rs 3916 (US\$ 64.94) is given to each farmer who opted for rice cultivation by SRI method. Under NFSM, Rs 7000 (US\$ 106) per hectare is given as assistance every season for one unit SRI farm (1 unit=10 ha). The beneficiaries for these two schemes (RKVY and NFSM) and they are chosen by the Gram Panchayat. All these complimentary and coordinated efforts have a positive effect on SRI in the state.

Outcomes

Currently, Tripura is expected to achieve self-sufficiency in rice in next two years. Though the goal of bringing 100 000 ha under SRI has not yet been fulfilled, around 85000 ha area is under SRI as of 2011-12. The state achieved 'Krishi Karman', a national level award for food grain production in Category III states in 2014 with total food grain production less than 1 million tonnes, mostly thanks to SRI. This high production and productivity has increased farm incomes and has given farmers new hopes in cultivating paddy.

Lessons

Successful promotion and application of new knowledge requires collaboration of several actors, complimentary policies and programmes and a favourable policy environment. Without the DoA-PRI collaboration, targeted use of complementary central government assistance and the political commitment to achieve self sufficiency in rice (through adoption of SRI), SRI promotion would have failed. Harnessing the potential of other actors, programme and policies should therefore be an important strategy for extension and advisory services.

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THE KRISHI VIGYAN KENDRAS (KVKs) IN INDIA: THE FULL POTENTIAL YET TO BE UNLEASHED!

Krishi Vigyan Kendra (KVK) is the only institution at the district level in India for technological backstopping in agriculture and allied sectors. While some of the KVKs have been effectively contributing to the technology development and promotion process, many are plagued with several problems. Though solutions to address these problems were pointed out by several committees, the implementation has been uneven. A lot more needs to be done to improve its performance including the public perception on the role and contribution of KVKs, argues Mahesh Chander.

The KVKs (Farm Science Centres) have been largely regarded as an institutional innovation that effectively link agricultural research and extension at the district level in India. So far, 642 KVKs have been established across the country with 100% funding support from the Indian Council of Agricultural Research (ICAR). Though established initially to promote new technologies through demonstrations and training, its present mandate covers assessment and refinement (if needed) of newly released technologies, training of field extension functionaries and production and sale of inputs such as planting materials. Several committees have evaluated the performance of KVKs from time to time. While several recommendations were made to improve their performance, many of these are yet to be implemented. A lot more needs to be done to enhance the contribution of KVKs to agricultural development.

Box 1: KVKs- A brief history

The Education Commission (1964-66) recommended that a vigorous effort be made to establish specialized institutions to provide vocational education in agriculture and allied fields at the pre and post-matriculate levels to cater to the training needs of a large number of boys and girls coming from rural areas. The Commission, further, suggested that such institutions be named as 'Agricultural Polytechnics'. The recommendation of the Commission was thoroughly discussed during 1966-72 by the Ministry of Education, Ministry of Agriculture, Planning Commission, ICAR and other allied institutions. Finally, the ICAR mooted the idea of establishing KVKs (Farm Science Centres) as innovative institutions for imparting vocational training to the practicing farmers, school dropouts and field level extension functionaries. The first KVK, on a pilot basis, was established in 1974 at Puducherry (Pondicherry) under the administrative control of the Tamil Nadu Agricultural University, Coimbatore.

The Planning Commission approved the proposal of the ICAR to establish 18 KVKs during the Fifth Five Year Plan Period (1974-79). Since then, several new KVKs were established by ICAR during each 5 Year Plan Period. On the occasion of the Independence Day Speech on 15th August, 2005, the Prime Minister of India announced that by the end of 2007 there should be one KVK in each of the rural districts of the country. By the end of the Tenth Plan (2002-07), the number of KVKs grew to 551. So far, the ICAR has established 642 KVKs across the country and these are hosted by different agencies such as Agricultural/ Veterinary Universities, Deemed Universities, State Governments, NGOs, Public Sector Undertakings and other educational institutions. Every KVK on an average receives about Rs. 10-15 Million (200,000 USD) each year from ICAR.

KVKs Mandate

KVKs are to provide a key facilitating role in the refinement of technologies to specific conditions, by acting as a two-way link between research and farmers. Application of technology/products through assessment, refinement and demonstration for adoption, thus, is the main mandate of the KVKs. To achieve this mandate effectively, each KVK is expected to perform following activities:

- On-farm testing to identify the location specificity of agricultural technologies under various farming systems
- Frontline demonstrations to establish its production potentials on the farmers' fields.
- Training of farmers and extension personnel to update their knowledge and skills in modern agricultural technologies.
- Work as resource and knowledge centre of agricultural technologies for supporting initiatives of public, private and voluntary sector for improving the agricultural economy of the district.
- Produce and make available technological products like seed, planting material, bio agents, young ones of livestock etc to the farmers.
- Organize extension activities to create awareness about improved agricultural technologies to facilitate fast diffusion and adoption of technologies in agriculture and allied sectors.

All KVKs are envisaged to reduce the time lag between generation of technology at the research institution and its application to the location specific farmer fields for increasing production, productivity and net farm income on a sustained basis. As technology transfer is the responsibility of the state line departments and ATMA, KVKs are playing only a limited role in field extension activities. The KVK technology demonstrations are called "frontline" as it happens for the first time in an area, whereas, line departments and ATMA conduct field demonstrations on large scale.

The High Powered Committee on Management of KVKs (ICAR, 2014) in its report has suggested a new vision, mission and mandate for the KVKs. This committee has defined the activities for each KVK as follows:

- On-Farm Testing (OFT) to assess the location specificity of agricultural

technologies under various farmings systems.

- Out scaling of farm innovations through Frontline Demonstration (FLD) to showcase the specific benefits/ worth of technologies on farmers' fields.
- Capacity development of farmers and extension personnel to update their knowledge and skills in modern agricultural technologies and enterprises.
- Work as Knowledge and Resource Centre for improving overall agricultural economy in the operational area.
- Conduct frontline extension programmes and provide farm advisories using ICTs and other media on varied subjects of interest to farmers.
- Data documentation, characterization and strategic planning of farming practices.

Performance of KVKs

In over four decades, several committees assessed the performance of the KVKs. Invariably every committee appreciated the huge potential of KVKs in delivering technologies to the farming communities including training farmers, farm women and rural youth (Box 2). Most of these committees suggested several changes required towards streamlining their performance. Unfortunately, many of the observations, suggestions and recommendation of these review committees were not taken up for implementation.

For instance, "van den Ban (1994) noted that many KVKs were found under resourced & have inexperienced staff. The World Bank (1990) found that many KVK training courses were under subscribed, raising doubts about their relevance. It was suggested to initiate an objective and scientific evaluation of all KVKs so that a case-by-case assessment could be made to guide the type and level of any further support. To intensify and enlarge such activities, it might be necessary to provide a few field level staff in each KVK (Farrington et al, 1997). Likewise, the Evaluation Committee on KVKs (1980), suggested that after imparting training to the farmers, these need to be followed up (ICAR, 1980). The 1996 Report on the Review of Extension System of ICAR also made several recommendations to strengthen the KVKs (ICAR, 1996). However, many of these suggestions have not been followed up.

Box 2: Achievements of KVKs

Some of the achievements of the KVKs during 2013-14 (DARE Annual Report, 2013-14) are as follows:

- **Technology Assessment and refinement:** Conducted 4189 on-farm trials on 537 technologies to identify their location specificity under different farming systems. 2,174 technological interventions were assessed by laying out 23,568 trials on the farmers' fields on various crops under different thematic areas. Besides, 452 technological interventions were assessed at 701 locations through 5,918 on-farm trials on animals covering a broad range of areas. Also, 143 farm-women specific appropriate technological interventions were assessed at 225 locations through 1,848 trials under the thematic areas, namely drudgery reduction, family resource management, health and nutrition, child care, processing and value addition and production and management.
- **Demonstrations:** A total of 1,897 trials were conducted at 309 locations to refine 253 technologies under different thematic areas. 1.71 lakh FLDs were organized by KVKs including 90,384 on crops covering an area of 26,399 ha. For popularization of improved tools and farm implements, 5,388 demonstrations on 3,229 ha farm area; 11,180 demonstrations on livestock enterprises; and 4,113 demonstrations on other enterprises including gender-specific technologies for women empowerment were organized. Out of the total FLDs, as many as 51,956 demonstrations were conducted exclusively on climate-resilient technologies under NICRA project.
- **Capacity Development/Training:** 61,495 training programmes were organized, wherein, 16.06 lakh farmers/farm women, rural youths and extension personnel participated. Skill-oriented training courses (7,489) were organized for 1.77 lakh rural youth, including 63,517 young women (36%) during the year. Capacity development programmes (5430 courses) were conducted for 1.18 lakh extension personnel, out of which, 28,289 were women extension personnel working in government and non-government organizations who were directly or indirectly related with the development of agriculture sector. The Zonal Project Directorates through their HRD programmes upgraded the knowledge and skills of 3,988 staff of KVKs by arranging 93 training programmes at various SAUs and ICAR Institutes in the frontier areas requiring capacity development of trainers.
- **Distribution of farm inputs:** 167.19 lakh quality planting materials of elite species of commercial crops, vegetables, fruits, ornamental, medicinal and aromatic crops, plantation crops, spices, tuber crops, fodder and forest species were produced and provided to 2.35 lakh farmers. Bio-products, namely, bio-agents, bio-pesticides, bio-fertilizers, vermi-compost, mineral mixture etc. were produced and supplied to the extent of 1.79 lakh q and 6.87 lakh numbers benefitting 13.74 lakh farmers. Animals of improved breeds of cattle, sheep, goat and buffalo including breeding bulls were produced and supplied to 800 farmers. Apart from poultry birds, pigs, rabbits, a total of 102.53 lakh fish fingerlings of different types of fishes were produced and supplied to 23,887 farmers.
- **Input Analysis:** A total of 2.91 lakh samples (soil, water, plant, and manure) were analyzed related to 2.29 lakh farmers of 0.37 lakh villages, with a revenue generation of Rs. 144 lakh.
- **Technology week:** under public-public and public-private partnership mode, was organized by KVKs benefitting 7.62 lakh farmers, farm-women, extension personnel, rural youth and members of self-help groups.
- **Mobile Advisory Services:** As a part of application of ICT in KVK system, Kisan Mobile Advisory (KMA) was initiated by the ICAR during 2010-11 to provide timely and need-based information to farming community. 3.89 lakh short text messages were sent to 16.28 lakh farmers on various aspects of agriculture, horticulture and animal husbandry, weather forecast and pest and disease control. In addition, 148 KVKs also sent 1,749 voice messages on different aspects of agriculture and allied enterprises to 30,752 registered farmers, which cumulatively benefitted as many as 10.04 lakh farmers.

The Performance Audit of Agricultural Extension activities in the ICAR by the Comptroller and Auditor General (CAG, 2008) is perhaps most revealing one about the state of affairs of KVKs and Zonal Coordinating Units. Based on a sample of 180 KVKs (13 from ICAR, 97 of SAUs, 53 of NGOs, 8 of State Governments and 9 Others) across the country, audited during May to November 2007, the CAG found:

- Eligibility criteria for possession of

minimum cultivable land were not observed in establishment of 50 KVKs (28 per cent). Most of the NGO KVKs (99 per cent) were yet to mortgage their land to ICAR. Further, improper site selection resulted in subsequent requests for change of selected sites and delay in conducting activities.

- 117 KVKs (65 per cent) did not assess location specific training needs based on

interaction with farmers and 53 per cent of the KVKs did not conduct training impact assessment. Shortfall in training courses for practicing farmers, rural youth and extension functionaries was observed in 121 KVKs.

- 94 KVKs (52 per cent) were still demonstrating older crop varieties released between 1948 and 1997 in Frontline Demonstrations. Average shortfall of 69 per cent was observed in 41 per cent of KVKs.
- 131 KVKs (73 per cent) did not conduct adequate number of on-farm testing.
- Inadmissible expenditure of Rs.5.70 crore was incurred by 123 KVKs on account of payment of salaries in higher pay scales and deployment of excess manpower.
- 44 KVKs (39 per cent) out of 114 established prior to the X plan were yet to fully establish mandatory infrastructural facilities. Further, infrastructure already constructed at a cost of Rs.8.15 crore remained unutilised in 46 KVKs. e-Linkage facility approved at a cost of Rs.41.02 crore for 200 KVKs during the X Plan was yet to be established as of January 2008.
- Only 0.34 per cent of the total rural youth trained were able to gain self employment.
- Coordination and monitoring of KVK activities by ICAR, ZCUs and KVKs were inadequate and needed to be strengthened. Shortfalls were observed in conducting meetings of monitoring bodies like Regional Committees and Scientific Advisory Committees.

Based on their observations, the CAG recommended that the KVK system must have updated, detailed and precise guidelines with clarity and precision. ICAR should formulate guidelines in respect of administrative and financial procedures for NGO KVKs.

The XII Plan Working Group on Agricultural Extension (Planning Commission, 2012) made following recommendations to make KVKs more effective:

- The KVK Farms should be developed as centres of excellence as role model for farmers. It needs to be ensured that every extension staff, including supervisory and administrative level officials, possesses

superior competency, skills and knowledge.

- Extension support is weak or non-existent in the case of animal husbandry and fisheries. As separate extension machinery for animal husbandry and fisheries are not going to be feasible in many states, this has to be integrated with ATMA. In districts where livestock and fisheries play a major role, staffing structure within ATMA and KVKs should be modified to include more staff with specialization in these sectors.
- The changing roles of and expectations from KVKs necessitate regular capacity building of its professionals. Hence, exclusive capacity building programmes shall be designed and conducted (like induction training, refresher courses, management and executive development programmes) for effective implementation of the mandated activities and image building/ branding of KVK system. NAARM, Agricultural Extension Division of ICAR and Zonal Project Directorates will jointly take up the responsibility for this.

To make KVKs more vibrant and visible, the ICAR recently constituted a High Power Committee (HPC), to review all issues pertaining to KVK system and suggest measures for improving their efficiency and relevance so as to meet the current expectations of stakeholders. This committee, since then has submitted its report (January, 2014), suggesting measures to improve relevance, efficiency and guidelines for implementation of policies for KVKs (<http://icar.org.in/en/node/8017>). The Committee has made recommendations on the mandate and domain of KVK activities; establishment and infrastructure; co-ordination, implementation and monitoring; convergence and linkage; administrative guidelines; financial management and visibility of the KVK System (<http://www.icar.org.in/en/node/7158>).



The key recommendations from this committee are as follows:

- a. The KVK Scheme is being funded from the Plan Budget since its inception (1974). Hence, the funds required for efficient functioning are often not available to the required extent as major component goes for staff salary. Therefore, it is critical now to project a part of the expenditure under Non-Plan instead of booking the entire expenditure under Plan. Accordingly, It is proposed that the requirement of funds in respect of eight ZPDs and KVKs (Salary, Travelling Allowance (TA), contingencies, HRD etc.) established till the end of X Plan (those in existence for more than five years) be allowed to be included under Non-Plan from the beginning of XII Plan period.
- b. With ever-growing nature and quantum of workload of each KVK, the existing six SMSs are finding it difficult to cope up with their responsibilities. It is, therefore, recommended that four additional posts of SMSs (Scientists) should be created in each KVK, thus, increasing the number of SMSs to 10. This is especially more important since lot of additional work is being entrusted to KVKs time to time, for instance, the KVKs undertook activities under NAIP (National Agricultural Innovation Project) and NICRA (National Initiative on Climate Resilient Agriculture). (<http://www.nicra-icar.in/nicrarevised/index.php/technology-demonstration>).

Perception on Performance

Over the past few years, there have been several reports in the media on the selection and governance of KVKs. Many of these reports have been highly critical of the way these KVKs were sanctioned to politicians and their affiliates (<http://archive.indianexpress.com/news/seeds-of-political-patronage/1116240/>).

- Appreciably the current government has taken note of such reports and constituted six member enquiry committee (<http://indianexpress.com/article/india/india-others/panel-to-inquire-into-functioning-of-kvks/>) in December 2014, headed by a former Agriculture Secretary. This panel has since then submitted its report(<http://indianexpress.com/article/india/india-others/follow-norms-says-krishi-kendra-review-panel/>).
- Based on its visit of just 4 KVKs (three run by Agriculture Universities and one run by an NGO) close to Delhi, it found that the KVKs don't follow norms and mostly

they lack expertise in the area of processing and value addition; agro-meteorology; agri-business; and diagnostic services. This panel has recommended that: In the case of NGOs, their credentials of dedicated working for espousing the cause of farmers and development of agriculture may be thoroughly examined before sanctioning KVK. The basic norms and criteria of quality sizeable land and potential of the host organisation to effectively implement the KVK activities should not be compromised.

- Skill Development training for rural youth has to be given more emphasis by KVKs. The process of skill development may be strengthened by establishing linkages of KVKs with National Skill Development Council.
- KVKs should forge PPPs at the district level to technically support the initiatives of private extension service providers.
- Apart from the quinquennial (recurring every five years) review, external evaluation may also be initiated for critical monitoring and evaluation of KVKs. The number of Zonal Project Directorates may be increased for better monitoring.
- KVKs should be linked up with Sansad Adarsh Gram Yojna, Pradhanmantri Sinchai Yojna and MNRREGS, so as to proactively identify suitable technologies, service providers, experts and organisations.

Implementation of all these recommendations is important to improve the effectiveness of the KVKs. Even with many of the limitations pointed out by the different committees, the KVKs have made important contributions to improving production, productivity and farmers' income. The ICAR has also made tremendous efforts to recognize and reward the innovative and good work done by KVKs. Over the years, several KVKs have won the ICAR Best KVK award at Zonal Level as well as at the National level. These KVKs can be role models for other KVKs and in fact such KVKs should come forward to train the staff of underperforming KVKs.

Several KVKs have been doing outstanding innovative work in their mandated activities across the country, but the good practices being followed by these KVKs are not highlighted properly outside the KVK conferences and KVK Zonal workshops. Such innovative KVKs and their success stories need to be brought to the notice of wider

extension/development community. This can be done effectively, if good practices are published on online portals like AESA (Agricultural Extension in South Asia, which encourages such documentation (<http://www.aesanetwork.org>).

KVKs and ATMA: The need for Coordination and Convergence

With the support of the Ministry of Agriculture, Agricultural Technology Management Agency (ATMA) is currently under implementation in 614 districts of 28 States and 3 UTs in the country. ATMA provides an institutional mechanism for coordination and management of Agricultural Extension System in the district (Box 3).



Box 3: Agricultural Technology Management Agency (ATMA)

Agricultural Technology Management Agency or (ATMA) is responsible for all the technology dissemination activities at the district level through linkages with the line departments, research organizations, NGOs and other agencies associated with agricultural development in the district. Research and Extension units within the project districts such as ZRS or substations, KVKs and the key line Departments of Agriculture, Animal Husbandry, Horticulture and Fisheries etc. are constituent members or Key stakeholders of ATMA. Each Research-Extension(R-E) unit retains its institutional identity and affiliation but programmes and procedures concerning district-wise R-E activities are determined by ATMA Governing Board to be implemented by its Management Committee (MC). The objectives of ATMA are as follows:

- To strengthen research – extension – farmer linkages
- To provide an effective mechanism for co-ordination and management of activities of different agencies involved in technology adaption / validation and dissemination at the district level and below.
- To increase the quality and type of technologies being disseminated.
- To move towards shared ownership of the agricultural technology system by key shareholders.
- To develop new partnerships with the private institutions including NGOs.

KVKs & ATMA are expected to work in true partnership mode, wherein, the KVK function as a frontline extension system, while, ATMA- as a field extension agency work for large scale technology dissemination/adoption, out-scaling of successful technologies/innovations through large-scale demonstrations and further verification/validation etc.

A joint circular was issued in January 2011 by the ICAR (Department of Agricultural Research and Education) and Department of Agriculture and Cooperation (Ministry of Agriculture, Government of India) on required linkage between KVKs and ATMA, elaborating their joint responsibilities (<https://drive.google.com/file/d/0B0TX5SvS4IMReTUtMWNra0xYVFU/view?usp=sharing>).

The guidelines provide mechanism for close involvement of agricultural research system represented by ICAR Institutes, SAUs and KVKs and State agriculture and allied departments by pooling funds, resources, programmes and manpower to enable the farmers to draw full benefits of technological advancements as per

local needs. The Ministry of Agriculture issued new guidelines for ATMA in 2014 and this also emphasized the need for better coordination and convergences between ATMA and KVKs (Box 4).

The High Power Committee on Management of KVKs recommended that the PD, ATMA and his team should plan periodical joint visits to the cluster villages of KVKs for gaining first-hand knowledge on new technologies being demonstrated so that activities could be initiated under ATMA for large-scale disseminations. Apart from cluster villages, the problems or issues noticed by PD, ATMA and his staff in other villages could be brought to the notice of KVK staff to ensure necessary follow-up.

The KVK conferences are important forum to review & share the performances of KVKs at national level wherein, among other things, the ATMA-KVK convergence issue is also prominently discussed. For instance, the 7th KVK conference held at Ludhiana, recommended that the successful process and methodological aspects of KVK-ATMA convergence should be documented elaborately and made available to all

Box 4: ATMA and KVKs- Roles expected in the Modified ATMA Guidelines-2014

These new guidelines were issued for better coordination & convergence between ATMA & KVKs. The salient points from this guideline are as follows:

- The Programme Coordinators (PCs) of KVKs in the district should not only regularly participate in the ATMA GB & Management Committee, but also should have an interface meeting with the Project Director (PD), ATMA once a month during the cropping season and work out a strategy of providing crop advisories to farmers for various stages of crop growth.
- The SMSs of KVKs will advise and mentor Block Technology Teams in identifying technological needs in various Blocks in the District and programmatic interventions to meet such needs.
- Comprehensive District Agriculture Plan (CDAP) or District Agriculture Action Plan (DAAP) under ATMA developed on the basis of the Strategic Research and Extension Plan (SREP) should be refined in the process jointly by ATMA and KVKs from the Block level and acted upon for the purpose.
- PD ATMA and PC of KVK should jointly visit at least five villages every month in the District to guide and supervise the extension related work assigned to scientists and the extension officers, including BTM & SMSs supported under ATMA.
- At the end of the month, a joint progress report will be submitted by the PD, ATMA and PC of KVK, to the Secretary (Agriculture)/Director (Agriculture) of the State and the SAU.
- In consultation with the Secretary (Agriculture) of the State, the Vice-Chancellor(s) of the University (ies) will allocate districts to specific scientists in the SAU, who would interact again with the ATMA and KVK of the assigned districts and provide technological inputs to the farmers through this mechanism.
- ATMA and KVK should coordinate with each other in the conduct of Field Days, Kisan Melas, Goshties and setting up of Farm Schools, so that there is no duplication in coverage and they should ensure percolation of appropriate scientific practices down to the field level.
- ATMA Management Committee having PC, KVK as its member may review the progress of technology application - related activities funded by ATMA. Besides this, the KVK may also provide an Agricultural Technology Update (ATU) on half yearly basis i.e. before the start of Kharif and Rabi crop seasons to the ATMA for its wider dissemination among the farmers of the district.
- KVKs will provide advice to ATMA and the District Administration for the implementation of Flagship programmes of the DAC namely – NFSM, NHM, RKVY, NAIS etc. The KVK Scientists will technically advise the Block Technology Teams (BTTs) and will also be actively involved in preparation of Block Action Plans (BAPs), especially with regard to research related issues/gaps and strategies. Regular participation of a KVK scientist in the meetings of BTT will be ensured at least once in a quarter. The participating scientist will also take feedback for his colleagues in the KVK in respect of their respective areas of expertise.
- Zonal Project Directors (ZPD), State Agriculture Commissioners / Directors and directors (Extension) of the SAUs concerned shall together take a quarterly meeting with KVKs and ATMAs.

the stakeholders for replication as per the needs of the district. Also, it was observed that the fund flow from ATMA to KVKs is highly skewed and varies from district to district and hence there is a need for uniformity in fund flow to all the KVKs and must be provided to KVKs directly (www.icar.org.in/files/KVK_NC_2013%20Final.pdf). In this conference, it was noted that Feed forward provided by the KVK to ATMA and the utility of feedback received from ATMA in preparation of action plan of KVK has been a major gain of the convergence and needs to be harnessed appropriately.

Though such efforts are promoting convergence, a lot more still required to be done to institutionalize and strengthen convergence.

Staff shortage, fear of loss of power and control on resources and lack of capacity in designing locally relevant programmes are constraining achievement of real convergence. At the field level, the success of these convergence efforts is yet to be visible.

Way Forward

The latest Situation Assessment Survey of Agricultural Households in India (NSSO, 70th round), based on a countrywide survey (July 2012-June 2013) of nearly 35,000 households revealed that "farmers continue to remain far removed from new technologies and guidance from state run research institutes including KVKs" (NSSO, 2014). Over 59% of the farm households received no assistance from either

government or private extension services. Of the 40.6% households who received extension assistance, only 11% of the services came from physical government machinery- extension agents, KVKs and agricultural universities. More farmers depended on other progressive farmers (20%), media including radio, TV, newspaper (19.6%) and private commercial agents (7.4%). Such findings make it imperative that the KVKs improve their functioning. This is possible, if the observations/suggestions of various committees as discussed above are taken into account, while being more proactive and creative in undertaking the mandated activities. Some of the suggestions summarized here may be useful towards making KVKs more vibrant:

Entrepreneurship Development: KVKs must develop farmer entrepreneurs, who can further help in technology transfer through mechanism of farmer to farmer extension. This is possible only when the KVKs rise above the routine activities they often perform mechanically. KVK trainings should promote entrepreneurship among rural youth, helping them in gaining self employment.

Promotion of diversified farming systems including Agro-tourism: KVK farms and KVK adopted villages can be developed as agro-tourism sites, to demonstrate diversifying farm income portfolio. KVKs' demonstrations must be cost effective for adoption by farmers.

Resource Generation: KVKs can compete and tap funds available from various government schemes/NABARD/Agricultural Skill Council of India for skill & entrepreneurship development in rural areas. KVKs should be in a position to generate a part of their resources from the sale of planting materials and other produce from their farms. Training programmes can also be charged for to some extent. KVKs must seek long-term funding relationship with local constituencies, such as NGOs, and with national and international organisations. There is over dependence of KVKs on ICAR funds currently. Lack of funds for off campus training and on-farm farm trials is a routine excuse in majority of KVKs.

Address capacity gaps: KVKs are meant to enhance capacities of farmers and other extension staff, but often the KVK staff lack in capacity especially in the fast emerging areas of agricultural technology which are more knowledge

& skill driven. Apart from updating technical skills in the area of their respective subject, the KVK staff, especially the PCs, need to be trained on innovation management (Sulaiman et al, 2014). Capacities to perform several functional skills related to networking and partnership building; enhancing access to technology, expertise, markets, credit and inputs; setting up/strengthening user groups, advocacy for institutional and policy changes, reflective learning etc., have to be enhanced through trainings, action learning initiatives, exchange of good practices across KVKs.

Clarity on governance: Lack of clarity on governance is a big issue affecting the KVK functioning. The role and responsibilities of Vice-Chancellors/Director of Extension in KVKs under SAUs; Directors of ICAR institutes in the case of KVKs under ICAR and Trustee of the NGO in the case of KVKs under NGO have to be clearly spelled out. Quite often the PCs of the KVKs have to do the balancing act between the ZPDs & their respective controllers who often have conflicting priorities. In some of the KVKs, full autonomy has been given to PCs, while in most of them they have to be at the mercy of others who takes decisions on administrative and financial aspects.

ATMA-KVK link: Lot more needs to be done to achieve the convergence between ATMA and KVK (as envisaged under the joint circular) operational. There might be some success stories, wherein, the proposed changes like quarterly joint meetings, earmarking of funds to KVKs, visit of ATMA staff to the cluster villages of KVKs and ATMA sponsorship for Technology Weeks (being organized by KVKs) are achieved successfully, which may be shared for wider replication in other districts.

Role of Zonal Project Directorates (ZPDs): The ZPDs co-ordinate the activities of KVKs under their jurisdiction in the respective zones (often with limited staff). The ZPDs need to be proactive not only in collection of data, preparation of reports for prompt onward transmission to Agricultural extension division of ICAR, effective monitoring & evaluating the performance of KVKs under their jurisdiction, but also in guiding/facilitating the KVKs to play more wider roles to promote and apply new knowledge. They could also play a major role in documenting and analyzing good practices and generating quality evidence on performance of new technologies.

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INSTITUTIONAL CONVERGENCE FOR AGRICULTURAL DEVELOPMENT: THE CHANGING ROLE OF EXTENSION

Extension agencies globally face the twin challenges of limited finances and manpower. However, some extension agencies manage these challenges and achieve larger impacts by converging their efforts with others. Based on their experiences with convergence of activities at the Krishi Vigyan Kendra (KVK) in Khordha under ICAR-Central Institute for Freshwater Aquaculture, Bhubaneswar, Odisha, PN Ananth, S Babu, NK Barik, AK Dash and JK Sundaray demonstrate how convergence at the KVK level can enhance innovation and impact.

Krishi Vigyan Kendras (KVK), the farm science centres, have been claimed as one of the major institutional innovations of the NARS (National Agricultural Research System) in India. KVKs act as knowledge and resource centres for the district extension system in India. KVKs are fully sponsored by the Indian Council of Agricultural Research (ICAR) and are authorised to organise technology assessment and refinement. Apart from this they also organise demonstrations to provide technological backstopping to state agencies at the district level and training to farmers (Box 1). Agriculture is considered to be a state subject which means that states are mainly responsible for agricultural development. But KVKs are centrally sponsored. The KVKs work closely with the state governments in providing information and knowledge on latest innovations, along with technologies and updates on agriculture and allied sectors for district agricultural development.

Though KVKs are knowledge and resource centres of the district, the organisation is plagued with low budgetary provisions and inadequate manpower, which inhibits its ability to cater to the district's extension system, farmers, and other stakeholders. On average, a district in India has 10 blocks and between 1000-2000 villages ranging in area from 2500-3000 sq. km. So the potential coverage for a KVK is fairly large. However, each KVK is manned by only six subject matter specialists with one scientific cadre staff heading the unit, and has an annual budget of one crore (almost 80% of this amount is spent on salaries).

Why Convergence for KVK?

There is a general misunderstanding that a KVK has to cover the whole district (as it is a district level organisation) with its extension services. The latest directive speaks on Technology Assessment and Demonstration for its Application and Capacity Development. The earlier directive had also mentioned Technology Assessment, Refinement and Demonstration. Additionally many consider and feel that KVK is a training centre. Training of KVKs are part of the demonstration programmes and a standalone activity. Demonstrations too differ from the state government's way of demonstration as it is unique being a Front Line Demonstration (FLD). The FLDs of KVKs means that a cutting edge innovation/technology is demonstrated for the first time in the district involving scientists and extension workers of the state government.

Though the mandates of KVKs clearly indicate that it is entirely different from a full time

extension agency, many expect it to function like a district level extension agency. For instance, if a technology being assessed by KVK is found to be feasible and productive for farmers, many believe that it is the role of KVK to extend its outreach to the entire district. But it must be kept in mind that KVKs are not

appointed to play this role. Apart from this, they are also not in a position to do this because they lack adequate budget and manpower. However, it is possible for KVKs to expand viable, assessed and demonstrated technologies if they work with other partners at the district level.

Box 1: Achievements of KVKs

- All over the country KVKs have conducted 29,805 on-farm trials on 3301 technologies at 4312 locations – to identify their location-specific advantages under different farming systems;
- KVKs have organized 129,678 Front Line Demonstrations (FLD) to demonstrate the production potential of newly-released production technologies on farmers' fields;
- Trained more than 1.3 million farmers/farm women, rural youths and extension personnel in agriculture and allied fields;
- Conducted a large number of extension activities benefiting about 19.87 million farmers and other end users;
- Produced more than 339,000 quintals of seeds and 147.56 million sapling/seedlings/livestock strains, as well as various bio-products made available to farmers;
- Sustained functioning of 44 Agricultural Technology Information Centres in ICAR institutes and SAUs;
- Organized 358 capacity development programmes for 9878 KVK personnel;
- Organized 268 interface meetings involving scientists and development officials at the district level.

Source: <https://kvk.icar.gov.in/ABOUTKVK.ASPX>

There was an extensivereform during 2014-15 wherein KVK Heads were re-designated as Senior Scientists and Heads from the former designation as Programme Coordinators – this was done in order to leverage the district administration. The Heads of KVKs currently sit in the front row in meetings whereas earlier they used to sit at the back. Now it is time for KVKs to work on realistic district action plans and play proactive roles in extending the reach of its activities (although still plagued with low investments and manpower). This expansion process is always in the hands of KVKs, but it can happen only via self-induced practices/personal traits in the personnel working in KVKs rather than through external push factors (especially in the case of Heads of KVKs). With set mandates KVKs normally assess a technology, demonstrate, train and then sends it the state government for scaling out (a linear model is what a government-sponsored official offers). Such a linear model will not be good for better reach of technologies assessed and demonstrated by KVKs.

KVKs now have to devise mechanisms to overcome the challenge of low investments and inadequate manpower. This blog gives details on how a KVK in the eastern state of Odisha (in India) has expanded its activities, covered more farmers, and provided technical backstopping to other organisations using similar partners in the district and many other ways, including tapping into Corporate Social Responsibility (CRS) funds. The experiences

shared here are from KVK-Khordha, which works in the district of Khordha, under the administrative control of ICAR-Central Institute for Freshwater Aquaculture.

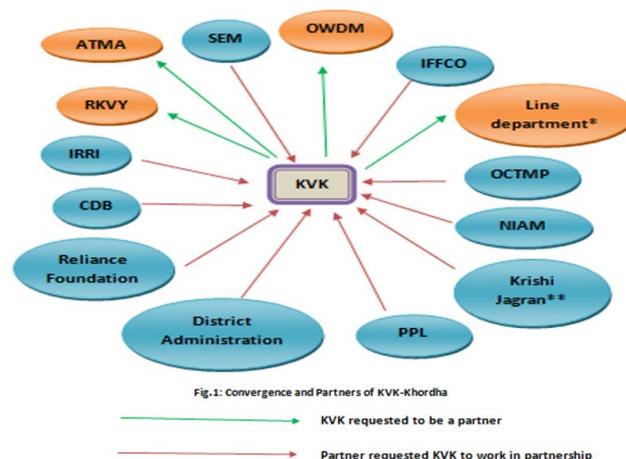
Approach Envisaged by KVK-Khordha

With an idea to expand its activities for better reach, the KVK made an action plan and named it as 'People and Partnership'. The approach was launched in 2012 in collaboration with various agencies to improve delivery of technical and extension services in a convergence mode. Since, then KVK-Khordha has been working with more than 21 partners, such as Employment Mission (GoO), ATMA-Khordha (GoO) supported by GoI, Odisha Community Tank Management Project (OCTMP) (a World Bank-aided project of GoO), District Rural Development Agency (DRDA) (GoO), National Council of Rural Institutions (NCRI) (GoI), Watershed Mission (GoO), Bringing Green Revolution to Eastern India (BGERI) a GoI-aided GoO project, Odisha Watershed Development Mission, Indian Farmers Fertilizers Cooperative (IFFCO), Coconut Development Board (GOI), Paradeep Phosphates (Pvt), Krishi Jagran Media group, Reliance Foundation, National Institute for Agricultural Marketing, RKVY-Odisha, and many others. Having understood the background this blog goes on to cover the nature of convergence initiated by a KVK marked with limited funding and manpower.

Analysis on the Convergence

A brief analysis of the initiative is imperative as the aim of working with partners (Table 1) is for mutual benefit with main focus on strengthening farmers in terms of increasing their incomes. The convergence envisaged by the KVK has yielded better outreach of activities and benefits to farmers that have been realised over time. By converging its activities with the efforts of others, the KVK started playing the role of a bridging organisation as envisaged under Extension Plus (Sulaiman and Hall 2004; Sulaiman 2012). As a bridging organisation at the district level with much better grasp of the ground situation, the KVK could better support agricultural extension system with aspects related to technology backstopping, integration, and management.

As the KVKs are not formally mandated to do these roles, they often concentrate more on organizing programmes by themselves. However, KVK-Khordha was well ahead in understanding its position and presence in the district and demanded to work with partners having its own capacity. The KVK identified partners who have



*District Extension Agencies of the government for agriculture, horticulture, veterinary and dairying, fisheries and other development missions
 ** A media house with a farm magazine in Odia

KVK Krishi Vigyan Kendra, OCTMP-Orissa Community Tank Management Project, OWDM-Odisha Watershed Development Mission, SEM-State Employment Mission, ATMA-Agricultural Technology Management Agency, IFFO-Indian Farmers Fertilizers Cooperatives, IRRI-International Rice Research Institute, CDB-Coconut Development Board, National Institute for Agricultural Marketing, PPL-Paradeep Phosphates Ltd.

similar objectives for expanding its activities. A brief analysis on the few partners with benefits from the KVK is presented in Table 1.

Table 1: Objective, mechanism, funding pattern, achievement and lessons learnt of the approach

Partner	Objective of partnership	Mechanism of partnership	Funding and sharing of resources	Achievements	Lessons learnt
Employment Mission	Developing entrepreneurs in freshwater aquaculture	Joint implementation	Full funding and sharing of expertise	143 entrepreneurs developed (one-month long skill development training)	Long-term capacity building is key for developing entrepreneurship
Orissa Community Tank Management Project	Support to agricultural livelihoods	Joint implementation	Full funding for implementation by the partner with additional manpower	412 ha of land under line sowing in paddy; 25 ha of community tanks under fish culture; 80 units of backyard poultry; 85 trainings benefitting 2285 farmers; trained 180 master farmers	Short-term partnerships to achieve targets in a livelihood project is a constraint
Odisha Watershed Development Mission	To train farmers on off-season vegetable cultivation	Implemented capacity building with own design	Full funding and expertise sharing	210 farmers trained in off-season vegetable cultivation; Unique guide for off-season vegetable cultivation in the local language	Absence of funds for assessing impact
District Administration	KVK key in the district extension system	Joint implementation of activities	Full funding and sharing expertise	Awareness camp--cum-workshop for 50 fish farmers to link with state schemes; and 120 farm women on drudgery reduction	KVK - vital for the district level extension system

National Council for Rural Institutions	Promoting rural enterprises	Implemented with own design	Funding on completion of the program	Training on rural enterprise for 35 farmers – trained on rural technologies	One time initiative for promoting rural enterprises is an uphill task
ATMA	Problem solving skills and feedback	Independent and joint implementation of activities	Formal allocation of funds to KVK by ATMA for validation trials and other activities	Technical backstopping to bring 10,000 ha of paddy cultivation by adopting the practice of line sowing; Organised validation trials on crops; Sharing expertise on suitable technologies for promotion in the district; Support to prepare Strategic Research and Extension Plan (SREP); Key member to prepare the Comprehensive District Action Plan (C-DAP); Interface meetings to scale up best practices for larger development in the district; Trained 850 progressive farmers identified by state actors	Personal relationships are key. Although it is mandatory to provide funds by ATMA to KVK, yet lobbying is required
Coconut Development Board	Focus on employment for rural youth	Joint implementation of skill development training	Full funding	210 rural youth trained in using coconut climbing machine; 210 climbing machines provided free of cost	Providing skill development training and support of a climbing machine can create impact
National Institute for Agricultural Marketing (NIAM), Jaipur	Develop a model to connect fish farmers to best marketing ways (Aquaculture Business Schools)	Development intervention in critical stages of fish production; and connecting to better markets	Full funding	Formed one aquaculture business school (other activities ongoing)	Model to be scaled up using different methods
RKVY	Developing and strengthening of Demonstration Unit of KVK	Infrastructure development to KVK	Full funding (INR 78 lakhs)	Construction of eight additional demonstration units	Critical inputs for providing certain innovations will be realised
International Rice Research Institute	Introduce innovations to reduce post-harvest losses	The new innovations of IRRI, such as Solar Bubble Dryer, cocoon and supper bags have been provided to KVK worth INR 2.5 lakhs to create awareness and demonstrate its usefulness	Full funding	Demonstrated the innovations in five villages	Most of the innovations of KVK are related to production aspects. KVK has started working extensively by demonstrating innovations related to reducing post-harvest losses with this partner.

Private-1 Paradeep Phosphates Ltd	Soil health cards (SHCs) using CRS funds	Achieve the target of providing SHCs	Financial support for providing SHCs	3000 soil health cards prepared and distributed; Support for a few farmer scientist interactions on soil fertility management	Realised the expertise of private sector; Tapping into Corporate Social Responsibility funds
Private-2 IFFCO	Product testing and upscaling	On-farm testing and joint demonstration of IFFCO products	Financial support	Seven products tested and reports provided; Introduced IFFCO products through cluster demonstration initiatives of KVK	Tapping both expertise and importance of KVK as a certifying agency
Private-3 Krishi Jagran (KJ) Media group	Using print media (monthly magazine for extending outreach)	Joint decision on content for Odia KJ farm magazine and digital platform of KJ Odia	Agreed that KVK should have two articles in all issues of the magazine (monthly). KVK suggests innovations, and technology assessed and demonstrated for KJ Odia for each issue. Joint content creation	Contents for Odia KJ since eight months (and continuing). Increased visibility for KVK-Khordha in Odisha, even though it is just a district level organisation	Realising the power of print media
Private-4 Reliance Foundation	Extending outreach through media	Sharing expertise	Investing in events	Organised eight video and audio conferences for farmers at out of rangeplaces	Reaching unreached farmers using media tools



Impact of convergence on the KVK's mandatory activities

1. A KVK that used to work on technology assessment with 22 technologies each year before convergence has now grown to include 40 as there has been demand from partners to assess technology for adaptive trials and to provide results for scaling up.
2. In most instances, before convergence 'fordism'¹ prevailed; but after convergence, most of the interventions were need-based as the KVK was contacted by partners to decipher their problems by sharing expertise and resources. Understandably, the KVK took on a new role in extension delivery.
3. Through partnerships the number of trainings organized increased from 73 to 110 every year, benefitting more than 5000 farmers. The core competencies of the KVKs shifted from – relevant technology assessment to scanning the need for technological interventions, to simple delivery of package of practices through demonstration – towards farming system models. The KVK's investment per training increased from INR 5000 to INR 45,000 and then to INR 1,20,000 as the shift moved from short-term to long-term.
4. During 2005-2010, the number of beneficiaries was 6000/year; and since 2012-2017 after

implementing this approach, it has grown to 12,000/year, for which a number of partners are responsible.

The coverage of the KVK has expanded considerably to all the blocks whereas before convergence the reach was only to five out of 10 blocks in the district.

Convergence: Before and After

Enhancement in outreach was the key outcome of this convergence as it was visualized shrewdly by the KVK. Nonetheless, with this key outcome many other advantages were also observed over a period of time. The reason to keep enhanced outreach as the key for partnership was the recognition that the KVK had poor visibility, had fewer interactions, was secluded, and also had many other problems. This was the state of affairs despite possessing capabilities higher than other extension organizations in the district.

It is an accepted fact that before convergence, the KVK was an isolated institution with minimal reach and had to achieve the set targets with available resources and manpower.

As a result of convergence, improvements arising from expertise, use of different multiple extension methods, use of innovative approaches in demonstrations, transformations in training pattern and other activities, were observed (see Table 2).



¹The so-called 'Fordism' (Chambers 1992) is a central hindrance to reform, since farmers will not make demands, and extension service providers will not consider locally perceived needs if both assume that extension only deals with fixed packages.

Table 2: Measures of convergence output of KVK-Khordha

Functions	KVK before convergence	KVK after convergence
Convergence with other institutions (No.)	1	21
Technology assessment/year (No.)	21	40
Interaction with research system	Prevailed	Strengthened
Involvement of scientists and academicians in KVK activities	Prevailed	Increased
Coverage of technology demonstration	Low outreach	High
Approaches in demonstration	Traditional	Cluster and block demonstrations
Expertise	Involved in basic demonstration of improved practices of crops, fruits, vegetables	Enterprise development
Trainings/year	73	110
Typology of training	Short duration (1-2 days)	Long-term (5-30 days)
Core competency expedited	Package of practices in lecture mode	Skill acquisition
Extension methods in training	Predominantly lectures	Multiple extension methods
Investment in training on one unit (INR)	5,000	45,000 to 1,20,000
Farm and rural advisory services in terms of beneficiaries (No.)	2000-2500	12000
Advisory delivery methods	Farm and home visits and all other traditional methods	Mobile, Short Message Service (SMS), WhatsApp and other ICT tools, audio and video conferencing
Interaction with other extension agencies	Prevailed	Increased
Participation in meetings	Low	High
Institutional investment on extension/year (INR)	70-80 lakhs	100-120 lakhs
Outreach and capacity of rural poor as service users	6000 farmers	12,000 farmers
Extension activities	Traces	50 events/year
Involvement with private sector	Traces	10-12 private sector and Corporate Social Responsibility funds are invested in KVK
Coverage	5 blocks of the district	All 10 blocks of the district
Green services	Traces	Increased to a considerable extent
Fordism	Prevailed	Changed
Trust and cooperation	As usual in business	Unusual (heightened)
Prominence in the pluralistic extension system	Existed	Enhanced
Demonstration units	2	12

New Extension Roles

The increased funds and involvement of more partners in demonstration of improved practices had greater impact – by involving additional farmers, adopting practices uniformly, introducing farm-mechanization, and putting into place a strong monitoring and evaluation system.

In most of the instances before convergence, Fordism prevailed and after convergence, most of the interventions were need-based as the KVK was approached by partners to decipher their problems by sharing expertise and resources. Understandably, the KVK took on a new role in extension delivery which is presented in Table 3.

Table 3: New roles of extension upon convergence

Strategic questions	Expected new roles required	Perception of KVK's new role in extension delivery after envisaging convergence
How to win trust and cooperate with partners having similar mandates?	Developing a commitment to actively explore ways to work together with small-scale farmers and rural producers	Prevalence of a commitment towards exploring possible ways to serve farmers involving multiple stakeholders; Due to involvement of partners, the KVK could identify the needy farmers that it has to work with.
How to target and achieve equity?	New approaches to overcome the elite, high-external input, and gender biases which have affected extension	Shift from traditional capacity building initiatives to skill development, towards eliminating high external-input agriculture to low external-input sustainable agriculture; New approaches, like cluster demonstration and training master farmers, were envisaged.
What is the mode of integration for better outputs?	Efforts to be focused on a realistic set of service components related to information and communication about agricultural technologies, keeping farmers' needs in a complex environment	Majority of the works have been demand-driven focussing on agricultural technologies that are relevant to the operating environment of the farmer; Partners sought help of KVK as they needed to partner for sharing resources and expertise.
How effectively can an extension agency like KVK use extension pluralism?	Enhancing the effectiveness of one agency to work strategically within a multitude of organizations and individuals that provide information and other services to farmers	Clearly brought multiple stakeholders into the fold to jointly deliver information, knowledge, and skill for boosting farmer and institutional capacity; Enhanced outreach was possible due to convergence.
What is the view from the field, i.e., from end users, of the KVK?	Objectives and approaches focusing on poor farmers be operationalized by extension agents in their day-to-day tasks	Sharing of resources, expertise and other aspects of each partner made KVK look closely into the field and carry out day-to-day tasks.

The shift has been from target crops to people through all these initiatives, as the KVK has responded to farmers' needs rather than to partners' needs. The whole convergence experience of the KVK deduced that rural development is complex; and demands that farmers, their neighbours, input salesmen, local officials, and other actors meet and negotiate to arrive at joint decisions for addressing complex problems of natural resource management (as

observed by Christoplos 1996). There is very little empirical research on the Agricultural Innovation System (AIS) and on how partnerships are formed, and how they affect extension service provision within AIS (Ragassa et al. 2016). Our experience fills this shortcoming to some extent.

Lessons

Firstly, the key to the success of this initiative of institutional convergence has been the mutual

understanding between a KVK and its partners, which has been complementary in terms of sharing resources and expertise. Both the KVK and partners have been in synergy due to the clear understanding of their respective strengths and weaknesses within a pluralistic extension system. It is worth researching whether partnerships are externally induced or self-induced, and why a partner demanded to partner? Questions may arise several times on why an extension services providing agency needs another partner. Given these arguments, it also means that similar extension organizations in a region should work with strong linkage mechanisms, and the government needs to be proactive in inducing partnerships.

Secondly, given the experience of this initiative it is evident that restrictively-funded public extension services providing organizations with rich diversified knowledge and expertise, can perform better with the help of partners for convergence of ideas, resources, and expertise. Their ability to drive agricultural development should also be beyond reproach. It is also evident that partnerships will continue only as long as

mutual benefits exist, and withdrawal is common when goals diverge. It must be inferred that partners can continue only through continuous dialogue and interactions, especially when new targets and innovations are to be delivered. In the present context of climate change and its impact, most of the agricultural extension agencies need to collaborate as pooled expertise is vital for providing appropriate solutions to farmers. Development projects/programmes should be forced to have dedicated partnerships in order to reach end-users effectively, and also to disseminate its many benefits to a larger audience.

Way Forward

In the increasingly pluralistic extension landscape, partnerships are going to be the key to design and delivery of effective and efficient extension. Frameworks such as Best Practice to Best Fit (Birner 2006), Extension-Plus and Agricultural Innovation Systems (AIS), too emphasize this. Extension professionals need to learn how to fit themselves into the existing AIS, rather than wait for policy directions from the top – if they want to remain relevant in these changing times.

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CONVERGENCE FOR SYNERGISTIC EFFECT IN DAIRY DEVELOPMENT

Convergence of different entities working for synergistic effect in dairy development is the need of the hour. VB Dixit, Hema Tripathi, A Duhan and IJ Singh share their thoughts in this regard.

There is an increasing demand among the farmers for knowledge on improved dairy technologies. However, due to lack of convergence among the different agencies involved in dairy promotion, these needs are not sufficiently met. The public extension system has failed to respond to the demands for knowledge support as it doesn't have adequate human and financial resources. Moreover, its bureaucratic nature of functioning and the huge load of administrative responsibilities on its field level workers have rendered the public extension services supply driven rather than demand driven. Without convergence of efforts by the varied public, private and NGO agencies involved in dairy development, we would fail to reach a large number of dairy farmers with the new and improved knowledge of dairying.

What is Convergence?

The word convergence has been derived from Latin word '*convergere*' which means to incline together. According to advanced learner's dictionary, convergence suggests that when people get along with each other for long enough, their acts, thinking and even appearance will become alike. Thus, convergence is mainly sharing of ideas, resources, manpower, knowledge and experiences of different entities which have different backgrounds for a common purpose i.e. dairy development resulting into synergistic effects of their combined efforts for ultimately enhancing the income of farmers.

Why Convergence?

Systems and institutions co-exist addressing the needs of farming community so as to derive synergistic advantages of both. There are pluralistic extension organizations working in the state. A lot of manpower is being utilized in this process. There is duplication of efforts with multiplicity of agents in extension work without convergence or coordination, resulting in loss of efficiency. In order to reduce the redundancy, repetition and better utilization of scarce resources, convergence and better linkage is required in Public Private Partnership mode.

Public organizations are strong in backward linkage. Private organizations are strong in forward linkage and NGOs are strong in social engineering and mobilization. Each and every organization has comparative advantages over the other. Single development agency may have limitations of resources. That is why convergence is needed: a clear strategy for a planned multi-stakeholder involvement with mandated activities as per the expertise, to supplement and complement the efforts and to ensure

effective involvement of community partnerships (Mukherjee and Maity, 2015).

Convergence in Dairy Sector

The state department of animal husbandry (SDAH) is implementing several dairy development programmes by expending huge resources in order to enhance the income of the dairy farmers. In addition, other organisations like, the Department of Dairy Development, the National Dairy Development Board (NDDDB), dairy cooperatives, agricultural and veterinary universities, ICAR institutions, financial institutions, input companies and NGOs are also working with dairy farmers. But most of these agencies are working in isolation and the adoption of improved

breeding, feeding and management by farmers is limited.

In the case of research, institutions such as CIRB, NDRI and LUVAS are converging with each other through network projects, NAIP projects and also on few occasions like animal husbandry officers' workshops and meetings for technology reviews.

In these cases, there is sharing of knowledge, manpower, resources, experiences, etc. However, there is not enough convergence between the research system with others such as field functionaries, input agencies/organisations and NGOs. Lack of such convergence is clearly visible in Haryana (Box 1).

Box 1: Low dairy productivity in Haryana

As per the livestock census 2012, in Haryana population of buffaloes and cattle was 6.08 millions and 1.8 millions respectively, while in Punjab buffaloes were 5159.33 thousand and cattle were 2427.71 thousands. In Punjab and Haryana, which are the leaders in animal husbandry, the average milk production in 2012-13 was 1500-2500 kilogram per animal in the entire lactation. Milk production in Punjab and Haryana was 9724.34 thousand tones and about 7040.2 thousand tones, respectively in 2012-13. Per capita availability of milk in Punjab is 961 grams/day (higher in comparison to Haryana's 767 grams/day). Thus, the state is lagging behind in milk production from Punjab in spite of having very good dairy husbandry conditions and breeding tracts for recognised breeds of cow and buffalo. Therefore, all the organizations related to dairy development must converge to increase milk productivity, production and income of farmers. However, mere convergence does not suffice the purpose unless all the agencies move in a synergistic manner i.e., complement and supplement efforts and energy of these agencies and simultaneously avoid duplication and conflict of interest of efforts.

Enhancing Convergence among Research Institutions

At present, NDRI and LUVAS organize animal husbandry officers' workshop annually but separately. It would be better if these institutions jointly organize these workshops with other research institutes. They may also try to address the problems of farmers through workshops and campaigns building on the strengths of each organisation. NDRI is equipped with information on dairy farming, while LUVAS has been known to respond better to the health related queries of the animal husbandry officers and CIRB is better equipped to deal with information pertaining to buffaloes.

Similarly, all the research institutions like NDRI, CIRB and LUVAS prepare area-specific mineral mixture. The mixture should be collectively analysed through a joint working group to make pertinent recommendations to the dairy farmers. Thus, all the institutions should jointly organize technology review meetings to avoid duplication and devise best possible methods to cater to the needs of the farmers.

For enhancing convergence, it is extremely

important that all the institutions and organizations working for dairy development are aware of their respective roles and functions. For example, to prepare literature on the prevention and treatment of mastitis in buffaloes, CIRB being the exclusive institution for buffaloes can develop the technical content. The field veterinary officers of the State Department of Animal Husbandry (SDAH) can customize the text by introducing appropriate words in local language. SDAH and Milk cooperatives may be involved in printing the required number of folders/ pamphlets for distribution to dairy farmers. Milk cooperatives need to play an important role in the supply of inputs required for clean milk production. SDAH needs to step up their role in diagnosing and treating cows and buffaloes for mastitis. By collectively addressing this issue as suggested above, the cost of addressing the mastitis problem could be reduced and more cattle could be protected from this disease.

Similarly, *Kisan melas* (farmer fairs) should be jointly organized by different institutions by pooling together their resources, knowledge, expertise and experience. At present, NDRI, CIRB and LUVAS organize *melas* separately. For its publicity and funding assistance of input agencies/

organisations and banks should be sought. Cooperatives at village level should be utilized to mobilize dairy farmers to visit the *melas*. In this way, such an event would have wider coverage. It would also be worthwhile to develop a joint annual training programme schedule by all the concerned institutions like CIRB, NDRI, LUVAS etc.

While developing such a training schedule, care should be taken in identifying relevant topics and matching these with appropriate institutions to impart training to the farmers. For example, CIRB should focus on improved animal/buffalo husbandry, NDRI on dairy processing and entrepreneurship while LUVAS on health aspects so that their efforts are complemented. Areas of trainings should be determined on the basis of training needs of the farmers.

Convergence among all Stakeholders

In Haryana, there are different stakeholders responsible for generating improved technologies through research. This new technology related to animal husbandry is passed on to the members of information dissemination system. The farmers are

supposed to utilize this knowledge as suggested by animal scientists. The administrators and planners of different institutions like university, ICAR institutes and SDAH are responsible for framing the policies, guidelines etc. The dairy personnel are responsible for milk procurement through milk cooperatives and value addition. The input agencies/organisations are vital for supply of feeds, medicines etc. Thus, all the agencies/organisations of dairy sector are engaged in performing one or the other essential tasks. Hence, it is imperative for these agencies/organisations to seek each other's expertise for the betterment of farmers. Therefore, they need to understand and appreciate each other's roles and functions so that planning, implementation and evaluation of dairy development programmes can be effectively carried out.

Convergence among different stakeholders of dairy development may be enhanced initially by constituting committees at different levels (state, district and block). The details of such committees is discussed and presented in the following Box 2.

Box 2: Committees at different levels to promote convergence

State level Apex Animal Husbandry Development Committee

An apex level animal husbandry development committee should be constituted at the state under the chairmanship of Animal Husbandry Commissioner. The Vice-Chancellors of Agricultural and Veterinary Universities, Directors of ICAR institutes, related to Animal Husbandry, Managing Directors of Dairy Development Federations, Directors of Animal Husbandry and Dairying Departments and 4-5 progressive dairy farmers, Representatives from the private inputs companies and NGOs involved in dairy development should be the members of this committee. This committee should be responsible for major policy and overall plan formulation for dairy development of the state. It should act as a technical body to guide the government on matters related to animal husbandry and dairy development. Its meetings should be organized at least twice a year. It would, thus, ensure a regular interaction of administrators, scientists, input agencies, farmers etc.

Dairy and Animal Husbandry Research Committee

This committee is proposed to coordinate extension and research activities of various research organizations operating in Haryana. This state level committee should have Directors and some senior scientists of ICAR institutions related to animal husbandry/dairy in the state. It should have Director of Research, Director of Extension, Dean of College of Animal sciences and Veterinary Sciences as members and Vice-chancellor of the state veterinary university as its chairman. Its main objective should be to coordinate the research and extension programmes of these organizations.

District level Committee

The district level committee should be constituted under the chairmanship of Deputy Commissioner/Additional Deputy Commissioner. It should have members from all the related organisations at the district level like Project Director (PD), ATMA, Programme Coordinator (PC) of KVK, district dairy officials, Deputy Director Animal Husbandry, representatives of input agencies and some progressive dairy farmers of the district. Major activities for animal husbandry and dairy development in the district should be planned by this committee. Problem identification, preparation of action plans, regular appraisal of Animal Husbandry development programmes/activities in the district should also be its responsibility. The committee should define the role and responsibility of each department in formulating and implementing the dairy extension activities. It should meet quarterly for closer engagement with planning, implementation and evaluation of programmes at district level.

Block Level Committees

These should be formulated under the chairmanship of veterinarians, dairy personnel, and representative dairy farmers within the blocks. The committee should discuss and prepare the plan of action of various extension activities and programmes of dairy development in the sub-division. It should also review the progress and ensure coordination among different agencies. It should meet at least once in every two months.



Way Forward

In this blog, an attempt is made to identify several areas for convergence amongst different agencies/ organizations working for dairy development. Lack

of a common platform to discuss convergence options among these different agencies is a major challenge. We hope the proposed committees to be constituted at different levels will pave the way for better convergence in the dairy sector.

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INTERNALISING NOBLESSE OBLIGE IN EXTENSION SYSTEM TO PROMOTE EXCELLENCE

Capacity Development is yet to receive the priority it deserves among organisations involved in agricultural development, including those engaged in extension and advisory provision. To address this issue, Suresh Kumar suggests the need for internalising *noblesse oblige* among all those involved in training extensionists, and also those engaged in extension delivery.

The Committee on Doubling Farmer Income (MoA&FW 2017) has proposed various measures in its report (Volume XI), for improving capacity of the extension system for doubling the income of farmers by 2022-23. Capacity development is a complex issue. FAO's corporate strategy on Capacity Development (2012) provides a useful framework for approaching capacity development, and this is equally relevant for capacity development in Extension and Advisory Services (EAS). The FAO framework talks about functional and technical capacities across three levels: individuals, organizations, and enabling environment. Capacities at these three levels are interlinked: individuals, organizations and the enabling environment are parts of a whole.

Capacity development often involves enhancing the knowledge and skills of individuals, the effects of whose work greatly impact the performance of the organizations in which they work. The effectiveness of organizations is influenced by the enabling environment. Conversely, the environment is affected by organizations and the correlations between them.

Every chain, and every component of every chain, needs to be developed synchronously. Even for individuals, capacity is competency plus; and these needs of each individual has to be addressed. Having undergone training need not necessarily mean one has been trained as planned. Training alone need not develop the necessary competence required for the job. The various terms including training, competency, capacity need to be rigorously defined and the concepts developed. The issue is important but it is beyond the scope of the present blog, which only covers one aspect – developing excellence among extension functionaries.

The New Extensionist Position Paper (GFRAS 2012) has elaborated on the different levels of capacities. The AESA (Agricultural Extension in South Asia) Network has conducted Capacity Needs Assessment of Extension Service Providers to identify these capacities at different levels (AESA 2016), and have also brought out a Facilitators Guide on conducting CNA of Extension and Advisory Service Providers (AESA 2016).

Every agriculture extension system, including the Training and Visit (T&V) system of extension and the recent extension reforms, has laid emphasis on training. However, post-recruitment training initiatives have not been as effective as desired due to various lacunae, which need serious consideration. A lot of suggestions have been made by various committees for improving training effectiveness and I do not propose to

repeat the same. However, I want to flag the

concept of 'Noblesse Oblige' (Box 1).

Box 1: Noblesse Oblige?

'Noblesse oblige' is a French phrase literally meaning 'nobility obligates'. It denotes the concept that nobility extends beyond mere entitlements and requires the person who holds such a status to fulfil social responsibilities. It refers to the obligation of honourable, generous, and responsible behaviour from those with high rank or birth.

It means the higher the authority, the greater the obligation to perform; and that higher authorities should gain respect through greater competence rather than from the authority of office. In other words, they should gain authority deriving from 'knowledge' rather than from that of 'office'. I am not going to lay down the entire concept here. Rather, I want to focus on a few ideas that are mentioned here regarding three key stakeholders: academic faculty, trainers, and officials in the extension hierarchy who need to internalise this concept.

Excellence in Academic Faculty to ensure Excellence in Teaching Programs

Post-recruitment training programs can only build upon, and incrementally add to, the competence and knowledge acquired in colleges and universities. Gaps at the stage of college education cannot be fully bridged through post-recruitment training. There are various aspects to improving quality of education. I am only flagging one here – relating to faculty quality and specifically the quality of PhD theses.

Quality of PhD theses

I decided to flag this aspect after reading an article by Dr Gursharan Singh, former Dean of PG Studies at Punjab Agricultural University, Ludhiana, in his article, 'We're down the learning curve' in the Hindustan Times (24 December 2015). He had highlighted various issues contributing to India's global low ranking in academic quality. (Extract given below for ready reference.) The following was mentioned with regard to faculty:

'There is 35-40 % shortage in our institutes of higher education and even up to 90% of budget is spent only on salaries, leaving highly inadequate amount for research. Lack of passion and motivation in bringing competing projects is another impediment in the way of quality research. The faculty conducts only student based research. Further the research done by the students is also not properly planned or monitored and it often lacks international or industrial collaboration. The dismal state of research in higher education in our country can be gauged from the fact that PHD dissertations are sold. It is pointless to expect

quality research from someone who has been awarded the doctorate degree undeservedly ignoring the merit of the work undertaken. It is a pity that roping in examiners to sign the required papers in the matter of evaluating these thesis/ dissertations has become a routine affair. Almost everyone will get the degree one has applied for sooner or later. What is the rejection rate of our theses/dissertations? Probably even less than 1%; there may be institutions where these has never been rejected. On the contrary in US universities, even under highly favourable conditions only three quarters of PhD students complete their work. This warrants careful introspection. Above all this, we are also unable to produce the desired number of researchers and thus fall even non-quantitative terms. China is now producing 22,000 PhD holders annually as against 8,000 by India.' (Singh, 2015)

Faculty excellence

Faculty excellence is critical as it determines the level of competence down the line among students who then go on to constitute the field formations of extension and research in both public and private sectors. The whole exercise must start with reforming the system of evaluating PhD thesis. This can improve the quality of teaching and research, as well as the rigour of the system. Faculty who have done rigorous research for their theses will also go on to ensure and enforce rigour in the working of the organisation.

I am not fully aware of the system being followed by various academic institutions for awarding PhD thesis, nor am I competent to prescribe a system. There is need to prescribe internationally-established criteria. There is need to switch over to the system of open defence of the thesis which can be uploaded on the website and then defended in an open session. This is only a broad suggestion which needs to be worked upon.

A linked issue is that of assessment of publication which is a criterion for promotion in academic institutions. Here again the best international norms for peer review need to be followed. A system of uploading the article on a website for observations and queries is one aspect. This should be applicable to staff of academic institutions also.

- The open defence system is key to excellence in both academic and research arenas. A suitable system for open defence can be developed. I recently attended the 1st International Extension Conference 2018, wherein every presentation was broadcast live and questions were invited in real time and received to be answered by respective presenters. It is a commendable initiative in organising workshops and has some features of open defence. The subject, however, requires full separate treatment.

Excellence of the Trainers and Training Institutions

As in the case of excellence in education for ensuring excellence at pre-recruitment stage, there is need to ensure excellence in trainers and training institutions. Unless the trainers are really good and have something worthwhile to offer to the trainees, and the trainees themselves feel they can gain by attending the programs, training will not build capacity of the trainees. While a large number of private training programs are avidly sought after, with participants even ready to pay hefty fees for these, government in contrast has to often force trainees to attend free programs and training institutions have to cajole them into attending. Often the appeal of visiting new places or getting away from routine office work is attraction enough for trainers to attend. Often, extension functionaries do not fight for a place in training programs because they do not feel the same shall be useful to them. Issue of improving the capacity of the training institutions and trainers need to be addressed on a high-priority basis, and an institutional mechanism for the same needs to be put in place.

The above requires a 3-phased approach among others, namely:

- Provide intensive training to trainers first and ensure they are fit to train and can add value to the training programs. Trainers should be tested for the competency they should have acquired.
- The training institutions should conduct action research in the field. This should be made mandatory for every trainer. These action research projects should be adopted for training. Action research can improve the understanding of trainers.
- A system of accreditation for trainers and training institutions should be developed and put into place. This was also recommended by the 12th Plan Working Group on Agriculture Extension.

The 12th Plan Working Group on Agricultural Extension noted that “to infuse professionalism in ‘HRD and Training’ the existing and emerging training institutions need to be accredited by following standard accreditation procedures”. The Draft Training Policy 2010 stipulates such accreditation for all the training institutions, trainers and consultants. Accreditation should be made mandatory so as to enhance the effectiveness and accountability of training institutions. Appropriate accreditation protocols, procedures and institutionalization in collaboration with other institutions will have to be evolved by MANAGE in consultation with other relevant institutions. To encourage compliance with mandatory accreditation, government funding and other incentives may be restricted to accredited HRD& Training Institutions only.

Towards Excellence in the Extension Hierarchy: Way Forward

Senior cadres in the departments, helping farmers and supervising extension workers, need to be more competent than those being supervised by them. The 12th Plan Working Group on Agriculture noted that lack of knowledge, often being the reason for lack of transfer of knowledge and principle of *noblesse oblige*, should be made applicable across the sector. The farms of research stations, agriculture colleges and institutions, KVKs, and state farms should be developed as centres of excellence so as to become role models for farmers. It needs to be ensured that every extension staff, including supervisory and administrative level officials, possesses superior competency, skills and knowledge.

It requires a comprehensive strategy, which could be comprised of five elements as mentioned below.

Development of a competency framework:

Competency cannot be developed unless the competencies are defined, and a methodology for their assessment developed. Therefore a competency framework needs to be developed for every category of functionaries, for both extension and research as well as for other services. The framework also forms the basis for training needs assessment, which would be the difference between the competencies needed and those possessed. Competencies need to be relevant to the job profile.

Annual competency assessment at the individual level:

This annual exercise should be on the lines of firing practice comparable to that in the armed forces. Every extension functionary should be assessed with respect to the

competencies prescribed for the post. They should be able to achieve a minimum level of proficiency. This competency gap shall also indicate the need for training.

Field orientation: It needs to be ensured that an extension functionary is able to perform the farm operations better than the farmers being advised by them in order to ensure that their advice is relevant, and that they are getting a feel of the problems farmers face.

Strengthening technical and functional capacities: Senior extension functionaries should be able to directly conduct or supervise a demonstration. DFI Committee has recommended demonstrations in the fields of progressive farmers (MoA&FW 2017). Moreover, every farm's management by the department or university, at every level from state to block, should be developed as models of best farming practices, and then used for training. Their performance has

to be top of the line. Extension functionaries at various levels should demonstrate their capacity by developing these farms. Every officer should be personally responsible for this development, apart from supervising the work of juniors.

Quantification of capacity development: Planning scientific capacity building requires quantification of capacity across the line –from the lowest to the highest. Every extension functionary's capacity needs to be assessed annually with respect to the requirement of the job, quantitatively, which shall indicate the training need gap for the specific functionary. After studying the capacity of the functionaries in the organizational unit, the capacity of the various organizational units, such as block, district, state and the country as a whole, should be quantified. This shall indicate to authorities the extent of the challenge as well as the progress made in the same. It shall also expose the capacity of every organization in the country.

The image displays three documents related to extension services. On the left is a poster titled "New Extensionist: Roles, Strategies, and Capacities Strengthen Extension and Advisory Services" from the Forum for Rural Advisory Services, October 2012. It features a graphic of a head profile filled with icons representing various agricultural and extension activities. In the center is a "Policy Brief" titled "Capacity Needs of Extension and Advisory Services (EAS) in South Asia" published by AESA (Asian Extension Services Association) in 2010. It includes sections on "Introduction" and "Capacity Needs Assessment of EAS". On the right is another "Policy Brief" titled "ASSESSING CAPACITY NEEDS OF EXTENSION AND ADVISORY SERVICES: A Guide for Facilitators" published by AESA and CRISP. It includes a photograph of a group of people in a meeting or training session.

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EXTENSIONPEDIA: A MECHANISM FOR IMPROVING THE EFFICIENCY AND EFFECTIVENESS OF NATIONAL EXTENSION DISCOURSE

In this blog, Suresh Kumar elaborates the idea and suggests the importance of having an “Extensionpedia” to guide the extension discourse in more useful and policy relevant ways.

Extension discourse occurs in the entire extension ecosystem (Box 1) formally through policy documents, seminars and workshops, articles, research papers, extension and research advice, representations, reports, media coverage and publications. Many of these are well documented.

Far more important is the informal discourse that occurs in real time in every farm and village between farmers, farm labour and farm service providers; conversations in every farm house between farm family and friends and relatives; discussions between field functionaries during formal visits, meetings and general discussions; informal and casual discussions between experts, policy makers and practitioners; and interactions between students and teachers after the class room.

Box 1: Extension Ecosystem or Extension Parivar

It includes farmers, farm labour, farm service providers, field functionaries and marketing functionaries directly supporting farming, experts and scientists, policy and opinion makers and administrators, vast network of trade and industry including those providing input, marketing and logistical support, the vast education and training network including teachers, trainers and students. There is a large print and electronic media focussing on farm sector in the country. The vast panchayati raj network is also directly involved in farm production as is the large cooperative and other financing institutions. Educational institutions are also taking active interest in farm development as are various business groups.

However, the effectiveness and efficiency of extension discourse is not commensurate with the efforts made, resources deployed and the very high degree of intellectual input that goes into the discourse. Very low outcome of the discourse is perhaps the biggest waste of national resources which is still not being recognised with focus largely on physical loss of agriculture produce. The limited outcome is due to various reasons.

Firstly, the informal discourse, though most important, is not formalised and is not documented. It is only available to the narrow group involved directly in these discourses. Secondly, the formal discourse is most often too diffused and unfocussed and this too does not directly get into the policy making process due to lack of a system to formalise and internalise the same.

I had urged to start the process of influencing the 13th Five Year Plan (2017-2022) now, in my earlier blog (<http://www.aesanetwork.org/it-is-time-to->

influence-the-13th-plan/) as it requires time to formulate issues; capture the concerns, aspirations and knowledge of all stakeholders of the extension ecosystem at all levels; and collate and present the same for consideration of the concerned sub groups and working groups of the planning commission.

Extensionpedia

To help do this, I suggest setting up an

“Extensionpedia” (building upon and adapting the methodology of Wikipedia). This is important for capturing the knowledge, concerns and practices in the discourse in extension ecosystem comprising entire range of stakeholders including policy makers, practitioners, experts, service providers, industry, farmers etc. Both formal and informal discourse, explicit as well as tacit, needs to be captured. Moreover, diffused discourse needs to be collated in an actionable form.

Box 2: Extensionpedia

“Extensionpedia” is a mechanism for capturing and collating the discourse on extension happening among wide range of stakeholders in different locations and fora mainly for internalising the same for consideration in policy, implementation and review. Concepts, methodology and systems for the same will need to be evolved. As a first step, an anchored theme paper may be prepared for each theme or area of interest and uploaded on a web platform to be developed/commented/edited by different stakeholders. This paper could be further revised based on new comments and inputs.

Why “Extensionpedia”?

“Extensionpedia” is important for the following reason:

- While formulating the report of 12th Five Year Plan Working Group on agriculture extension, it was felt that the Working Group and sub-groups did not have enough time to collect and collate data and provide opportunity to every stakeholder to give their views. The Working Group also could not consider all recommendations made in various forums, get them discussed extensively and then take a considered view well in time for inclusion in the report. Inability to interact widely with field level stakeholders to get a feel of their concerns and to get benefitted from their knowledge was also profoundly realized.
- Workshops, seminars and conferences in most cases have become an end in itself with no mechanisms (time or resources) for ensuring follow-up of the recommendation. Reports of commissions, working groups and expert groups also have the same fate. Detailing is often not done about how these should be implemented within the existing frame work and how much resources are required to act on these recommendations.
- Research studies often end up producing academic publications that are of little policy relevance. Many of them make similar and repetitive recommendations and there is no system to collate the voluminous output. It is not possible for the decision makers to consider the exceptionally large number of suggestions and recommendations available in individual documents.

There are a large number of activities which lose out on the benefit of co-development due to lack of a suitable mechanism. These include research recommendations, extension education course materials and extension training materials.

Operationalising “Extensionpedia”

“Extensionpedia” needs to be anchored in a national organisations and I suggest MANAGE (National Institute of Agricultural Extension Management) as a natural choice (www.manage.gov.in). I hope the following suggestions would be helpful in operationalising extensionpedia:

1. After wide consultations, various themes and sub-themes of the extension eco system may be firmed up by MANAGE or the anchor organisation. A directory of themes and sub-themes may be prepared giving unique number to each theme/sub-theme. The various themes selected for MANAGE Centres (Agricultural Extension Policy, Reforms and Processes; Agri-Institution Capacity Building; Agricultural Markets, Supply Chain Management and Extension Projects; Allied Extension and Water/Input use Efficiency; Knowledge Management, ICT and Mass Media; Agripreneurship, Youth and PPP; Women and Household Food and Nutritional Security, Urban Agriculture and Edible Greening; Agrarian Studies, Disadvantaged Areas, NRM Extension and Social Mobilization; and Agri-Business Management) could be the themes for the zero draft for this purpose.
2. The 12th Five Year Plan Working Group Report on Agricultural Extension, already hosted on the Planning Commission website (<http://planningcommission.nic.in/>) may be uploaded

by MANAGE and other extension organisations on their respective portals. Multilingual reports of the sub-groups, after uploading onto the planning commission website, may also be hosted on the above mentioned websites. These reports shall constitute the base document for extension policy planning.

3. For each theme and sub-theme, a base anchor paper may be prepared based upon the sub-group and working group reports which shall be the zero draft. The thematic anchor paper may be posted on website for collaborative development.
4. Every policy suggestion concerning a theme/sub-theme may be made through track change mode on the anchor paper which shall provide facility of link to every suggestion made on the lines of wikipedia and other projects. This will ensure that all policy recommendations are made and could be discussed on one anchor paper. This will also provide continuity in thinking; allow formation of consensus on various issues and further ensure that all suggestions are available at one place for the next sub-group and working group. It also ensures that no additional time is spent on making suggestions already made.
5. Communities of Practice (CoPs) may be constituted for various thematic areas and sub-themes as required. (Communities of practice are groups of people or practitioners who share a concern or a passion for something

they do and learn how to do it better as they interact regularly through joint activities and discussions).

6. A Directory of track change options may be prepared with unique number to each option. Each option may be allotted to each CoP and other contributors.
7. Subsequent versions may be released annually as Version 1, Version 2, Version 3, Version 4 and so on after detailed comments from CoPs and a theme wise national consultation by concerned MANAGE Centre. Version may be distinguished by the year. For instance, one could use Version 2014, Version 2015, Version 2016, etc. Version before the constitution of working group may be termed as zero draft for the 13th Plan. Next working group may base its recommendations on this version which shall provide it the entire information about views of every stakeholder and status of its functioning. The Group could therefore, spend its time on consultations and working recommendations instead of collecting data and ascertaining views and opinions.
8. The anchor paper, as per latest revision, could be the base consultation paper for every workshop and seminar. Papers to be presented in extension workshops and seminars should take into consideration this anchor paper and the policy recommendations of the workshop should again be made with reference to the anchor paper.



9. On the lines of thematic anchor papers, scheme wise "Current Scheme Status" may be created for each scheme on lines of the theme paper. The current scheme status document may also include every development, instructions issued, progress made, observations, difficulties experienced and suggestions during the plan period. Document will need to be structured to capture data about progress made, field problems in various states especially those articulated by ATMA (Agricultural Technology Management Agency) and BTTs (Block Technology Teams). Each unit should record their progress and observations on this document. This shall ensure that everything about a scheme shall be available in one document rather than going through a large number of files and progress reports.
10. Technology Directory has been already recommended to be constructed to incorporate information about technical recommendations made, status of their adoption and impact. The Directory may be uploaded on the "extensionpedia" platform. Opportunities could be provided for everyone to give their feedback on the recommended technologies for further action.
11. Research Articles and technical papers may be uploaded on the portal. Every research project and technical paper should make the changes on the relevant place of the theme paper so that the same is captured real time. Mention about this needs to be made in the research paper.
12. The teaching and training material could be uploaded on the "extensionpedia" platform and co developed.
13. Compilation of an Extension Manual has been recommended by the working group on agriculture extension. The manual is to encompass best practices for various extension methods. This could be also uploaded on the portal and a revised version released annually.

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REDEEMING THE PUBLIC EXTENSION SYSTEM: CAN RURAL DEMOCRATIZATION OFFER PLAUSIBLE ALTERNATIVES?

Even while critical debates on the relevance of public extension systems are on- with propositions that argue for more privatized extension services dominating the scene- the significance of public extension systems is only increasing. Rather, it has assumed more relevance as available 'alternatives' fail to proactively address the concerns of the farming community. Needless to state, the overriding alternatives are all about linking the production system with markets, entering value chains and developing competencies for addressing the ever varying market dynamics, argues Jiju P Alex.

Rural Lives and Livelihoods

Rural life and access to livelihoods are fraught with several problems about which the communities do not have any sway. Thinking of ways to ensure sustainable rural livelihoods warrants recognizing the vulnerability of rural communities. Worldwide, inflation, falling prices of produces and lack of access to inputs and credit make rural lives more difficult. Falling rates of employment generation in villages and tendency of governments to step back from key sectors have also added to their woes. Market, which is pointed out as an alternative, is indeed a reality that can impact lives. But it requires careful fostering of those who are new to its dynamics and vagaries.

Hence, the focus of intervention should be to enhance livelihood security and sustainability by scaling up institutional mechanisms that can help reduce the vulnerability of communities. In fact, the capability to thrive- something that we frequently talk about rural communities in the emerging contexts- cannot be acquired on their own, unless socially responsive public systems come to their rescue.

This invariably requires a new orientation to extension intervention with emphasis on improvement of service delivery mechanisms and a host of issues ranging from self-reliance to sustainability and empowerment.

Role of the State: Lessons for Agricultural Extension

Agricultural extension in India as well as in other developing economies can draw valuable lessons from this situation. There is a growing body of evidence which suggests that the public sector should earnestly step in more than ever before, as investments in agriculture for the common good have been showing declining trends during the post reform period resulting serious setbacks for the less endowed farmer (Jha, 2007, Mani et al 2011).

It is widely observed that national extension systems in many developing countries have declined over the last couple of decades due to lack of political and financial support, reduced investment, attrition of human resources and physical infrastructure, and lack of clarity on the roles of the public extension institution vis-a- vis other stakeholders and service providers (Rivera, 2011). Governments guided by the provisions of the structural adjustment agenda tend to shirk their responsibility by assigning the interventionist role to multiple actors, private and non-governmental sector included. Though this might have enhanced pluralism of intervention,

social control over the agencies that are given this responsibility has been ignored. The key question is how these moribund systems could be rejuvenated.

Rural Democratization: Making Extension Responsive and Effective

Redeeming public extension systems by functionally linking them with people in a large

way would be an uphill task given the reasons cited above. Rural democratization bolstered by strong linkages with rural institutions and development agencies in the public sector could be a plausible approach to infuse vitality into a declining extension system. It can be made possible through a deep democratization process, which includes devolution of power and resources to the local governments.

Box 1: Is market the only way out?

Enhancing market linkage and improving capability to respond to the likes and dislikes of market would sound reasonable to anyone who explores ways of salvaging the desperate small producer. However, the notion that livelihood options of small and marginal farmers would improve by simply linking them with market has not yet yielded convincing results in most such cases. This is because of the fact that quite often, in market linked interventions, small farmers are not properly and adequately facilitated to take on the emerging challenges. It is also accompanied by proposals for reducing the role of public sector in many ways. Sometimes the situation gets compounded by restricted support from the government, implying drastic cuts in incentives and subsidies. In policy environments that consider governmental support as unproductive welfarism (Davidson and Ahmad, 2003, Mathews 1997), survival of the small producers become nearly impossible.

Recent global experiences show that such approaches to development falls severely short of a critical look at the current socio economic, political and environmental trends that have pushed a large number of people to the margins of the development sphere. Economists have attributed this to the neoliberal economic policies (Stiglitz 2012). It is true that these economic reforms have opened up new avenues that would ideally go beyond even national boundaries.

It might also have expanded markets that would give the producer more opportunities. However, it has also created a situation where survival of communities is becoming increasingly dependent on markets, the trends of which are more or less determined by the preferences of the urban elite.

In fact, there is a growing discontent on the efficacy of markets in resolving livelihood issues. The spiraling economic crisis has posed serious questions about the sanctity of being too much dependent on market. This discontent which has manifested in several parts of the world in the form of open protests against the economic crisis is characterized by three disturbing revelations: markets were not working the way they were supposed to, for they were obviously neither efficient nor stable, and that the political systems are fundamentally unfair (Stiglitz, 2012).

Since neoliberal policies could push even well-endowed communities up against the wall (Steiglitz,2012), there is commendable scope for bringing back a growth model propelled not by market alone, but by the logic of redistributive growth, grounded on the rights of the communities and the collective ownership of their resources and promptly linked to the market.



Box 2: Democratization

Democratization is a highly evolved form of political empowerment, and can enhance participation, transparency and efficiency. But connecting democratization with development requires a whole set of innovative institutions and processes facilitating seven important pre requisites:

1. Enhancement of financial resources to local governments,
2. Participation of stakeholders in deciding development intervention,
3. Generation and management of human resources, social capital and financial resources for being invested in the process,
4. Devolution of fiscal and administrative authority to undertake administrative decisions at the local level on key development issues,
5. Transferring key development agencies to local self governments,
6. Establishing stakes for people's representatives, local resource persons and local organizations in the functioning of development agencies and
7. Responsive and participatory auditing systems to enhance transparency.

Evidences from places where intense rural democratization has been tried out show that it would be possible only if a whole new genre of grassroots level participative structures are put in place. As far as extension is concerned, there are several studies that show that decentralization and devolution of agricultural extension to local governments have failed (Carating et al 2010). Weakening of linkages with research, lack of funds for technical training, varying financial situations of local governments, local political priorities which need not necessarily be aligned with the interests of small farmers and the vulnerable have all affected decentralization of extension almost everywhere.

It is evident that a strong sense of empowerment engendered by vigilant public action is required to make this mechanism functional. People's involvement in all stages of development intervention will have to be ensured mandatorily. In places where decentralization has been able to turn around the approaches to development significantly for longer periods, there were robust administrative reforms and institutional mechanisms for sustaining participation by

linking them with development initiatives at the grassroots level, as explained in Box 2. In any case, an organic vigil instigated by an informed public sphere and bolstered by proactive political groups would keep these changes moving.

How does Rural Democratization work in India?

In India, the Panchayati Raj System which has been strengthened by the 73rd and 74th constitutional amendments during 1995 offered immense scope for reorienting the formal extension system. There are provisions to transfer the responsibility of local agricultural and economic development to the local self-governments. There are also opportunities to formulate participative fora for people's involvement in planning, implementing and monitoring development programmes. The state governments have the freedom to devise their own mechanisms to enable participation in local development initiatives. For instance, Kerala (one of the southern states of India) has successfully implemented democratization in India and it improved the reach and effectiveness of agricultural extension in the state (Box 3).

Box 3: Democratization in Kerala

In Kerala, as part of democratic decentralization, a substantial share of public funds and a host of development agencies have been transferred to the local self-governments. Extension agencies are now being directed to work in unison with local self-government institutions, with considerable accountability of the former to the latter. The possibility of linking rural institutions with the process of planning has enhanced institutional multiplicity and synergy. Larger sections of the farming community have been covered by the extension agency as a direct result of decentralization and convergence of agencies at the grassroots level. This has led to better channelization of resources- fiscal, human and physical- and better targeting of beneficiaries. More significantly, service delivery and project management are being ICT enabled, with unique programmes for e- governance. There had been a spurt of development initiatives born out of local ingenuity, as a result of this new paradigm of growth oriented democratic decentralization.

Deliberating on the scope of decentralization of agricultural extension, Swanson and Rajalahti(2010) observes that decentralisation not only gives local

government control over personnel and finances, but in theory focuses control closer to the level of farmers and thus can improve

extension accountability to their needs. Rural democratization, supported by efficient systems of service delivery and functional linkages can bring about substantial changes in the delivery of extension services. It also leaves adequate room for linking rural enterprises with value chains duly supported by credit and micro finance institutions. Since there is better scope for wider consultation with stakeholders, identification of critical problems and applying precise solutions are also possible. Better management of common resources and productive initiatives by collectives of farmers, farm women and rural entrepreneurs aided by the common wisdom of the community and public funds are yet other possibilities.

However, not everything is well with the new systems. Bureaucracy and local politicking have had their share in setting in the signs of degeneration. Devolution of authority and financial resources may have to be enhanced to take up new challenges. Building capability of the actors at the grassroots level to manage the institutions that have been formulated for facilitating decentralization would be the biggest challenge. The ways of preventing deterioration and improving efficiency also necessitates detailed enquiries about this system. Building up autonomous and sustainable systems would

remain as uphill tasks unless these vulnerabilities are addressed.

Learning from the Praxis of Democratization: Role of Extension Scientists

Extension scientists as development interventionists and social researchers should explore the dynamics of rural democratization in detail. While doing this, we should be able to characterize the policy environment required to revive rural institutions democratically. Innovations in linking grassroots level democratization process with better livelihoods would show the way ahead for effective utilization of rural resources. How efficiently such systems address important concerns like sustainability and ownership of common resources could be of interest to an extension researcher. Evolving a robust system of rural democratization warrants critical social action and a departure from the conventional norms of participation. It is the outcome of a long drawn socio-political process, which would prompt the extension scientists to look at it critically and ideologically. It would be unfair on the part of extension scientists to leave out this important innovation in public administration and service delivery from the realm of their academic interests.

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OPERATIONALIZING FARMERS WELFARE

In August 2015, the Government of India, renamed Ministry of Agriculture as Ministry of Agriculture and Farmers' Welfare (MoA&FW), explicitly recognizing farmers' welfare as the core of agricultural development in India. The Government of India also initiated an ambitious program of doubling farmers' income by 2022-23. Suresh Kumar in this blog suggests two steps to move forward to operationalize the concept of Farmers' Welfare.

Renaming of Ministry of Agriculture as Ministry of Agriculture and Farmers Welfare (MoA&FW) on the 27 August 2015 has expanded the ambit and mandate of the ministry beyond the traditional mandate of production. Farmers' welfare depends on enhancing farm production and income. The Government of India declared an ambitious mission to double farmers' income by 2022-23. Ministry of Agriculture has appointed a committee on Doubling Farmers Income (DFI) under Dr Dalwai, Special Secretary (Agr.). The report brought out by the committee is structured through 14 volumes. Volume XI 'Empowering the Farmers through Extension and Knowledge Dissemination' (MoA&FW, 2017) has been uploaded on the website for suggestions. The committee has made a range of recommendations (Prasad, 2018).

As brought out by the committee, farmers depend upon timely and synchronous delivery of various services across the value chain including timely supply of quality inputs at reasonable costs, supply of production inputs including water and power (as provided and promised), extension services for supporting good agricultural practices and dealing with farmers' problems including dealing with incidence of pests and diseases, tackling contingencies of climate change and marketing support. He/she also needs support to address the increasing farm distress which has spread to several parts of the country. Though farmers suicides is the worst manifestation of farmer distress, distress has become a part of day to day struggle for the farmers which needs to be taken note of, even if the farmers are not agitating or taking the extreme step. This blog focuses on two aspects that need urgent attention.

Action 1: Farmers' Charter and Single Window Delivery of Services for ease of doing Farming

The different types of services required by a farmer are currently provided by a large number of departments and public and private sector enterprises. Standards for inputs and some services provided to farmers have been prescribed. The Central Ministries and State Departments have formulated citizens' charters providing standards of services to be provided to citizens by them. Many state governments have also enacted right to services legislation to enforce these service standards.

Enactment of legislations and prescribing service standards are welcome, but they need to be carried forward, enlarged, enriched and; supplemented, restructured and reorganized as a Farmers' Charter, to ensure that farmers are able to access all the services required by them easily, without

hassles and of the requisite quality through one platform.

Formulation of Farmers' Charter was recommended by the Working Group on Agriculture Extension for the 12th Plan:

"A farmers' charter may be adopted and declared by every organization (public as well as private) providing services to farmers. The charter shall indicate the quantity, quality, price and timeliness of services to be provided. This should be uploaded in the proposed "Farmers' Portal" and its implementation should be monitored. One officer in each organization should be designated for grievance redressal based on complaints relating to the farmers' charter. They should also file complaints with the Consumer Courts."

DFI Committee has mentioned the enforcement of Farmers' Charter as one of the 24 roles of the agricultural extension personnel. The concept of Farmers' Charter is not new. However its articulation by the DFI Committee has imparted a sense of urgency. The concept accordingly needs to be developed and operationalized.

Farmers' Charter requires ensuring that all departments and agencies, public and private, formulate Farmers' Charter and include every service required by the farmers and standards are prescribed for all these services. The quantities and schedule of supplies and services to be delivered by private service providers also need to be prescribed by the field officers as part of the farm plans, under respective licensing provisions and all these, incorporated in the Farmers' Charters of the private service providers. This obligation of the private service providers needs to be incorporated in the regulations governing the agencies.

Accessing these services by approaching the entire range of public and private agencies and within the framework of the respective Acts and the respective Charters is a major challenge for the farmers, being tedious, time consuming and sub effective, making major demands on the time of the farmers, already under pressure for completing various farm operations and tackling various constraints. DFI Committee eg lists 97 public sector extension agencies. Besides it will be difficult for the farmers to decide which agency to approach for specific service.

Single Window System concept has been successfully introduced as part of ease of doing business. This concept needs to be extended to the Farm Sector. There is accordingly a need to extend the concept of Single Window System to agriculture by developing the concept, compiling and declaring Farmers' Charter by the nodal

department i.e., Ministry of Agriculture and Farmers' Welfare, at the center and the Agriculture Departments across various states. The charter should include details of all services required by the farmers and also the responsible public and private sector agencies and the methodologies for ensuring compliance with the services. This should also require the department to facilitate grievance redressal. This could eg include approaching the statutory authorities in case of quality complaints.

What is mentioned above is only a concept. Operationalising the same shall be an immense task considering the very large number of agencies involved. DFI Committee eg The Directorate of Extension (DOE) under the MoA&FW may hold a workshop in collaboration with MANAGE (National Institute of Agricultural Extension Management) to initiate this process.

Action 2: Alleviating Farmer Distress-Real Time Connect with the Farmers

Continuing media coverage of farmer suicides has shaken the nation's conscience reminding the pathos of the movie 'Peepli Live'. But unlike the movie, farmers in every state have started uniting and agitating for their rights and these are being reported daily. The farmers are extending their demand for loan waiver beyond short term loans, to waiver off other loans and non-payment of dues such as electricity dues.

Concerns are also being expressed about the impact of loan waivers on credit culture. Broad public support for their demands, gathering strength of their movements and the socio-economic dimensions of the problem has posed a major challenge before the government. The human dimension of the distress also affects the capacity of the farmers to undertake farm operations, which ultimately affects farm production and/or incomes.

Extension - the frontline interface with the farmers, needs to position itself towards alleviation of farmers' distress as its core mandate. Counseling for farmers' wellbeing, facilitation and feedback are also recommended as duties of the agriculture extension by the DFI committee. It provides for extension system to identify a distressed individual, provide necessary advice to overcome the distress and most importantly offer psychological counseling and where needed, guidance on actions to overcome the distress. Farmers, like any other societal unit, have aspirations, needs, concerns and problems which vary from area to area and farmer to farmer. Even if the extension is not responsible for various non-farm issues causing distress to farmers such

as unemployment, health and drinking water, they may need to bring the same to the concerned authority. Different agencies are responsible for addressing issues related to inputs, marketing, water, power etc., but these need to be monitored and escalated by extension staff to the concerned authorities.

As a long term measure, extension requires a deep and comprehensive understanding of the concerns at both individual and group level before decisions are taken for individual concerns. Policy formulations require long term studies across farming situations and farmer groups and households. A team of researchers from Punjab Agricultural University (PAU), Telangana State Agricultural University and Marathwada Agricultural University are presently working on preparation of a "Stress Index" for farmers and a training manual for village level volunteers to counsel farmers. This initiative, as brought out by DFI Committee, is very important. However, going forward, there is need to provide an institutional framework. An All India Coordinated Project on studying farm distress and suggesting remedial measures shall be an ideal vehicle for such studies.

There is a further need to designate an institution/ center as coordinating center for such studies.

Working group on Agriculture extension for the 12th plan had constituted a sub group on Agrarian Distress and Conflicts, INSTA Response and Farm Studies (GoI, 2011). It had recommended establishment of such a center in MANAGE.

Beyond the long term studies, farmer distress needs to be addressed in the short term by escalating every concern relating to any component to the higher level for corrective action. Ideally, potential causes need to be identified after every farm season for corrective action in the following season. The ambit of SREP (Strategic Research and Extension Plan) also needs to be suitably modified and extended to include farmers' distress.

Final Remarks

Comprehensive strategy shall be evolved and operationalized soon after considering report of DFI Committee. Above two aspects are brought out for consideration of the policy makers.



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**STRENGTHENING
EXTENSION
RESEARCH**

03

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RESEARCH IN EXTENSION: IT IS TIME TO INTROSPECT

Though the field of extension globally has moved beyond technology transfer to facilitation, learning, organising and building networks, extension research in India is still stuck in studying technology transfer, per se. Moreover, extension research has never received adequate attention from practitioners, managers and faculty in extension. Lack of adequate field-oriented research and poor professional standards in research have considerably eroded the credibility of extension research and practice. It is time to introspect and take corrective measures, argues RM Prasad.

In research, knowledge is acquired using scientific method. Scientific method is a body of approaches and tools for investigating a phenomenon and acquiring new knowledge as well as for verifying, correcting and integrating previous knowledge. It is based on gathering observable, empirical, measurable evidence, subject to the principles of reasoning. Growth of any discipline is directly proportional to the creation of knowledge in that discipline. Research is the means for creation of knowledge. Extension research proposes specific hypotheses as explanations of social phenomena and design studies that test these predictions for accuracy (Box 1).

The research process has to be objective so that the scientists do not bias the interpretation of the results or change the results outright. But as extension professionals have we paid adequate attention to extension research?

Extension research in India mainly faces two major challenges, namely inadequacy of research and poor professional standards.

Inadequacy of Research

We have to openly admit that we are not doing adequate research in extension. For instance organisations that have resources, mandate and personnel at the national level such as the National Institute of Agricultural Extension Management (MANAGE) or the ICAR (Indian Council of Agricultural Research) Extension Division have done very little research on extension. Extension research in ICAR research centres mostly revolves around transfer of specific technologies the centres have developed. There is no All India Co-ordinated Research in Extension, where as ICAR has several such projects in other disciplines.

Extension research undertaken by Deemed Universities and State Agricultural Universities in India is largely confined to research by the post-graduate (M.Sc and PhD) students. In this context, it is to be highlighted that under NATP and NAIP scheme of ICAR, there were some innovative and field oriented research projects in extension undertaken by our extension scientists. However, compared to research output of other disciplines, contribution of extension research has been very limited.

Poor Professional Standards

There has been a general decline in scientific rigour in most of the extension research. The following points illustrate why this is happening.

- In many cases, the problems selected for research in the field of Extension are based on convenience, easiness in conducting research

- and replica of studies already conducted elsewhere. Original, field-oriented and need based research for addressing the problems and the results of which could give directions for policy, etc are either lacking or are too little.
- In the case of post graduate (student) research, students often select research problems that have been studied earlier by other researchers, and pursue their research by changing the crop or locale or sampling unit of the previously studied problem. In many cases, even the results of the study and discussion are merely copied as such from the original.
- Ideally, the “review of literature” establishes the context of the research and introduces insights into the range of techniques and tools that are relevant for the topic under study. However, in practice, the literature review quite often lacks rigour and consistency, context and breadth, clarity and brevity and effective analysis and synthesis. This results in improper ‘theoretical orientation’ which affects the results of the research.
- Selection of a pilot site and conducting a pilot test using each data gathering method will help in obtaining better results. But, it is observed that in many cases, conduct of pilot study at the field level is not done, and is shown in the report as being done (just for the sake of reporting).
- The results of the study are often analysed without considering the suitability of the test and its relevance. Many of the extension researchers are interested in getting the results analysed using many tests and preparing large number of tables. However, in many cases, the results are not properly explained or interpreted. This often happens because the researcher feels that his/her quality of research can be enhanced only by using more number of statistical tests and presenting the results using many tables.
- Discussion on the results in large number of cases is quite shallow, superficial and not supported by theories or relevant concepts. The readability of the discussion chapter in many theses/ research reports is very poor and is merely a repetition of the findings in many cases.
- The research reports are prepared by the researchers in a routine and mechanical way, and many a times, it is observed that sincere attempt is not made to make the reports meaningful to the target users. The form, content and style of the research report should be chosen to suit the level of understanding, experience and interest of the targeted users as well as to make the readers to apply the findings in their respective areas. However, this is not seen in many of the research reports prepared by the extension scientists.

Box 1: Types of extension research

Exploratory research: Extension research has to move beyond exploratory research, which answers “What is where?” The results of exploratory research are however not usually useful for decision making by themselves.

Descriptive research answers the question “What is what?” Extension research employs three main types of descriptive methods- observational methods, case study methods and survey methods. Here, it is to be borne in mind that descriptive methods can only describe a set of observations or the data collected, but cannot draw conclusions from that data about which way the relationship exists.

Explanatory research has to be employed to know the cause and effect relationship. Though extension scientists use different statistical tools to explain the cause-effect interaction, in many cases, the relationships are not properly inferred and explained, which presents only loose inferences, which may not be valid.

Experimental research can be employed to present strong evidence for causal interpretation. One important feature that differentiates experimental research from explanatory research is that instead of simply measuring two variables, the researcher can manipulate one of them in the case of experimental research. Extraneous variables can also be controlled in experimental research. Extension, being a discipline which has drawn its contents from various other disciplines, there is much scope and space for inter-disciplinary research in extension. However, extension research hasn’t exploited this possibility fully. Though the field of extension globally has moved beyond technology transfer to facilitation, learning, organising and building networks with a wide range of other agencies, extension research in India is still stuck in studying technology transfer. For instance, most of the research in extension in India conceive extension’s role purely in terms of knowledge extended or transferred, whereas globally its role is increasingly recognised in terms of creating knowledge (Warner et al, 1998) strengthening innovation process (Sulaiman and Hall, 2002) and in participatory action research (Pretoda, 2009).

Another serious problem related to extension research is the limited presence of extension

research in reputed peer-reviewed international multi-disciplinary journals such as Agricultural

Systems, Outlook on Agriculture or Rural Sociology as well as international extension journals such as Journal of Agricultural Education and Extension (JAEE) and Journal of International Agricultural and Extension Education. Even those who are engaged in quality research in extension pay very little attention to publishing their research outputs in some of these reputed journals.

Apart from these, lack of functional integration between extension research and field extension; low attention to professional ethics and standards; absence of inter-disciplinary research projects; continued use of outdated scales and tests and lack of drive to use advanced social science research methods have all led to declining credibility of this important and vibrant discipline.

Way Forward

- Identify new and relevant areas for extension research: Social capital, cash transfer, micro finance, convergence as a social process, management of CPRs, climate change adaptation, public private partnerships, livelihood analysis, organisational learning and agricultural innovation systems are some new areas that need adequate research.
- Extension research should cover all the following types of research and these include, basic research (inquiry focused on basic concepts and theories with a view to revisiting the existing concepts/theories and developing new theories), developmental research (contributing to the development of the discipline by way of developing innovative methodologies, good practices, effective tools of measurement etc); adaptive research (studying the applicability and usefulness of the new practices, tools developed, etc and

testing their effectiveness); academic research (focusing on the process and methods of developing tests, scales and new approaches in the field of extension); applied research (focusing on the problems of conducting research in terms of data collection tools, measurement, experimentation, etc).

- Initiate network projects and coordinated projects for Extension research.
- Earmark 10 percent of the funds of MANAGE, Extension Education Institutes (EEIs) and State Agricultural Management Extension and Training Institutes (SAMETI) for conducting research on extension.
- Organise refresher courses on research methodology for teachers, scientists and doctoral students.
- Encourage and enforce a rigorous system for screening research articles/proposals, and organising peer reviews so as to conform to professional scientific standards in research.



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RESEARCH IN EXTENSION: NEW TOOLS TO REINVENT ITS FUTURE

While research tools and techniques in core disciplines from which extension borrowed its research methods have evolved significantly, extension research still depends heavily on many of the outdated tools. Extension research has a lot to catch up if it hopes to address its declining credibility and improve its contribution to social science research, argues, P Sethuraman Sivakumar.

Extension research is not a stand-alone phenomenon. It is multi-disciplinary in nature and helps extension science to grow stronger through sustained supply of vital elements (concept, tools, techniques and methods). The 'objective' and 'unbiased' information generated out of extension research is useful not only for planning and implementing extension interventions, but for other social science disciplines too. Extension scientists employ a variety of quantitative and qualitative tools to generate 'objective' information (Box 1).

Many of the research tools we once borrowed from core disciplines such as sociology, social psychology, educational psychology, cultural anthropology etc are currently outdated. These core disciplines have witnessed considerable evolution in terms of their research tools and techniques, but extension research still use some of the outdated tools. Success in science does not depend on choosing a "right thing" out of few options, but it is about creating a "basket-full" of "right things" to choose from.

The following sections provide an idea about the research areas, methods and tools which can be employed in extension research. These areas provide new directions for extension research as well as ways of improving its scientific rigor.

New Methods and Tools

Multivariate statistical tools

Quantitative research in extension is heavily dependent on classical test theory, drawn mostly from Edwards' book which was published more than 50 years ago (Edwards, 1957). However, "psychometrics" (which is a measurement of knowledge, abilities, attitudes, personality traits, and educational achievements) has grown beyond classical test theory with the advent of modern multivariate statistical tools. New methods like Item-Response theory (including its variations), and Rasch model of measurement are becoming popular in psychology. The following websites provide basics of IRT and Rasch models.

- The basics of item response theory
<http://info.worldbank.org/etools/docs/library/117765/Item%20Response%20Theory%20-%20F%20Baker.pdf>
- Item Response Theory and Rasch Models
http://www.sagepub.com/upm-data/18480_Chapter_13.pdf
- The application of IRT and Rasch model for scale construction can be found from the following papers.

- Rivera, J.E. (2007). Test item construction and validation: Developing a state wide assessment for agricultural science education. PhD Dissertation, Cornell University. <http://dspace.library.cornell.edu/bitstream/1813/3496/1/9-10-06.pdf>
- Baranowski, T., Missaghian, M., Watson, K., Broadfoot, A., Cullen, K., Nicklas, T., Fisher, J., and O'Donnell, S. (2008). Home fruit, juice, and vegetable pantry management and availability scales: A validation. *Appetite*. 50:266-277
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Box 1: Methods and tools in Extension Research

Extension research is basically non-experimental or descriptive in nature. It consists of (i) field studies (exploratory/hypothesis-testing), (ii) ex-post-facto research, (iii) survey research, (iv) content analysis, (v) case study, and (vi) ethnographic studies (MANAGE, 2007). These methods employ a variety of data collection methods and tools, to generate the data. Method is a procedure, technique, or way of doing something, especially in accordance with a definite plan (e.g. personal interview), but tool is a device that helps to collect the data (e.g. questionnaire). These methods and tools are mostly borrowed from cultural anthropology, sociology, cognitive psychology, social psychology, educational psychology, marketing and computer science and engineering. In the recent years, there is an increasing emphasis on using participatory methods and tools. The data generated by extension researchers is mostly ordinal or interval in nature, which can't be analyzed through parametric statistical analyses. Thus, extension researchers depend heavily on descriptive statistics (frequencies, percentages, mean, standard deviation etc), non-parametric inferential methods (chi-square, Friedman ANOVA, etc), and parametric inferences (correlation and regression).

With the advent of multivariate statistical methods, the social science research has witnessed a radical transformation. Traditionally, the data analysis is performed after collecting the data. These multivariate methods are not merely tools of data analysis, but they form integral part of every stage in data collection. For example, structural equation modeling, which is a combination of correlations, confirmatory factor analysis, path analysis and goodness-of-fit tests, provides detailed steps in constructing an attitude scale beginning from collection of statements to assessing reliability and validity. It is an integrated tool where all the analyses related to constructing an attitude scale are inbuilt and reduce the researchers' effort and time considerably. Conjoint analysis is another statistical method used for quantifying farmers' preferences of a particular technology. It estimates the farmers' "perceived utility" of a particular varietal attribute, and provides us with an ideal variety combining the preferred varietal attributes in a systematic way. If someone wishes to conduct a farmers attribute preference study, they can directly employ the steps in conjoint analysis for conducting research.

Estimating Construct Validity

Construct validity indicates how well a scale measures or correlates with the theorized psychological construct. In extension research, the construct validity is measured by correlating the scale scores with a known scale which measures the similar or related construct. However, this method is tedious as it takes lots of time and energy in collecting data using these two scales. Modern multivariate models like structural equation models and its variations can estimate the construct validity of a research instrument/ attitude scale through confirmatory factor analysis. Statistical software like SAS (PROC CALIS procedure), AMOS, and LISREL are widely used for structural equation modeling. Other methods like Multitrait-Multimethod Matrix (MTMM) and pattern matching can also estimate the construct validity accurately.

The following papers will provide an idea of applying these methods for construct validity estimation:

- Suresh Chander G.S., Rajendran C. and Anantharaman R.N., (2002), Determinants of customers perceived quality: A confirmatory factor analysis approach, *Journal of Service Marketing*, 16(1): 9-34.
- Shattuck, D., Corbell, K. A., Osborne, J. W., Knezek, G. and Christensen, R. (2011) Measuring teacher attitudes toward instructional technology: A confirmatory factor analysis of the TAC and TAT. *Computers in Schools*, 28: 1-25
- Davis, J.E. (1989). Construct validity in measurement: A pattern matching approach. *Evaluation and Program Planning*, 12(1): 31-36.

Analyzing User Decisions

Most of the farmers' decisions are taken in uncertain situations. They use multiple criteria to analyze a technology and take appropriate decision on using the technology. For example, a farmer may choose either of the following

decisions while deciding on adopting a variety based on its characteristics (e.g. high-yielding, disease resistance, cooking quality etc.). He/she may decide to (i) Fully adopt the variety (ii) Partially adopt the variety now, and full adoption at a later stage (iii) Rejecting the variety. These decisions are often measured through three point rating scale. In other situations, the farmer may express his agreement to a variety of attitude statements on a five-point Likert-type summated rating scale (e.g. attitude towards GM crops).

Both cases represent an uncertain situation, where the farmer is presented with a technology and he/she decides to use a technology to the "extent" which he/she feels comfortable. This decision is "approximate" and taken based on the "perceived benefits" and "range of choices" available to them. In these cases, fuzzy logic can effectively be used to interpret the farmers' decision behavior.

The following papers will provide an idea of application of this method:

- Ghosh, S., Singh, R., and Kundu, D.K. (2005). Evaluation of irrigation-service utility from the perspective of farmers. *Water Resources Management*, 19: 467–482
- Bosma, R., Kaymak, U., Van den Berg, J., Udo, H., and Verreth, J. (2011). Using fuzzy logic modelling to simulate farmers' decision-making on diversification and integration in the Mekong Delta, Vietnam. *Soft Computing* 15(2): 295-310.
- Jaya, S., and Das, H., (2003). Sensory evaluation of mango drinks using fuzzy logic. *Journal of Sensory Studies*, 18: 163-176

Measuring Perceptions

Understanding users' perception of a technology/method/initiative is necessary for facilitating adoption. Perceptions indicate the users view of a technology/method/initiative, which is formed based on his previous experiences. In extension research, perceptions are measured using summated-rating or other rating scales. However,

methods which can measure these aspects objectively are currently available. Means-ends chain analysis, developed by Gutman (1982) is a popular qualitative research method of measuring the perceptions, which is used widely in marketing research. The means-end theory sustains that the way consumers relate to products can be represented by a hierarchical model of three interconnected levels: product attributes, consequences of use and personal values.

The following papers will provide an idea of application of this method:

- De Souza Leao, A.L.M., and de Mello, S.C.B. (2007). The means-end approach understanding customer values of an on-line newspaper. *Brazilian Administration Review*, 4(1): 1-20
- Gutman, J. (2006). Analyzing consumer orientations toward beverages through means-end chain analysis. *Psychology & Marketing*, 1(3-4): 23-43.

Livelihood Analysis

Livelihood analysis is performed using qualitative methods like PRA, and the results are summarized to provide an overview of the livelihood system. The PRA is primarily a "planning method" which aids in collective decision making for developing a viable intervention to improve the life quality of the community. The PRA methods/tools are not "objective" research methods, which are often used to generate a "pooled perspective" of a given problem from a "group" of respondents (> 5 respondents for many tools). Recent developments in participatory research have brought several hybrid methods that integrated the quantitative tools with participatory methods. Few methods are listed in the website of Statistical Service Centre, University of Reading, UK. (<http://www.personal.reading.ac.uk/~snsbarah/partiandstats/home.html>).

The following papers will also provide an idea for integrating quantitative tools with participatory methods:



- Sivakumar, P.S., Nedunchezhiyan, M., Paramaguru, S., and Ray, R.C. (2009). Production system-specific differences in farmers' demand for greater yam (*Dioscorea alata*) varietal attributes in Orissa State, India. *Experimental Agriculture*, 45: 1–14.
 - Babulo, B. Muys, B., Fredu Nega, Tollens, E., Nyssen, J., Deckers, J., and Mathijs, E., (2008). Household livelihood strategies and forest dependence in the highlands of Tigray, Northern Ethiopia. *Agricultural Systems*, 98(2): 147-155.
 - Tittonell, p., Muriuki, A., Shepherd, K.D., Mugendi, D., Kaizzi, K.C., Okeyo, J., Verchot, L.,
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- An investigation of factors that influence senior executives to accept innovations in information technology. *International Journal of Management*, 22: 542–555.
- Voon, P.J., Ngui, K.S., and Agrawal, A. (2011). Determinants of willingness to purchase organic food: an exploratory study using structural equation modeling. *International Food and Agribusiness Management Review*, 14(2): 103-120.

ICT applications in Extension

The research on ICT application in extension is still at infancy stage in India. Many of the recent papers in this theme lack empirical evidence and the investigations only deal with the periphery of the problem. There is a need to work on designing of instructional systems and their impact on learning process using objective research methods. For instance, research should investigate how the mental processes affect the comprehension of information as well as how the users evaluate and utilize the information supplied. Few aspects on ICT which needs to be investigated to improve its effectiveness in extension delivery are

ICT utilization

ICT utilization indicates the intention and extent of utilizing ICT tools in extension. Information system acceptance is a psychological phenomenon which is extensively studied using technology acceptance models (discussed earlier in the blog along with references).

Instructional design and its impact

Instructional design plays a crucial role in determining the effectiveness of multimedia applications developed specifically for technology transfer. Though few Indian studies have examined the effectiveness of multimedia based extension applications like Interactive Multimedia Compact Disc (Anandaraja *et al.*, 2006), CD-ROM (Rajula Shanthi, and Thiagarajan 2011) and e-agriculture prototype (Saravanan, 2012), the role of instructional design was not examined critically. Since these ICT applications are targeted to improve the users' knowledge, skill and positively enhance their intention to use the technology/ aspect, instructional design plays a crucial role in determining the effectiveness of these applications. Few areas which needs attention by ICT researchers are

Modality and cueing – Studying the effects of modality (written/spoken text), text organising strategies (controlling the reading rate, rereading key text segments, reading backwards, skipping

Technology Adoption Process

Diffusion of innovations is widely researched area in extension science and a good number of papers emerged from Indian sub-continent in the last three decades. Though the Roger's classical paradigm of technology diffusion has provided deeper insights into the process of technology spread, its longitudinal nature has constrained the extension researchers to examine this model critically to derive newer insights. Several technology acceptance of adoption theories and models like Theory of Reasoned Action (Ajzen and Fishbein, 1980), Theory of Planned Behaviour (Ajzen, 1985), Technology Acceptance Model (Davis, 1989), Unified theory of acceptance and use of technology (Venkatesh *et al.*, 2003) are developed by social and cognitive psychologists to examine the process of technology acceptance (intention to use and actual adoption) in a given period of time.

These models provide the flexibility to assess the technology adoption process at a particular time-period through cross-sectional studies. These models are extensively used in marketing and information system research.

The following papers can be useful to understand the application of these models for conducting cross-sectional research in technology adoption process:

- Pynoo, B., Tondeur, J., Braak, J.V., Duyck, W., Sjinave, B., and Duyck, P., (2012). Teacher's acceptance and use of an educational portal. *Computers & Education* 58: 1308–1317.
- Pijpers, G.G.M. and Montfort, K.V. (2005).

less essential text, or jumping back and forth between text segments etc.) and visual cueing (using non-content information like arrows, colors etc. in the instructional material to help learners select, organize, and integrate information in their working memory) in a multimedia learning system.

The following papers will provide an idea about this research area:

- Crooks, S.M., Cheon, J., Inan, F., Ari, F., and Flores, R. (2012). Modality and cueing in multimedia learning: Examining cognitive and perceptual explanations for the modality effect. *Computers in Human Behavior*, 28: 1063–1071.
- Rummer, R., Schewpe, J., Furstenberg, A., Scheiter, K., and Zindler, A. (2011). The perceptual basis of the modality effect in multimedia learning. *Journal of Experimental Psychology: Applied*, 17(2), 159–173.

Effect of knowledge and task characteristics on learning

-Assessing the impact of design on users' knowledge levels (factual, conceptual, procedural and meta-cognitive knowledge) and developing suitable tools to measure these knowledge levels in multimedia learning environments is necessary. Task characteristics like task complexity, task uncertainty can also influence the learning from multimedia and internet.

The following papers will provide an idea of implementing these aspects in ICT research:

- Mascha, M.F. (2001). The effect of task complexity and expert system type on the acquisition of procedural knowledge: Some new evidence. *International Journal of Accounting Information Systems*, 2: 103–124.
- Van Genuchten, E., Scheiter, K., and Schüler, A. (2012). Examining learning from text and pictures for different task types: Does the multimedia effect differ for conceptual, causal, and procedural tasks? *Computers in Human Behavior*, 28: 2209–2218.

Conclusions

Extension is a unique discipline among social sciences as it has evolved from "field practices" that are implemented to improve the quality of life of rural communities. So, research "output" in extension should contribute to improve the efficiency of an existing practice. While several other disciplines consider theories as the pillars on which their subject matter is built upon, there is a widespread opinion among extension scientists and professionals that extension research should

be "applied" in nature and therefore its focus should not be on developing theories and models that are purely academic. However, theories guide the growth of any discipline and the empirical research helps to improve generalizations of theories and enhance 'replicability' of the practices. Therefore, it is crucial for extension science to establish its own theories to sustain in the long-term.

The perspective taken here is that extension science is an applied, problem-oriented field, and 'scientific knowledge' (which includes theory) within extension should exhibit both 'scientific rigor' and the 'applied perspective' of the extension work. Theory-driven empirical research in extension should be distinguished from research in other fields based on the substantive content of the problems studied and methodological innovations. Research is the lifeline of any professional discipline and the quality of research output is one of the important indicators of the growth of discipline. So there is an essential need to show our research capacity and prove that extension is a scientific discipline, not merely a "work" based profession.

Way Forward

- Changing the mindset of extension researchers is the first step towards the progress of extension research. Professional societies in extension should take a lead in this effort.
- Exploring the research world of other science disciplines like marketing, cognitive psychology, educational psychology, social work, chemistry, food science etc with an "investigative eye" will enrich our basket of research tools.
- Focus on theory - Theory is the foundation for the success of any effort that aims to transform human conditions through technological solutions. Any field-effort which is guided by theory, will not only solve the problem, but also provide valuable insights into this process.
- Employing Multivariate Research Methods which integrate data collection tools with appropriate statistical methods will help the extension researchers to conduct research effectively and efficiently.

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NEGOTIATING REALITY: A PRAGMATIC APPROACH FOR CONDUCTING QUALITY EXTENSION RESEARCH

Extension scientists are often under stress due to the demotivating work environment and lack of technical guidance from the professional societies. But still one can conduct quality research in extension by following a pragmatic approach, argues, P Sethuraman Sivakumar

Research is the backbone for all disciplines and for the discipline of “extension”, research plays an important role in standardizing relevant interventions to facilitate equitable development. As a “field-oriented” professional discipline, the extension research differs significantly from other social science research in terms of its content and methods. The extension research is an “applied problem solving” enquiry, conducted in complex environments created by the interplay of natural, social and biological forces. Researching a complex environment is a cumbersome task, which needs identifying and executing sound methods and techniques with reasonable precision and control. However, the current research tools in extension are outdated and their continued use has resulted in stereotypic and insignificant outcomes. Due to lack of practical significance and stagnation in theory development, extension research is often criticized by other agricultural disciplines as a “non-performing discipline”. Extension scientists are often under pressure to deliver tangible outputs to show impact of technologies whereas the poor technology adoption is often the results of a number of factors including the weaknesses in field extension. Though there is no “magic wand” to deliver output in a short time, a systematic and pragmatic approach to extension research can contribute to development of relevant technologies and appropriate extension approaches. Only these can lead to enhanced credibility for extension discipline and at the same time contribute to better technology uptake.

The Problem of Extension Research

Varying Perceptions and contradictory demands: While “field-extension” is a responsibility of the state (governments), the front-line extension system (mainly Krishi Vigyan Kendra’s and extension activities of ICAR and SAU centres) is expected to help the field functionaries by providing new approaches and “state-of-art” tools to improve the effectiveness of their extension work. While this is the accepted division of labour, many research managers have a different perception on the role of extension scientists. Many of them believe that the role of extension scientists is to promote technologies (developed at the respective research centres) in the field, rather than contributing to the effectiveness of the research projects through research and publications. The “field deliverables”, are viewed in terms of the quantity and coverage of extension interventions or stakeholder participation over a period of time. These perceptual differences have created a stressful working environment where the extension

academicians/ scientists are overburdened to meet the immediate goals of their supervisors leaving aside their research ambitions.

Low quality of academic research: In the case of SAU extension research, which contributes more than 60% of the total research conducted / papers published in extension journals, most of it focus on the "subject" of extension of as a field of academic enquiry and thereby contributing very little to improve the field extension activities. The academic research conducted at the SAUs is time-bound and repetitive, with both guides and students not-willing to venture into innovative topics/ methods fearing rejection at the viva-voce or at the review meetings. The extension journals

too focus on the "volume" of publishing rather than improving the quality of research papers. In many journals, the peer-review process is carried out haphazardly with little focus on innovation and utility. Due to this most of the extension journals are rated low (<5.0) in the journal ratings determined by the National Academy of Agricultural sciences, New Delhi (NAAS, 2014). This trend is also similar for extension journals of International repute. With this limitation, the extension scientists and students face innumerable difficulties in applying for higher positions for their professional growth including scholarships and awards from reputed societies.

Box 1: Evolution of extension research in India

The foundations for extension research were laid out in the 1960s by the scientists working with the ICAR (Indian Council of Agricultural Research) and SAUs (State Agricultural Universities). Extension research methods during the 1960-1980s were drawn mostly from the psychology and sociology, with a strong psychometric orientation. The leading extension science journals at that time published high quality research papers and a few of these attracted International accolades. The quantitative research paradigm dominated by multivariate statistical modelling, brought a new scientific outlook for extension discipline during that time. Several scales and indices like socio-economic status (Trivedi, 1963), economic motivation scale (Supe, 1969), etc were developed during that period. Teacher-made knowledge tests and several scales pertaining to different aspects of extension were developed subsequently. Since the beginning, the classical test paradigm has been used for scale construction. With the advent of participatory methods, use of Participatory Rural Appraisal (PRA) methods has also been used in extension research. .

The current extension research is mostly non-experimental or descriptive in nature. It consists of (i) field studies (exploratory/hypothesis-testing), (ii) ex post-facto research, (iii) survey research, (iv) content and readability/ comprehension analysis, (v) case study, and (vi) ethnographic studies (MANAGE, 2007). Studies on training - need analysis and effectiveness; knowledge, perception and attitude assessment on specific aspects; communication / information processing behaviour; adoption behaviour; constraint analysis; farmer involvement in extension programmes; gender mainstreaming and empowerment; and job satisfaction and productivity of extension personnel are widely undertaken now. Emergence of Information and Communication Technology (ICT), entrepreneurship, organizational management and impact assessment paradigms in the early 1990s have redefined the extension research. The extension research methods and tools which are currently in use are mostly borrowed from cultural anthropology, sociology, cognitive psychology, social psychology, educational psychology, marketing and computer science and engineering. The data generated by extension researchers is mostly ordinal or interval in nature, which cannot be analyzed through parametric statistical analyses. Thus, extension researchers depend heavily on descriptive statistics (frequencies, percentages, mean, standard deviation etc), non-parametric inferential methods (chi-square, Friedman ANOVA, etc), and parametric inferences (correlation and regression).

Lack of professionalism among professional societies: In the absence of motivating environment at the workplace, talented extension scientists often look for innovative ideas and methods from professional extension societies. But the extension professional societies in India are mostly divided on the personal interests of few individuals, who consider bright young extension scientists as "threats" to their position. Extension is probably the only discipline in agricultural sciences, where the professional societies organize at least four specialised meetings every year, where the participants comprise mostly of extension scientists from a particular region or lobby. The "award syndrome", where over 50 extension

scientists are awarded for best paper, best poster, best presentations etc or as promising young scientists in these meetings has also lowered the professional standards. A vast majority of the awards are given to "known people" based on personal relationships and the research quality takes a backstage in these events. Recognising an average or poor research worker creates frustration among promising extension scientists who lose motivation to do innovative research.

Need for a Pragmatic Approach

In general, extension research is conducted in 6 different settings:

- Research project in a research Institute or college,
- Student project in a college or research Institute,
- Field research in a Krishi Vigyan Kendra,
- Field research in a NGO,
- Field research in a state extension department and
- Field research in a agri-input/ marketing/ credit agencies

The number and volume of extension research vary among these settings. While the first three settings have a compulsive environment to deliver quality research output, the pressure to deliver is low among others.

In either case, the Indian extension scientist is under stress due to the demotivating environment within his organisation and due to lack of technical guidance from the professional societies to improve his/her research quality. He/she should normally belong to the following categories:

- A researcher who is burdened with field extension
- A researcher frustrated with too much documentation
- A researcher/academician overloaded with teaching
- A student who is under compulsion to complete his/her MSc or PhD within the prescribed duration or
- A subject matter specialist in a KVK or an NGO extension staff burdened with demonstrations and trainings

In this context, there is a need to look at some of the potential ways of conducting quality research at the individual level, without disturbing the routine schedule of activities expected within the organisation. Some of the potential ways forward are as follows:

Explore opportunities to conduct research in any mandated activity

Any mandated activity can produce quality research output. If someone is continuously engaged in teaching/ training/ exhibitions, they can concurrently do research on their routine activity. In case of exhibitions, high quality research were conducted on the contextual model of learning – learning in a free-choice settings (Falk and Storks dieck, 2005), exhibit labelling and visitor concept development (Falk, 1997) and impact of prior knowledge on learning at an exhibition (Falk and Adelman, 2003).

If someone works for a KVK or other field extension agency, he/she can conduct quality research while conducting FLD or method demonstrations. Method demonstrations can be researched using traditional media/ method comparison techniques (Crouch *et al.*, 2004) or its effect on learning motor skills (Ishikura and Inomata, 1995). The extension personnel engaged in capacity building work have wide array of choices from need analysis to ICT applications. Skill learning with sensory and motor tasks is a vital component of any training programme. Skill learning research (Scully and Newell, 1985; Willingham, 1998) can be conducted for farm machinery and other equipment studies.

Explore opportunities for collaborative multi-disciplinary research

Extension research conducted as part of a multi-disciplinary enquiry can solve problems much better. If an extension scientist is posted in a crop or animal / aspect specific Institute, it is good to get the mastery over the mandated subject before beginning any empirical enquiry. Understanding the mandated aspect will help to get deep insights into the forces that determine progress in the specific area. For instance, a post- arvest scientist develops a technology to produce functional pasta from any starchy crop; the extension scientist can help to determine its sensory acceptability by the potential consumers. Besides sensory testing, the extension scientist can test the product on a larger consumer sample and identify the potential market segments, estimate the market demand based on hedonic model and provide several market insights to and provide several market insights to the technology producer (Sivakumar *et al.*, 2008, 2010). This work can satisfy both producer (Sivakumar *et al.*, 2008, 2010). This work can satisfy both the post-harvest scientist and research managers besides helping the extension scientist to get few research papers in high-impact International journals.

In a participatory plant breeding research, the extension scientist can help the breeders to decide on the varietal attributes using preference studies (Sivakumar *et al.*, 2009). The conjoint analysis is a widely used preference or utility estimation method which has been successfully used to identify cattle attributes in West Africa (Tano *et al.*, 2013), Apple varietal preferences in UK (Manalo, 1990), and groundnut varietal attributes in Niger (Baidu-Forson *et al.*, 1997). These results will help the breeders to decide on the breeding objectives and develop varieties that can cater to the needs of the farmers. In a multi-disciplinary team, the extension scientist will also be credited with developing varieties/ products along with

biological scientists. There are several engineering or biology or chemistry or other discipline journals that publish extension research. Since these journals are rated high (Impact factor over 7.0), multi-disciplinary team work will provide high quality research publications. An exhaustive list of journals where extension scientists could publish has been compiled by AESA (Agricultural Extension in South) Network and this could be accessed at <http://www.crispindia.org/Where%20we%20can%20publish%20extension%20research%20-%20Final%20Note%20%281%29.pdf>

Using alternate research methods to study an established phenomenon

Most of the research methods used in extension science are borrowed from other social science disciplines such as psychology, cultural anthropology, sociology, economics, marketing and communication. Though the research practices in these disciplines witnessed a sea change in the last two decades with the emergence of state-of-art techniques, the extension researchers continue to use out-dated methods from these disciplines. Though the extension research themes became diverse over the years with wider scope, the research methods continue to be old and obsolete. This phenomenon resulted in poor quality research as indicated by stereotypical publications and duplicating results. For a more detailed discussion on new methods and approaches in extension research, see the AESA blog on this theme (Sivakumar, P S 2013).

Master the field of statistics

The goal of scientific research is to identify the hidden patterns in the observed data to make generalisations on the phenomenon under study. The knowledge and use of statistics helps in this. Quantification of relationships among a social phenomenon will provide several leads for further research, besides explaining the research questions under the study. In simple words, the mastery of statistics will not only improve the quality of the output, but also help in conducting a sound empirical research and enhancing the probability of getting the output published in peer-reviewed high impact journals.

There is a widespread perception among extension scientists that quantitative studies using statistics are theoretical in nature and that they do not lead to any meaningful interpretation. Using statistics is often perceived as a "suffix" phenomenon i.e. performing the statistical analysis after collecting the data. However, statistics provides us with the knowledge and tools for assessing complex natural phenomenon in a systematic and objective way.

With the advent of multivariate statistical methods, the social science research has witnessed a radical transformation. Traditionally, the data analysis is performed after collecting the data. These multivariate methods are not merely tools of data analysis, but they form integral part of every stage in data collection. For example, structural equation modelling, which is a combination of correlations, confirmatory factor analysis, path analysis and goodness-of-fit tests, provides detailed steps in constructing an attitude scale beginning from collection of statements to assessing reliability and validity. It is an integrated tool where all the analyses related to constructing an attitude scale are inbuilt and it reduce the researchers' effort and time considerably. Limited dependent models like logistic regression can be used to assess the effect of nominal and ordinal independent variables on a nominal dependent variable. For example, adoption studies (adopted/ not adopted) or acceptance of a food product (accepted/ not accepted) etc can be well-researched using these models. Multi-nominal and ordinal regressions can add one more category i.e. partially adopted into the logistic model.

Though extension scientists are increasingly using multivariate methods to increase the probability of their paper acceptance in journals, it is not sufficient to ensure quality. The statistical methods should be chosen based on the research problem, and there are several research papers published in high rated journals using simple statistics (Sharma and Joshi, 1995; Sivakumar *et al.*, 2009). Since most statistical analyses are based on the nature of data, precautions should be taken to use the right method for analysing the observed data.

Way Forward

Extension is a unique discipline among social sciences as it has evolved from "field practices" that are implemented to improve the quality of life of rural communities. Extension research needs



a face-lift to increase its impact and restore its credibility among research managers and other discipline scientists. The outputs from extension research should contribute to improve the efficiency of an existing practice. As extension science is an applied, problem-oriented field the

'scientific knowledge' (which includes theory) within extension should exhibit both 'scientific rigor' and the 'applied perspective' of the extension work. A pragmatic approach consistent with the mandate of the organization can considerably help in producing quality output.

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EXTENSION RESEARCH: RANDOM THOUGHTS FROM A WELL WISHER

Are we serious in undertaking research in Extension? Do we have a research agenda? As a discipline, are we using new concepts and approaches to better design our research? How policy relevant is our research? Do we only extend knowledge or do we also create knowledge? As extension professionals, we need to introspect on the status of our research and address many such disturbing questions, argues RM Prasad.

Our current research paradigm followed in most academic institutions tends to be linear in design, as given in Fig. 1 (Smith and Helfenbein, 2009).

In most cases, extension research looks at farmers or extension personnel as subjects and crop/farming system as settings of the study. The dissemination of research findings into the public sphere is very often limited to sharing of results with other scientists or students. Though farmer participatory research had become popular at least among some of the researchers, it is observed that in farmer participatory research, research or extension are too dominant, while farmers comply with the wish/request of extensionists/researchers to arrive at joint decisions on research topics, designs, analysis and dissemination of results (Katz et al, 2007)

What we should do?

- The concept of 'research' in extension needs to be broadened, recognising that beyond the public research and extension organisations, a range of actors have important and vital roles in the generation and dissemination of agricultural innovation. The Agricultural Innovation System (AIS) landscape has a wide range of actors going well beyond formal research and extension institutions, but the research in extension is still stuck with the typical actors and has not moved beyond R-E-F linkages. Of late, marketing is also added. Without a functional interface between the various actors, neither research will be able to make innovations that benefit farmers, nor can extension offer services that resolve all the problems of farmers.
- The understanding of innovation needs to change as it is increasingly recognised that non-technological innovations such as ways to access to more profitable markets, value chain development or organisation of producers are equally, if not more important than technological innovations.
- The practice of Extension has been described as 'knowledge applied' or 'knowledge extended'. What about 'knowledge created'? Of late, at least some of the extension researchers have begun to recognise Extension's role in 'creating knowledge' which is a welcome step. But this is yet to yield significant results.
- Research institutions need to provide researchers with the right incentives to engage effectively, enable them to contribute to policy and political processes and develop realistic expectations as to what they can collectively achieve.



Fig. 1: Current research paradigm followed in academic institutions

- Researchers need to alter their own mindsets, paving way for team research. This may mean working in inter-multi-and/or trans-disciplinary research teams, admitting to being part of a value based system. The research agenda is usually decided by the researcher, which also needs a paradigm change. Defining the research agenda is about defining the problem with research users, who they are- not just farmers, but scientists, entrepreneurs, environmentalists, policy makers, journalists, etc whoever is part of the 'innovation system' that affects research uptake and use.
- Knowledge brokering is absent in the current research system. This is a central component of knowledge transfer that involves bringing people together, helping to build links, identify gaps and needs, and sharing ideas. It encourages the use of research in planning and implementation and uses evaluation activities to identify successes or improvements. Thus it helps to bridge the gap between research and policy development.
- It is high time that our extension scientists give importance to translational research, which has gained popularity in medical research. Translational research is a process rather than a stage and it focuses on multi-disciplinary collaboration. Translation is the process of cascading global best practice and innovation and combining it with local knowledge, so crucial with the variation in soil type, water availability, climatic variations, etc. Translation aims at developing people to manage and lead land based and agri-food businesses in a more productive and sustainable way, which can only be achieved by exchanging knowledge and diffusing innovation that can be readily applied to the agro-food supply chain.

Box 1: Basic Research, Applied Research and Translational Research

Basic Research: The objective of basic research is to gain more comprehensive knowledge or understanding of the subject under study without specific application in mind. Understanding how a social process (eg: conflict) affects group behaviour is an example for basic research.

Applied Research: It aims at gaining knowledge or understanding from basic research to meet a specific recognised need or to solve a specific problem. Finding a conflict resolution process for better functioning of groups is an example for applied research.

Translational Research: This can be considered as Applied research plus. This refers to the new scientific methods and technologies, inter disciplinary approaches and collaborative institutional arrangements being developed to narrow the gap between basic science and its application to product and process innovation. Translational research encompasses scientific, technical, market and policy signals that arise from basic research to final consumers. Developing conflict resolution strategy for group behaviour in an organisation could be an example for translational research.

Translational Research in Extension

Two variants of translational research that can be used in extension research are:

A. Translating Research Into Practice (TRIP)

–This is a research framework gaining importance in research projects associated with Medicine, Nursing, Communication, etc. This can be employed in Extension research also.

TRIP creates a space for collaboration,

co-constructed inquiry that values and utilises the expectations of all stakeholders. This approach follows from what Lagemann (2008) refers to as 'problem finding research' that produces, or at least provides insights into 'usable knowledge'. Smith and Helfenbein (2009) present the recursive nature of translational research in Education (below), which can be used by the extension scientists.

B. Research into Use (RIU) Approach: RIU programme (<http://www.researchintouse.com/>) was designed to put the results of

agricultural and natural resources research into use to reduce poverty, promote economic growth and mitigate environmental problems. RIU had two objectives: a. Do everything to put new knowledge (generated in the previous research into use) and b. Use this as an action research case to learn from 'How

to put new knowledge into use? Though the fact that RIU originated in a different context and is now closed, the interesting part for the researchers was the second objective, about learning from putting research into use (what works and what doesn't and what needs to be done to put new knowledge into use.

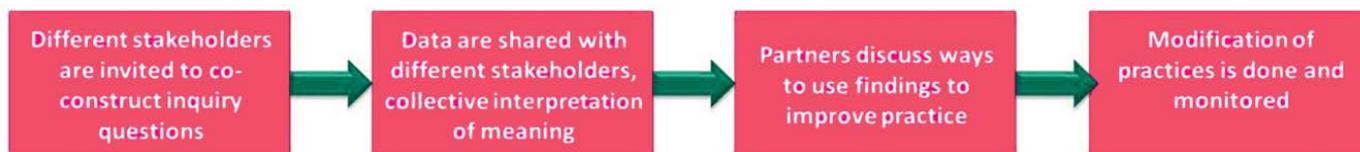


Fig. 2: Recursive nature of translational research in Education

The Centre for Science and Policy, University of Cambridge presents a review of different approaches for translation of research into practice

innovation to support sustainable management of natural resources and the alleviation of poverty (Box 2).

Box 2: Translating Knowledge to Policy on Food Security in India

Outcome: In September 2013, the Government of India enacted the Indian National Food Security Bill, enshrining the legal right to food in the Indian Constitution.

Process: A long running campaign on the right to food used specific opportunities to pressurise the GoI to enact new legislation. The ability of key actors to influence the official policy process was facilitated by the use of Public Interest Litigation (PIL) and judicial interventions.

The identity and previous experience of the key actors were important factors. Specific pieces of research were commissioned to generate evidences in support of the proposed legislation. The most influential research outputs were those that were easy to access, in terms of availability and cost. Researchers, activists and policy actors worked together to build coalition of support for the new law.

Source: Centre for Science and Policy, University of Cambridge, 2014

Some of the applications of translational research in extension include:

Value Chain Analysis

Translational research has been successfully used for value chain analysis of important crops. Value chain analysis describes the activities that take place in a business and relates them to an analysis of the competitive strength of the business. The primary activities, support activities, enabling activities, etc by the different actors involved in value chain can be analysed and properly utilised through translational research.

Decision making by farmers

Extension workers sometimes try to 'push' farmers into accepting recommendations. However, when decisions about what to grow and how to sell are imposed, this rarely leads to success. Farmers do not 'own' such decisions, as they feel a low sense of responsibility. However, helping farmers to make their own decisions is more difficult and also a slow process. But in the long run, it will be more successful and sustainable. However, it is disappointing to note that extension researchers have not bestowed much attention to this. A

farmer-centric analysis of decision making process and behavioural change of farmers through unpacking the 'black box' of decision making theories in agriculture is what is needed. Some of the issues to be addressed are:

- Understanding values of the decision maker
- Segmentation of farmers in terms of business engagement and adaptability
- Framework of decision making based on capacity, willingness and engagement
- Role of uncertainty and risk in decision making
- Information used by farmers for decision making
- Tactical, Strategic and Structural decisions by farmers
- Bias in decision making process
- Types of participatory research based on Locus of decision making

Here also, translational research can be successfully employed to apply and validate an effective methodology to deliver a robust evidence base for the decision making process by the farmers.

Box 3: Translational Research in Wheat value chain

A technical report of RAND Corporation (nonprofit institution in Europe that helps improve policy and decision making through research and analysis) considers how translational research and knowledge exchange can be enhanced throughout the food and agricultural value chain so that best use is made of public and private investment on research and knowledge generation. The wheat value chain was chosen as the test case for development of the methodology. The project distinguished four actor roles within the value chain- funders of knowledge generation; knowledge producers; knowledge intermediaries and knowledge users. Different broad fields of research related to upstream and downstream activities were analysed.

Upstream fields of knowledge, encompassing basic and applied research include: crop science, food science and food safety, organic agriculture, alternative crop use, resource efficiency and climate change and machinery and equipment engineering.

Downstream fields of knowledge covering product and process development include: farm inputs and implements, on-farm production, alternative crop use, resource efficiency and climate change, food science/ food safety, food processing and distribution.

Translational research cuts across both categories of research fields, it occurs around activities within upstream and downstream categories. This could add more value by improving existing knowledge exchange activities so that they address the specificities of the wheat value chain more effectively.

Source: Wamae Wet al2011. Translational Research and Knowledge in Agriculture and Food Production, Technical Report, Rand Corporation

Meta-Analysis in Extension

Meta Analysis is about "conducting research about research". This refers to the methods that focus on contrasting and combining results from different studies, in the hope of identifying patterns among study results and sources of disagreement among those results. A meta analysis gives a thorough summary of several studies that have been done on the same topic/theme and provides the reader with extensive information on whether an effect exists and what 'size' that effect has. The main advantages of meta-analysis are that the results can be generalized to a larger population and that the precision and accuracy of estimates can be improved as more data is used.

Some of the applications of meta-analysis in extension could be:

- a. Sustainable rural livelihoods (based on the results of NAIP research on sustainable livelihoods).
- b. Climate change adaptation by farmers (based on the results of NICRA).
- c. Social capital (based on various studies conducted on social capital, including SHGs,

farmer organisations, etc).

- d. Farmer Field Schools (based on different studies conducted on Farmer Field Schools).

Possible Actions?

- Can we look at Extension (as it exists today) and redefine it to the current context and use research findings/development in other social sciences to reinterpret it?
- Can the extension scientists of ICAR join hands and conduct network/ co-ordinated research projects?
- Can the extension scientists conduct Meta analysis on the available research studies on topics of relevance to the farming community?
- Can the extension faculty of SAUs take lead in preparing a Researchable Problems List for M Sc and Ph D students? Can they allot problems to students on selected two or three themes/ topics so that in one year, we will have more information about the research topic from various regions?
- Can we form ourselves into Community of Practice (CoP) to encourage shared learning on selected themes?

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EXTENSION RESEARCH AND TECHNOLOGY DEVELOPMENT

Though extension scientists in the NARS can potentially engage in useful research that can influence the technology development process, they are mostly engaged in organizing training programmes, conducting events, dealing with visitors to the institute and handling documentation responsibilities. Senior extension scientists, M J Chandra Gowda, Sreenath Dixit, R Roy Burman and P N Ananth reflect on this situation here and suggest how extension research can better contribute to technology development.

Technology is a design for instrumental action that reduces uncertainty in the cause-effect relationships involved in achieving a desired outcome. Technology embodies both software and hardware aspects, although software aspects are generally less visible than the hardware. In India, agricultural technologies are mostly generated by scientific research activities carried out by public (mostly ICAR Institutes and SAUs) and private R&D institutions (mostly manufacturers/producers of inputs). Besides, there are umpteen number of location specific technologies developed by practicing farmers.

The technology development process, in a formal set-up, consists of 6 stages viz., Problem – Research – Development – Commercialization – Diffusion & Adoption – Consequences (Rogers, 2003). Extension research has the potentiality and responsibility to contribute to this process directly as well as indirectly. Unfortunately, the extension stream in ICAR research institutes as well as state agricultural universities haven't been able to contribute in this area for various reasons. This is an attempt to discuss how extension research can re-catalyze agricultural technology development and utilization scenario in the country.

Technology Development Process

Problem Identification

The technology development paradigm as discussed above assumes that all research processes must necessarily start with indentifying the problem or need. There is a serious concern over the way problems are being perceived or research agenda is set in public agricultural research agencies. There is a general feeling that, at present, research projects are mostly designed based on review of literature, thrust areas decided by funding agencies and continuation of previously implemented projects in some other institutes.

Bi-monthly workshops, a successful mechanism of NARP (National Agriculture Research Programme) days, had a give-and-take symbiotic purpose, wherein the researchers used to get first-hand feedback on burning issues and the development departments used to get technologies and advisories for communicating the same to farmers. Bi-monthly workshops may not exist now, even if exist, these have become routine, ritualistic and have lost the sting. Extension researchers must explore new arrangements to get the flow of farmers' problems into technology development process. Some of these are discussed in Box 1.

Ex-ante analysis of ground realities related to a researchable issue ensures integration of users' or stakeholders' perspectives in the research stage.

Most of the internationally funded projects insist on an ex-ante analysis, preferably carried out by a socio-economist, who is also a part of the project team. On the contrary, very few ICAR and SAU projects follow multi-disciplinary team approach with socio-economist as part of these teams. A mechanism has to be put in place to ensure that

the socio-economic perspectives are built into the technology development process. Extension faculty may be weak (in terms of numbers as well as professional competency) in certain institutes. In such cases, efforts have to be made to strengthen their capabilities to contribute to the research process.

Box 1: Accessing farmers problems and linking it to research

The ICAR has a nation-wide network of Krishi Vigyan Kendras (KVKs) and majority of them located in remote areas, thus having close proximity to farmers. KVKs are identifying farmers' problems through district diagnostic surveys, rapid rowing surveys and regular field visits. Thousands of farmers visit KVKs in pursuit of solutions to their problems. Though these are documented in KVKs, researchers in NARS are not properly using these. There is a huge scope for systematizing the flow of researchable issues, particularly to ICAR and SAU research stations and also get back to farmers within a reasonable time limit. Extension research that enables pooling and up-linking of researchable issues to the larger system of NARS is a challenging and daunting task. The Promotion and Uptake Pathways (PUP) of technologies generated by the research system will be an emerging area of research for extension itself.

Kisan Call Centres (KCC) of Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, function on 16 x 7 basis across the country. Kisan Call Centres are receiving about 6 lakh calls a month or about 20000 calls a day. At least half of these calls are genuine and real indicators of problems of various kinds – mostly pest & disease outbreak, climate/weather related events, input availability, water and soil management etc. But, there is no mechanism to get these problems conveyed to research systems on a real-time basis. A software and network driven mechanism needs to be put in place so that these problems are automatically categorized according to the domain of each Institute and

Research fall into their **(basice-&mailapplied)** box for use in research activities. Accessing the data base of farmers' problems, including the personal and demographic details, from the Ministry of Agriculture, is a precursor to the whole process

Development

This stage deals with putting new ideas in a form that is expected to meet the needs of potential users. The concept of 'social construction of technology' argues that technology acceptance is shaped by social factors. Technology is a product of society and is influenced by the norms and values of a social system. For example, an oilseed crop variety that is not accepted by oil mill industries will never see the light of day. The social construction of technology is yet to get its

due share in the technology development process. For institutionalizing the social construction of technology, nation-wide research in extension needs to be built into research agenda of the entire NARS (Box 2). The present structure of ICAR and SAUs has not been encouraging for extension research to facilitate the technology application process. Most of the extension scientists are deployed in routine works such as organizing training programmes, conducting events, managing visitors to institutes, handling documentation responsibilities etc.



Box 2: Strengthening extension research in ICAR

Extension research in India has never taken-off beyond a certain level of applied research. During XIIth Five Year Plan, the Agricultural Extension Division of ICAR has proposed for a specialized institute for Extension Research. To begin with, there is a need to identify a team of small but free thinking teams of researchers to pioneer in creating "extension innovations" that facilitate social construction of technologies. This could be similar to "skunk works", a name that became popular during World War II, for the dedicated work carried out by a small group of individuals in an enriched environment in developing military technologies. Steve Jobs of Apple Computer, Inc. used this strategy to develop the Macintosh, which became a super hit product. In a similar fashion, crash teams are required to be set up by ICAR so that the extension research gets a foothold in the NARS. Besides, the output of such research could serve as basis for policy formulation to facilitate extensive up-scaling of high-impact innovations.

Commercialization

From the extension research point of view, commercialization of a technology can be facilitated by identifying its potential application zones. Under NARP, the entire county was categorized into 127 agro-climatic zones. Each agro-climatic zone is not only vast (the country has 640 districts, an average of 5 districts per agro-climatic zone), but also vary widely in their micro-situations. Soil conditions vary by tens-

of meters than kilometers. High degree yield variation exists across regions and between farmers. Part of the variation is being explained by climatic, edaphic and management factors. But variability exists despite similar climatic and edaphic factors and the reasons range from non-adoption of technologies to lack of support systems. Yield gap analysis is a known and well accepted practice to ascertain the scope for introduction of new technologies to a given agro-climatic situation (Box 3).

Box 3: Yield Gap Analysis

Analysis of yield gaps is also a continuous process, as adoption of technologies may vary from season to season and hence, the yield gap levels may also likely to change. It is, therefore, essential that extension research must standardize the ways and means to accurately and continuously assess yield gaps for all major crops and agro climatic zones. Recently, the Working Group on Agricultural Extension constituted by the Planning Commission (Government of India) has indicated the following broad levels of yield gaps:

Gap-A: Genetic potential yield - Maximum yield at the Research farm

Gap-B: Maximum yield at Research farm - Maximum yield under FLDs

Gap-C: Maximum yield in FLD -Maximum yield on farmer's fields

Gap-D: Maximum yield on a farmer's field- District average

Gap-E: Maximum yield on a farmer's field-Average yield in a group of villages around

Gap-F: Maximum yield on a farmer's field- Average yield of farmers in the same village

Farmers manage their each piece of land differently. In such situations, it is foolhardy to think and recommend technologies very generically. What is needed is technology mapping and indexing (Box 4) which needs a

strong and viable partnership between research, extension and local institutions. Mechanisms, are therefore, needed to institutionalize this concept through strategic and translational extension research.

Box 4: Technology Mapping

Technology mapping has been used here in two senses. In the first case, a technology is tested for its applicability/suitability in as many locations as possible through technology assessment process being carried out by Krishi Vigyan Kendras. Second and most important dimension is mapping of all relevant and suitable technologies to a particular micro situation, which may give us the Technology Availability Index to that micro-situation. A similar mapping may also be used for indicating technology adoption. A comparison between technology availability and technology adoption maps throw out technology gap for each micro situation. The challenge lies in not only the preparation of such maps and indices, but also in updating and digitizing them for wider utilization on a continuous basis.

Commercialization of technologies doesn't always happen through commercial organizations. It

could be achieved through small organizations as well. Successful promotion of paddy

mechanization by a group of trained and equipped women group in Kerala known as Paddy Task Force is an example of how small organizations can commercialize a technology. Production and supply of bio-products viz., *Trichoderma*, *Pseudomonas* by tribal women groups in Waynad district of Kerala for use in controlling wilt disease in pepper, and mass multiplication of *Acerophagus* predator against papaya mealy bug in tapioca in Namakkal and neighbouring districts in Tamil Nadu are some other examples.

At a time when rural youth are shying away from agriculture, attracting and retaining rural youth in agriculture is a researchable area for extension. Agri-entrepreneurship is an achievable proposition since the characteristics of entrepreneurs are not inherited but can be developed through systematic motivational training and capacity building. Farm and non-farm business opportunities that ensure more employment and income to rural youth need to be tested and applied through partnership approaches. Developing entrepreneurial motivation training modules, designing appropriate strategy to develop entrepreneurship and agri-business models and agri-based business models for peri-urban systems should be an agenda for extension research.

Diffusion and adoption

Extension services in India are pluralistic in nature, with multiple service providers under both, organized and unorganized sector. Convergence between and among stakeholders in agricultural research and development has become a buzzword, but we still need to identify the limitations and constraints in developing linkage and convergence at the ground level. In the Development Departments, majority of the states have their staff up to block level only. Several positions below block level (which is often called the cutting-edge level) remain vacant. Extension personnel who are in position, perform multiple roles, and hence have very limited time and resources for extension education. Most of the times, they are pre-occupied with implementation of government schemes linked to subsidies and subsidized inputs.

Research on designing and validation of alternate extension approaches, identifying potential partners and mechanisms to achieve sustainable partnership has attained greater significance. The effort of Division of Agricultural Extension, IARI in this regard through developing linkage with branch post masters at village level is very pertinent. About 1.55 lakh post offices exist in India and out of these more than 90 per cent are

rural. Each of these branch post offices cater to six to sixteen villages and the branch post masters are generally resident of that area and practice farming. Capacity building of rural branch post masters for technology dissemination has been experimented and found successful.

Critical inputs like quality seeds of improved varieties can also be delivered to the farmers through this channel. Another Institute which has equally strong presence in the village level is Milk Cooperatives. These can be potentially used as Extension Outreach Centres. Such innovative experiments can prove research in extension meaningful.

Use of ICTs

Information and communication technology (ICT) tools are proving to be an important mechanism to maintain continuous contact with the farmers. Very little evidence is available on the utility of these ICT tools in improving technology adoption. Application of ICT tools have been limited by the constraints both from the demand and supply sides. From demand side, the major limitation is that not all farmers can be reached through language other than their local dialect. Many women farmers who are the actual practitioners and users of the agricultural technologies in real field situations are yet to accept ICT tools for communicating with extension system. On the contrary, supply side has the limitations of lack of connectivity and power availability in rural areas, non-availability of gadgets that support local language etc. Research on strategies and avenues that stimulates use of ICTs for extension, keeping in view these supply and demand side constraints, needs priority attention.

Content management

It is very important in any information and communication intervention. The localization and customization of content is influenced by the way the content is accessed from different sources, assessed to a particular context and delivered in the form and style acceptable to end users. Participation of local farmers in developing these modules is also a key factor as the farmers identify themselves with the situation and the technology. Participatory content development is being attempted in many rural settings and programmes (eg. Digital Green, Community Radios etc). However, there are no easy ways to tap, track and put to use the available information and knowledge (tacit as well as explicit, formal as well as informal). Research based efforts are needed to put in place data warehouses, repositories, search engines and social & technical networking to harness the unearthed potential of ICTs for agricultural development.

Extension Management

The management efficiency of extension and development organizations has to be increased to accelerate the process of development. There is a need to analyze the drivers and processes of innovation and institutional development, devise strategy for sustainable institutions and synergetic convergence, assess the effectiveness of extension models and approaches and develop training modules for enhancing management competencies of extension professionals.

Social mobilization for technology uptake

Group approach to extension has become inevitable considering the widening and unmanageable ratio of farmers to extension workers, which is the result of increased number of holdings on one hand and non-filling-up of vacant posts of extension personnel on the other. Farmers' groups are being formed by many agencies, but are not being nurtured properly to facilitate uptake of emerging agricultural technologies for enhancing their entrepreneurship prospects. Delineation of the factors responsible for successful group mobilization and documentation of good extension practices (GEP) for technology

application, group action, empowerment and capacity building are other promising areas for extension researchers.

Consequences

Commercialization of any technology leads to consequences for its adopters/users. These consequences have, in the past, been skewed towards elite sections of the society. Even the change agents, who are recruited to serve the entire community, have a tendency to work with progressive farmers. It's a challenge to develop technologies which are scale-neutral and diffuse them into the social system in such a way that use of such technologies leads to greater equity in the socio-economic consequences. There is a need to bridge the time gap in the technology uptake between "innovators" and "laggards". Even more desirable is to eliminate the late adopter categories. Extension research that facilitates development of scale-neutral technologies is as much important as that of extension tools and methods that empower small and marginal farmers to accept and benefit from such technologies. Extension research in this area is urgent as well as important. Undertaking tracer studies is one such option in this context (Box 5).

Box 5: Tracer Studies

In order to ascertain the successful cases of technologies which have been developed and disseminated with greater degree of equity, "tracer studies" may be very appropriate. These tracer studies are very useful in a detailed study of successful innovations and possibilities of replicating the best of such innovation development processes by scientists of NARS. There are certain weaknesses in tracer studies. These tracer studies are always retrospective in nature, study only the innovation development process but not the consequences part, use limited sources of information for data collection and give a notion that all innovations are developed in a planned manner. It's a challenge to design and carry out tracer studies overcoming limitations and use the results for generating and disseminating technologies resulting in achieving equity.



Acceptance and continued use of many technologies depend on the prevailing development policies, climate/weather parameters, availability of inputs, supporting factors like market, institutions, credit availability and user/consumer preferences. The extension researchers may have to constantly watch the suitability of earlier recommendations to changing circumstances. The changing climate and market forces may necessitate frequent recall of technologies with new/alternate technologies suitable to different micro-situations. It is interesting to know the impact on credibility of change agency if innovation discontinuance is desired for a previously recommended innovation. Research is needed to understand the concerns while handling such tricky situations.

Feminization of agriculture has become a reality and has implications for technology application, but the problem is yet to be taken cognizance of by the extension researchers. Gender empowerment is essential to face paradigm shifts in agriculture. Conscious and concerted efforts and research are required to push forward the processes that would help, generate and promote technology, policies and institutions based on participatory assessment of gender needs, roles and resources.

Way Forward

Most of the evidences to substantiate the importance of extension research for agricultural development have been only anecdotal. Though the field of extension globally has moved beyond technology transfer, extension research in India is still stuck in need assessment of farmers and constraint analysis. As extension discipline has drawn its contents from various other disciplines, scope and space for interdisciplinary research is very high. There is an urgent need for a strong extension research to generate acceptable proof of contribution of extension research to agricultural development.

Technology development that is happening in informal sector, by farm innovators, entrepreneurs etc. have strong fundamentals as they are essentially problem-solving in nature. However, these innovations fail at commercialization and dissemination stages for lack of support from formal systems. Thus, extension research needs to work with both formal and informal R&D set up so that research for development becomes a reality. Extension research has to be more inclusive in order to ensure that problem-solving agricultural research generates results that are not only commercialized and widely disseminated, but also have equity concerns.

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ACTION RESEARCH– A PROFESSIONAL DEVELOPMENT APPROACH FOR STUDENTS AND TEACHERS

Agricultural extension professionals lag behind in conducting innovative research and generating new knowledge, mainly because of their dependence on conventional research methods. In this blog, Sagar Wadkar, Birendra Kumar, and P Sethuraman Sivakumar highlight the need for promoting action research in extension –as a process to build the empirically-based research capacity of students and teachers– along with a strategy to create and maintain positive social, economic and environmental change.

Farmers in developing countries face several new challenges. These include dealing with uncertain markets and weather, declining land and water availability and their deterioration, and increasing cost of inputs compared to declining income from farming. Extension professionals need to be more realistic and technically competent to address many of these issues. Extension professionals need an empathetic lens to see and understand the target clientele/community better. They should have the ability to analyse a particular issue or field situation from a historical, political, socio-cultural and economic point of view. However, the existing curricula in general and research methodology courses in particular, offer a theoretical orientation for doing research. We need pragmatic orientation to develop this competency for understanding communities, their dynamics and environment.

The extension research was initiated under the influence of a diffusionist approach with emphasis on 'why don't' they adopt innovation, and 'who' adopts and 'why', finding the critical variables that fuelled transfer of technology approach. However, the Master's and Doctoral researches in extension are discipline-focused, oriented towards knowledge acquisition in aspects related to extension rather than skills development and field application/intervention. Research methodology courses currently orient extension students on scientific ways of conducting research. They are taught scientific methods of problem formulation, collecting data, analysing it and reporting. Accordingly, they do research, collect data and analyse it in ways that enable them to describe situations as they exist and/or report impact of any intervention, package of practices, etc., and come up with a 'list of recommendations' for others to implement. This process develops their competency in doing research, but they cannot change field situations and thus produce reports that have minimal application in the field. Adversely it also does not set them apart from other students doing similar academic studies. Sivakumar and Sulaiman (2015) observed that currently extension research in India is not providing any substantive input for extension policy or in generating good practice of extension. Due to lack of practical significance and stagnation in theory development, extension research is often criticized by other agricultural disciplines as a 'non-performing discipline' (Sivakumar 2015).

Therefore for universities to be more consistent with stated institutional mandates, which emphasise problem solving for communities and national development, empirical research needs to be balanced through the integration of more development-oriented and participatory action

research that enable them to generate empirical data, which further can be used to solve farmers' problems.

The committee on doubling farmers' income (MoA&FW 2017) has also suggested identifying the location-specific problems of farmers, and accordingly the research priorities of post-graduate and doctoral scholars must be guided. Thus, there is a need for application of action-oriented methodologies to make extension research more field-oriented, problem-focused and ethically satisfying.

Action Research

Action Research (AR) is a process of action inquiry that follows a cycle in which one improves practice by systematically oscillating between taking actions in the field of practice, and inquiring into it. The basic action inquiry cycle is about planning for improvement in the practice, acting to implement the planned improvement, monitoring and describing the effects of the action, and then evaluating the outcomes of the action (Tripp 2005). Thus, it is carried out for people, with people and by people, and begins with a systematic investigation of the problem in order to formulate the right questions based on interactions with stakeholders. Unlike academic research, it calls for more engagement with the field. Action is designed to solve problems being faced, and research verifies the efficacy of the action.

It is often considered as social research for social change¹, which demonstrates working towards a resolution of the impetus for action with the reflective process of inquiry and knowledge generation, so as to generate new practices (Somekh and Zeichner 2009). A more succinct definition of AR is:

"...aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. Thus, there is a dual commitment in action research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. Accomplishing this twin goal requires the active collaboration of researcher and farmers, and thus it stresses the importance of co-learning as a primary aspect of the research process." (Thomas et al. 1986).

This approach was found to be effective in helping and empowering farmers, especially when educational institutions, non-governmental organisations, and farmers work together.² Kurt Lewin, who first pioneered the action research concept (Box 1), viewed it as a cyclical, dynamic, and collaborative process; and since then action research and its variations have been adopted in a variety of disciplines, including education, psychology, community health sciences, and more recently in rural development.

How is it different from Traditional Research?

AR emphasises problem solving through 'learning by doing'. It focuses on practice of enquiry through concurrent activities. But it is not simply a problem-solving activity. There is dual commitment in action research – to study a system and concurrently to collaborate with members of the system in changing it, in what is together regarded as a desirable direction. Several attributes separate action research from other types of research. Firstly, it focuses on turning the people involved into researchers too. Secondly, it has a social dimension. The research takes place in real world situations and aims to solve real problems. Thirdly, the initiating researchers make no attempt to remain objective, but openly acknowledge their bias to the other participants. Owing to these attributes and other principles it is not possible to place action research in a positive paradigm, especially since the paradigm is based on objective reality and relies heavily on quantitative measures. Action research shows a number of perspectives within the interpretive paradigm. Though this paradigm relies on qualitative measurement, it still retains the ideals of researcher objectivity and researcher as passive collector and expert interpreter of data. Therefore, it is also not the right paradigm for action research. Affiliation of action research lies with the paradigm of praxis. Praxis is the art of working upon the conditions one faces in order to change them. Knowledge is derived from practice and practice informed by knowledge in an on-going process – this is a cornerstone of action research. It also rejects the notion of researcher neutrality, recognizing that the most active researcher is often one who has most at stake in resolving a problematic situation. Thus AR employs recognised research techniques

¹Greenwood and Levin. (1998.) *Introduction to action research: Social research for social change*. London: Sage.

²Suvedi M and Ghimire RP. (2016.) *In search of an alternative agricultural extension strategy: An action research on off-season vegetable production in Nepal*. *Journal of International Agricultural and Extension Education* 23(2):50-62.

to inform the action taken to improve practice, requires action in the fields of both practice and research, so to a greater or lesser extent, it will have characteristics of both routine practice

and scientific research. The following table shows how action research stands in relation to some of the differences between these two (Table 1).

Box 1: Origin of action research

As per evolution, four main streams emerged– traditional, contextual, radical, and educational action research (O'Brien 2001).

Kurt Lewin³ and Traditional Action Research

A German social and experimental psychologist, Lewin coined the term AR⁴ and characterized AR as an alternative to the norms of decontextualized research. Instead of focusing on surveys and statistical methods, action research's purpose is to improve social formations by involving participants in a cyclical process of fact finding, planning, exploratory action, and evaluation. Lewin has introduced four types of AR – Diagnostic (to identify a problem and help generate proposed solutions that would be acceptable to those involved in an existing problem situation (people involved in this AR may not themselves be directly affected by the problem); Participant (those affected by a problem are involved from the beginning in finding a solution. This type of AR, tends to have only limited local application and limited generalizability); Empirical (involves accumulating and recording day-to-day lived experiences within groups in order to build generalizable knowledge); and Experimental (using controls to test hypotheses in quasi-experimental conditions. Of all the varieties of AR, this AR has the greatest potential for the advancement of scientific knowledge; however, it is the most difficult form of AR to carry out successfully). Further he conceptualized all kinds of social change as a three-step process: preliminary diagnosis & data gathering (unfreezing) > action planning and co-learning (changing) □ integration of desired condition in existing structure (refreezing).

Eric Trist⁵ and Contextual Action Research

A social psychiatrist engaged in applied social research, Trist tended to focus more on large-scale, multi-organizational problems, which led to the founding of contextual action research, also referred to a 'action learning'. It entails reconstituting the structural relations among actors in a social environment, where all concerned parties and stakeholders participate so as to understand the working of the whole.

Paulo Freire⁶ and Radical Action Research

Freire, a Brazilian educator and philosopher, pioneered the Participatory Action Research (PAR) methodology, a subset of radical action research, which has a strong focus on emancipation and the overcoming of power imbalances. This method grew out of his critical pedagogy and emancipating theology ideas. He further emphasized the significance of critical consciousness for social change, where oppressed groups can take up their own action for their self-upliftment. The two branches of this school are PAR and Feminist Action Research.

John Dewey⁷ and Educational Action Research

An American educational philosopher, John Dewey believed that development practitioners, and professional educators, should engage in solving community problems by professional development, curriculum development, empowerment and action learning. Dewey's problem solving model (known as reflective thinking) is popular and he affirms that in practice, educational action research influences the quality enhancement of teaching and learning. This evolved into the living theory approach – to justify the practitioners' educational influences in their own learning by asking "How am I improving what I am doing?" (Whitehead 1989; McNiff 2002).

³Lewin K. (1948.) *Resolving social conflicts: Selected papers on group dynamics*. Ed. Gertrude W. Lewin. New York: Harper & Row.

⁴Lewin K. (1946.) *Action research and minority problems*. *Journal of Social Issues* 2(4):34-36.

⁵Trist Eric. (1977.) *A concept of organizational ecology*. *Australian Journal of Management* 2(2):161-75.

⁶Freire P. (1970.) *Pedagogy of the oppressed*. New York: Seabury Press.

⁷Dewey J. (1929.) *The quest for certainty: A study of the relation of knowledge and action*. New York: Minton, Balch and Company.

Table 1: Differences between routine practice, action research and conventional research

S. no.	Routine Practice	Action Research	Scientific Research
1	Habitual	Innovative	Original, resourced
2	Continuous	Continuous	Occasional
3	Responsive, contingency driven	Pro-active, strategically driven	Methodologically driven
4	Individual	Participatory	Collaborative/Collegial
5	Naturalistic	Interventionist	Experimental
6	Unexamined	Problematized	Commissioned
7	Experienced	Deliberative	Argued
8	Unarticulated	Documented	Peer reviewed
9	Pragmatic	Understood	Explained/Theorised
10	Context specific		Generalised
11	Private	Disseminated	Published

(Source: Tripp 2005)

The process of Action Research

Extension researches are applied in nature, meaning that the findings need to be useful for changing behaviour of the clientele group. However, in reality the methods used are no different from the other social research methods except that the problems are field-oriented mostly. Inclusions of action research in education and management have the logic of relevance and applicability. It is a process to conduct research in a natural setting, and learns from the findings that go on to improve the situation. Here action and research go hand in hand. Research is conducted to solve a problem being encountered by the practitioners and then the researcher takes efforts to understand and conceptualize the problem and form hypothesis for alternatives. Then s/he takes actions systematically to solve the problem. Along the way s/he also collects data to measure the impact of the action. It is a cyclic process of action and reflection. The best part of the research is its focus on applicability of the solutions. It is so different from academic research that many academicians may refuse to accept it as research, but the relevance of the

methodology may motivate them to use it to learn from everyday action and practice. Thus, it deals with two things: action (what you do) and research (how you learn about and explain what you do). The action aspect of action research is about improving practice. The research aspect is about creating knowledge about practice. The knowledge created is your knowledge of your practice (McNiff and Whitehead 2010). A few examples of conventional extension research questions and action research questions are displayed in Table 2.

However, action research is very challenging and difficult to do. Normally academics accustomed to conventional data-based research may find the whole exercise unpalatable and unresearch-like due to the uncertainties regarding conceiving, conducting, reporting and publishing such research.

Various scholars have explained action research as emancipatory research, collaborative inquiry, and action inquiry, but all are variations on a theme. There are many models and guidelines for engaging in the action research methodology

Table 2: Differences in conventional and action research questions

S. no.	Conventional extension research	Action research
1	What is the relationship between adaptor characteristics and adoption of improved	How do I influence the farmers so that they adopt the improved technology?
2	Does the leadership style influence the extension worker's productivity?	How do I improve the leadership style of extension managers so as to improve worker productivity?
3	Does the extension intervention (FLD, etc.) improve the farm income?	How can I increase the farm income by implementing A specific extension intervention?

Case Study 1

1. Linking research institute with post offices for dissemination of agricultural technologies: An action research project

The aim of this action research project conducted by the Indian Agricultural Research Institute (IARI), New Delhi, was to establish linkage with Post Offices for dissemination of agricultural technology and package of practices. In the first phase of the study, an exploratory and descriptive study was conducted on the possibility of establishing linkages with post office in dissemination of IARI technology. During the course of this process the post offices and their personnel at district, block, and villages levels in Sitapur district of Uttar Pradesh were contacted, and the trends in post office workings in the last 10 years was assessed. In Phase 2, suitable crops and their varieties were identified and disseminated through the postal network; then performance was assessed. Performance of these crops was assessed in terms of area coverage, yield obtained, total quality of produce generated for further use, and their economics for high volume-high value and low volume-high value crops. Post office personnel's and farmers' perceptions (n=200) were ascertained and correlated to see the degree of convergence. As a result, the AR team including post office personnel, conclusively decided to disseminate IARI's quality seed and related package of practices through Post Offices.

In 2011–12 Rabi season, 1014 farmers under seven post offices in two blocks, namely Sidhauri and Kasmanda, covering 30 villages were reached through this approach. It was observed that more than 90% of the farmers received the seed of wheat, paddy, pigeonpea, bajra (pearl millet), mustard, bottle gourd, pumpkin, and okra crops sent through post offices within 4–6 days of despatch from IARI. At the evaluation stage, a survey was conducted with certain identified farmers to analyse their feedback regarding IARI seeds, seed despatch mechanism and related issues. The performance of IARI crop variety was found superior as compared to prevailing popular varieties. Farmers, as well as village post office personnel, found this approach very effective and a successful means for making the improved agricultural technologies available in the rural areas in fairly less time and cost. In the final stage, the capacity building of farmers and post office personnel was done so as to raise their level of agricultural knowledge; and cost sharing for high volume crops further helped to improve the sustainability dimension of this approach. This AR helped to generate a new empirical model of transfer of technology through post-offices, and helps to strengthen backward linkages with research institutes.

(Source: Dubey et al. 2012)

Agriculture and rural development is based on local resources, bio-physical properties, and more importantly, the capabilities of people as key resources. AR helps to utilise these local resources and capabilities and offers a

practical approach to innovation and support, and facilitates change processes concerning issues of sustainability of livelihoods. These aspects are highlighted in Case Study 2 (below).

Case Study 2

2. Improving income for walnut growers in Kishtwar, Jammu and Kashmir, through better marketing linkages and value addition at the source

Jammu and Kashmir (J&K) State contributes almost 98% of the total walnut production in India. In the state, Kishtwar district is the major contributor, and offers huge potential for high incomes to farmers. However, factors such as a large number of middlemen, lack of market information and connectivity, and low value addition at source have prevented the benefits of these endowments from reaching the actual growers of this region. Farmers lost up to 38% of their potential income in the year 2013-14. In this backdrop, action research was undertaken with the focused objective of increasing per capita income of walnut growers through effective post-harvest management. The study was divided into three major parts. In part 1 situation analysis was carried out to understand the context and identification of the problem. This was performed by narrowing it down to the commodity–Walnuts, then value chain analysis and the opportunity therein; and finally identification of villages for which a rank-based ordinal approach was adopted, then the Panchayat with the top score was selected based on quality and quantity of walnuts, and ratio of small farmers to large farmers.

In the second stage, analysis of the existing walnut-marketing channel was assessed; walnut growers were sensitised and mobilised towards post-harvest management, their capacity built to undertake different functional roles (as monitors, harvesters, collectors, processors and transporters) for primary processing at the source, and finally the per capita gain in income was calculated and revealed, and the process documented. As a result, a village, 'Sigdi', was identified for the study. The potential of gain from the last

selling prices of producers per kg was found to be 31% for shelled walnuts and 47% for kernels. Therefore it was decided to have manual cracking of walnut at household level, then at district level grading, segregation, quality inspection and packing was done, and finally transportation of packaged kernels and shelled walnut to the local and national market. All these efforts resulted in: dissolution of the information barrier, increased value due to processing, and higher offer prices in the new market. Consequently the average earning for 297 households of the village increased by 28% in addition to perceivable improvement in the status of women. The action research approach adopted by the team (growers, panchayat representatives, and district officials) and convergence displayed by the various government functionaries truly reflect the essentials of a successful intervention. This approach helps to organise farmers so as to strengthen their organizational and entrepreneurial capacities. It was also observed that in the absence of this foundational phase, farmers will not develop the necessary ability to function as genuine partners in value-chain analysis.

(Source: Sharma 2017)

Action research engages the researcher in a collective action approach and enables them to implement the programmes and schemes efficiently and thus develop new solutions that

can change existing practices. They can moreover then test the feasibility and features of these new solutions, innovations, products, services, etc. (Case Study 3)

Case Study 3

3. Improving efficiency of skill development schemes: Action research in Naxal-affected Narayanpur district of Chhattisgarh

The aim of this AR was to improve the efficiency of the skill development scheme in order to provide suitable livelihood opportunities to prospective youth. This study analysed the three major skill development programs – Mukhya Mantri Kaushal Vikas Yojana, Deen Dayal Upadhyay Gramin Kaushal Yojana and; Rural Self Employment Institute– implemented in Narayanpur district under the aegis of the Chhattisgarh Skill Development Authority. The study divided into four major parts: a) Situation analysis to assess skill demand was conducted through a survey to understand the employment status in the district and demand for skill courses among the potential youth (age group of 14 - 45 years); b) Skill gap analysis to ascertain prospective employment opportunities in the district and State were mapped with the help of local administration, local employers, entrepreneurs, government officials, and upcoming industries in the district; c) Content analysis of selected schemes were carried out to understand the provisions under each scheme; and d) accordingly a perspective plan for the effective implementation of these schemes was prepared and executed. The AR team has a proactive role in all phases of the AR process, comprising District Skill Development Authority and its enabling agencies, 35 anganwadi sevikas, 52 saksharata preraks, 38 vocational training providers, 26 private employers within the district, all facilitated by a Rural Development Fellow as the Researcher. Thus it is suggested that there is need for convergence of the relevant schemes at the district level for its effective implementation. Any scheme or program should not be implemented as a standalone plan, but it should be part of a larger framework that includes education, people's development, livelihood security, employment generation and socio-economic integration of society, for its effective implementation.

(Source: Patki 2017)

Potential of AR in Extension

Action research has immense potential in extension. In general, most research problems in extension are complex in nature, calling for multi-disciplinary collaborative action. As extension research strives to advance knowledge, one has to master the skill while solving the problem. A few examples of action research in extension science are shown in Table 3.

A few research papers on Action Research

The following research papers examined action research approaches on various aspects related

to agriculture; and then were published in highly-rated and peer-reviewed international journals.

Distance education

- Nunes JMB and McPherson MA. (2003.) An action research model for the management of change in continuing professional distance education. *Innovations in Teaching and Learning in Information and Computer Sciences (ITALICS)*, 2(1). (Citescore2017- 0.27).
- McPherson MA and Nunes JMB.(2002.) Supporting educational management through action research. *The International Journal of Educational Management* 16(6):300-308. (CiteScore 2017:1.16).

Table 3: Examples of action research in extension

S. no.	Research problem	Objectives of research	Type of action research	Variables	Who will conduct the research and outputs
1	The vegetable farmers are suffering from unstable market prices of seasonal vegetables. The aggregators, who collect vegetables directly from farms are exploiting the farmers by paying a lower price. The farmers' share in the consumer price is estimated at 55% despite their proximity to Delhi. There is a need to design sustainable value chain interventions in order to enhance the welfare of vegetable farmers.	To enhance livelihood of farmers through sustainable value chain intervention Steps 1. Selection of value chain; 2. Mapping of value chain; 3. Assessment of value chain to identify intervention points; 4. Develop a competitiveness strategy; 5. Design and implement value chain interventions; 6. Monitoring and evaluation; 7. Institutionalisation – Creating Farmers' Organisations, like FPO, etc.	Participatory value chain intervention Mixed methods research design • Multi-disciplinary – Economics, extension, seed technology, food technology, agronomy; • Type of user involvement – Collaboration; • Integration of research with extension work – involves creation of farmers' groups/ FPOs, demonstration of technology, training of stakeholders, farmers' seminars/ workshops, market linkage, and entrepreneurship development.	<ul style="list-style-type: none"> Variables <ul style="list-style-type: none"> Marketing channels, market-related operations, value chain actors and processes, interconnections and flows, current technologies and problems, profit at each level, price spread, share in consumer rupee, interventions, entrepreneurship orientation of farmers, entrepreneurial eco-system; Methods – PRA, focus groups, market survey, document analysis, participatory observations; Major statistical tools – network analysis; regression. 	<p>Who Two PhD student theses, or three to four MSc theses, by splitting the research components.</p> <p>Outputs</p> <ul style="list-style-type: none"> Research papers in quality peer-reviewed journals; Development of an extension model with reasonable replicability; Improving adoption of University-developed technologies; Suggestions to University to modify existing technologies or develop need-based technologies; Demonstrating the University's role in socio-economic development of the population it serves.
2	The state government has announced a programme on peri-urban agriculture with a focus on promoting home gardening in cities. The idea was to increase the availability of safe and nutritious vegetables in cities while maximising the green cover to combat pollution. As a part of the programme, the University is	To develop a course management model to provide quality learning experiences Approach Development of an integrated learner-centred model for course improvement, tutor development, course management strategies and infrastructure evolution.	Distance Education Management Action Research Mixed methods research design - • Multi-disciplinary – Extension, Computer Science/ Engineering, Horticulture; • Type of user involvement – Collaborative – implemented through a Learner Club created for study Steps 1. Creation of Learner Clubs;	<ul style="list-style-type: none"> Variables - specific topics desired by learners, type of information/ skill desired, preferred learning mode/ -media; learner characters – learning style (cognitive, visual, auditory, kinaesthetic and tactile); current knowledge/skill levels, education, motivation to learn; feasibility studies of home gardening at their place; availability and access to seeds and other inputs 	<p>Who Two PhD student theses or three to four MSc theses, by splitting the research components.</p> <p>Outputs</p> <ul style="list-style-type: none"> Research papers in quality peer-reviewed journals in computer based learning or distance education; Development of a distance model with reasonable replicability; Improving adoption of University-developed vegetable technologies and systems;

designing a distance education course on vegetable-based home gardening, targeted towards housewives and retired people in urban areas. The course will be delivered through the existing distance education system of the University. The extension department is tasked with designing the educational management approach for the specific course.

Models

1. Educational Management Action Research model (McPherson & Nunes 2002)

2. Educational Systems Design Framework (Nunes 1999)

2. Diagnosis – Identification of learning needs and learner characteristics;
3. Action planning – Instructional design by combining pedagogical model with suitable educational setting; field testing of learning paths;
4. Action taking – Managing course delivery;
5. Action evaluation – Formative and summative evaluations on learning achievement

(customised to home garden needs); tutor selection and training, learning paths; learner feedback

- Methods – Participatory workshops with learners and tutors; participant observations; focus groups discussion; experiment (to assess user learning with different learning paths/ designs)

- Demonstrating the University's role in socio-economic development of the population it serves.

- Forster Mand Washington E. (2000.) A model for developing and managing distance education programs using interactive video technology. *Journal of Social Work Education* 36(1):147-158. (Thompson Reuters Impact Factor: 1.000).
- Nunes JMB and McPherson MA. (2003.) Action research in continuing professional development. *Journal of Computer Assisted Learning* 19:429–437. (Thompson Reuters Impact Factor:1.859)

Value chain analysis and intervention

- Murshed-e-Jahan K, Ali H, Upraity V, and Gurung S. (2018.) Making sense of the market: Assessing the participatory market chain approach to aquaculture value chain development in Nepal and Bangladesh. *Aquaculture* 493(1):395-405. (Thompson Reuters Impact Factor: 2.710; Cite Score: 3.05)
- Thiele G, Devaux A, Reinoso H, Pico H, Montesdeoca F, Pumisacho M, Andrade-Piedra J, Velasco C, Flores P, Esprella R, Thomann A, Manrique K and Horton D. (2011.) Multi-stakeholder platforms for linking small farmers to value chains: evidence from the Andes. *International Journal of Agricultural Sustainability* 9(3):423-433. (Thompson Reuters Impact Factor: 2.702)
- Lie Helene, Rich Karl M, Burkart Stefan. (2017.) Participatory system dynamics modelling for dairy value chain development in Nicaragua.

Development in Practice 27(6):785-800. (RG Journal Impact: 0.75).

Climate change and vulnerability

- Bryant CR, Chahine G. (2015.) Action research and reducing the vulnerability of peri-urban agriculture: a case study from the Montreal Region. *Geographical Research* 54(2):165–175. (Thompson Reuters Impact Factor: 1.343)
- Bele MY, Sonwa DJ, and Tiani AM. (2013.) Profiling climate change vulnerability and adaptive capacity of local communities in Bukavu, DR Congo. *The Journal of Environment Development* 23:331-357. (Thompson Reuters Impact Factor: 2.313)
- Mapfumo P, Nsiah-Adjei S, Mtambanengwe F, Chikowo R, and Giller KE. (2013.) Participatory Action Research (PAR) as an entry point for supporting climate change adaptation by small holder farmers. *Environment and Development* 5:6-22. (Thompson Reuters Impact Factor: 2.334)

Way Forward

Putting people at the centre of development is the key to sustainable development. In a changing development scenario, extension professionals need to be competent in both technical areas of their field as well as in process skills. Farmers' problems are multi-dimensional, it demands multi-disciplinary research and convergence of all relevant stakeholders (currently missing in most

extension researches), whereas action research encourages agricultural stakeholders to keep an eye on changes and modify their approach and programs to suit the changing contexts.

However, currently MSc and PhD research is limited by institutional mandates and protocols with a pre-determined approach, which needs to be reviewed if action research is to be encouraged. Action research provides a unique opportunity for students to look at how participatory methods can be translated from theory into practice, how they become institutionalized, and its impact on diverse farming communities. The knowledge gained and generated in the process helps academicians, extension professionals and development

practitioners to enhance theoretical understanding of how increasing peoples' participation leads to increased empowerment and decision-making. Further, this process of participation brings change in people and nurture a sense of belonging and ownership towards developmental efforts, thereby leading to sustainability of the intervention undertaken. The students with these new skill sets are expected to become development facilitators and/or managers of rural innovation, who can simplify complex development processes. We should encourage extension researchers, especially PhD scholars, to undertake action research on contemporary issues– this change may call for the capacity building of faculty in action research methodology.

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31

SAMPLE SIZE FOR EXTENSION RESEARCH – QUANTITATIVE STUDIES

Non-availability of sound guidelines for sample size estimation is the primary factor affecting the quality of extension research in the country. In this blog, P Sethuraman Sivakumar presents guidelines for choosing adequate sample for extension research.

Sample size is of primary importance for any applied scientific research as it directly influences the validity and generalisability of the research findings. In extension science, empirical research is expected to yield sound extension tools and techniques to help the field functionaries effectively implement extension programmes. However, the empirical extension research is often conducted with smaller samples, which is confined to a specific geographical or demographical population (Sivakumar and Sulaiman, 2015). Social science studies conducted with inadequate sample sizes are vulnerable to inconsistencies. Such studies are likely to produce contradictory findings when conducted on the same research problem on an identical population (Johnson and Lauren, 2013). Though there are many factors responsible for the small sample extension research, the non-availability of sound guidelines for sample size estimation is the primary factor affecting the quality of extension research in the country. The purpose of this blog is to describe the sample size estimation process and provide guidelines for choosing adequate sample for both the quantitative and qualitative studies in extension research.

Sampling Strategy

The strategy is the plan devised by the researcher to ensure sample chosen for the research work represents the selected population. Choosing an appropriate sampling strategy is a key aspect of the research design. Robinson (2014) proposed a four-point sampling process for systematically selecting adequate samples for obtaining quality results.

- 1. Define a sample universe:** Establish a sample universe, specifically by way of a set of inclusion and/or exclusion criteria. Inclusion criteria specifies the attribute(s) that respondents must possess to qualify for the study and the exclusion criteria stipulate attributes that disqualify a case from the study. For example, in a research investigation focusing on the "Information source utilisation of Bergrowers", the inclusion criteria is "Ber grower (Current/ past specified in years)", while the exclusion criteria is "growers of other crops". During the selection, the homogeneity of the samples i.e., demographic (e.g. youth), geographical (e.g. Maharashtra or Tamil Nadu), physical (e.g. female workers), psychological (progressive farmers) and life history (e.g., migrant workers) should be considered.
- 2. Deciding on sample size:** The size of a sample used for a quantitative or qualitative extension research is influenced by both the theoretical

and practical considerations. The theoretical considerations for quantitative studies include the nature of problem, the population size and the type of analytical strategies used; while qualitative investigations focus on the saturation and redundancy of the data collection methods (Robinson, 2014). The practical aspects include the time and resource availability, researcher capability and purpose of research work (e.g., for dissertations or sponsored research).

3. **Selecting a Sample Strategy:** The popular sampling methods in quantitative research are probabilistic and non-probabilistic sampling, while qualitative research uses random/convenience sampling and purposive sampling strategies. After deciding on the sampling strategy, the respondents required for each sample category (e.g., strata) is decided from the overall sample size.
4. **Sourcing sample:** When the sample universe, size and strategy are decided, the researcher needs to recruit the participants from the real world. Voluntary participation, recruiting students from the subject pools, advertising in social and print media for recruiting community members, online surveys with jackpot provisions are few ways of recruiting participants for research work. In this phase, the researcher should follow ethical guidelines (if suggested by the ethics committee) in advertising, selection and handling participants, confidentiality of research data, compensating participants for their time and effort, etc. However, the extension research in India is conducted without following any ethical practices as suggested by various "Human Subject Research" regulatory agencies. The ignorance and non-compliance with International ethical guidelines poses serious problems when the research outcomes are published in peer-reviewed international journals.

Sample Size Estimation for Quantitative Extension Research

In the quantitative extension research, the samples are drawn through either probabilistic or non-probabilistic sampling techniques and stratified random sampling is widely used by the researchers. Though the sampling methods specify few guidelines on the number of samples to be selected, the sample size is dependent on various other factors like type of study, nature and size of the population and choice of statistical analytical methods for the study. Other factors which help in deciding the sample size include the following:

- Confidence level at which the results are interpreted,
- acceptable levels of sampling errors and precision of the results expected,
- effect sizes required,
- variance and standard deviations of the primary variables reported by the past work.

In case of self-report methods, the expected response rates also influence the sample size since poor response rates are likely to reduce the sample numbers required and affect validity of the research.

The following are the factors to be considered while selecting the sample size for a quantitative study:

1. **Type of research investigation and test population:** The type of research investigation whether descriptive and observational or experimental, determines the number of samples required for the work. The descriptive studies employ minimal statistical estimation procedures like proportions and Chi-square tests, and sample size estimation procedures are described in the following sections. For experimental studies involving human subjects (e.g., knowledge gain from a multimedia instruction), the sample size depends on the design – replication, randomisation and stratification. The test population size also plays a crucial role in sample size estimation and the quantitative methods often require samples representing a maximum of 5% of the total population (Henry, 1990). The study population size can also be derived from past studies and secondary data sources (e.g. agricultural census). If the population size is unknown, the sample size can be estimated using the modified procedures as described in Box 1.

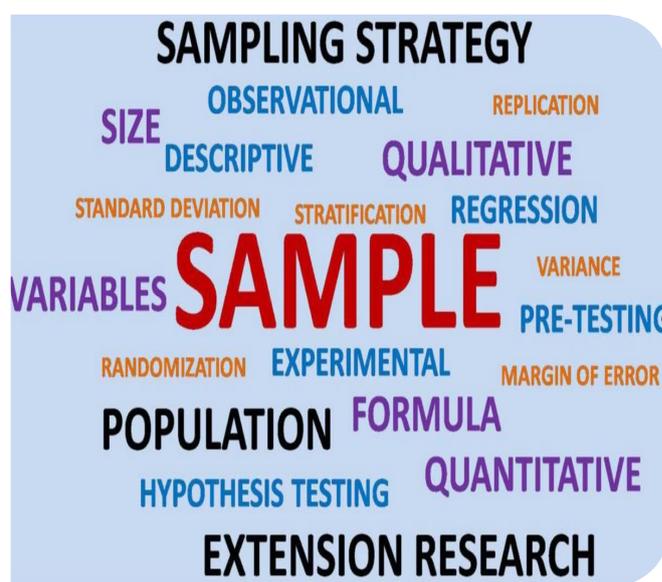


Table 1: Necessary Sample Size to Detect a Given Effect Size for Simple Linear Regression, ANOVA (t-test), and X² Analyses ($\alpha = 0.05$ and $\beta = 0.20$).

Multiple regression			ANOVA and t test	
Correlation coefficient (r)	Reqd. Sample size (N)	Eta (η)	Reqd. Sample size (N)	
0.10	782	0.10	396	
0.15	346	0.15	176	
0.20	193	0.20	99	
0.25	123	0.25	64	
0.30	84	0.30	44	
0.35	61	0.35	33	
0.40	46	0.40	25	
0.45	36	0.45	20	
0.50	29	0.50	16	
0.55	23	0.55	14	
0.60	19	0.60	11	
0.65	16	0.65	10	
0.70	13	0.70	9	
0.75	11	0.75	8	

(Source: Gatsonis and Sampson, 1989)

2. Primary variable(s) of measurement: A research investigation may use a variety of dependent and independent variables. For estimating the sample size, the researcher should decide the primary variables (dependent and few significant independent variables) to be included in the study. After deciding on the primary variables, the sample sizes are estimated separately for each primary variable or combinations using the formulae given in the Box 1. For example, if a researcher wishes to conduct a study on the factors influencing adoption of IPM for tomato crop, he/she should review the past studies to know the primary independent variables influenced adoption (e.g., gender, educational status, scientific orientation etc). Using the estimates of those variables (e.g., educational qualification correlation coefficient with adoption), the researcher can decide on the sample size using Table 1. After estimating the sample size for all primary independent variables individually, the researcher must choose the largest estimated sample size for the investigation.

3. Acceptable Margin of Error – confidence intervals and confidence levels: The margin of error is the error the researcher is willing to accept in the study. The margin of error depends on the confidence interval, which is

a measure of probability that a population parameter will fall between two set values. In any empirical research, we are selecting samples to estimate few numerical values for describing or analysing certain attributes of the respondents. The confidence intervals provide a range of values which represent a population parameter (e.g. adoption level of a crop variety or animal breed in the full population of the farmers in the real world) and tell us this that these values are true with a probability level (eg., 90%, 95% or 99%).

These probability levels are called as confidence levels. In any descriptive or analytical study, the confidence intervals are presented along with the mean and standard deviation of a specific attribute or variable. The confidence interval provides a range of values around the mean (both + or - mean) which represent the value of marginal error. It is necessary to decide on the allowable margin of error prior to the survey for calculating the appropriate sample size. It is decided by scanning through the past research studies on the same topic and identifying the reported mean values of primary variables. For example, if a researcher wishes to conduct a study on "Effectiveness of the training programme" with "Knowledge gain" as the primary variable, he/she should

find the knowledge gain mean values reported from the past studies and decide on the value to be used for sample size estimation. In social research, a maximum of 5 percentage points around the mean is used as marginal error (Krejcie and Morgan, 1970).

The confidence level indicates an alpha error value in hypothesis testing. The alpha (α) or type I error is a false-positive error of rejecting the null hypothesis that is actually true in the population, while the beta (β) or type II error indicates a false-negative error of failing to reject the false null hypothesis. Statistical power is probability of correctly rejecting the null hypothesis and is represented as $1 - \beta$. During sample size estimation, we are trying to reduce the alpha error by selecting a lower significance level of either 0.05 (95%) or 0.01 (99%) of the test. While an alpha level of 0.05 (5% probability for error) is acceptable for most social research, 0.01 (1% probability for error) is preferred when critical decisions are taken using the research results. As indicated in the previous paragraph, the confidence intervals are always expressed with a specific confidence levels (alpha error). The β error is not as serious as α error, but it is of particular concern when interpreting the results of a negative study, without statistical significance (no statistical significance or there is small significance and the test is unable to detect it). Statistical power for any sample estimation is conventionally set at 0.80 i.e. $1 - \beta = 0.20$.

4. Effect size: The effect size represents the size of the association between variables or difference between treatments the researcher expects to be present in the sample. If the researcher expects that his/her study to detect even a smaller association or difference between variables with precision, then he/she may need a larger sample size. For example, the knowledge gain from multimedia extension module can be detected precisely when the researcher tests the module with a large sample. In descriptive studies, the association or difference between the variables is reflected by the amplitude of the confidence interval calculated in the estimation. The effect sizes can be estimated from the reported values of association or effect from previous studies using Cohen's D, odds ratio, correlation coefficient and eta square methods. In general, the effect size (Cohen's d) of 0.2 to 0.3 is considered as "small", around 0.5 a "medium" effect and 0.8 to infinity, a "large" effect (Cohen, 1988). As a thumb rule, the associations or differences between variables reported in the past studies

with "small" effect, require a large sample size for further studies.

Various online effect size calculators are available in the Psychometrica website (http://www.psychometrica.de/effect_size.html).

5. Variance or Standard Deviation: When the variables analysed in the study are of a quantitative nature, their variability (variance or standard deviation) is considered for sample size estimation. Variance is a measurement of the spread between numbers or observations in a data set and is a square of standard deviation. The variance measures how far each number or observation in the data set is from the mean.

Cochran (1977) listed ways of estimating population variances or standard deviations for sample size estimations: (1) Select the sample in two steps, i.e. select the first sample and estimate the variance through pilot study and use the estimated value for the selection of sample size estimation for the main study; (2) use data from previous studies of the same or a similar population; or (3) estimate or guess the structure of the population assisted by some logical mathematical results. If the researcher finds difficulty in obtaining variance values from the previous study, he/ she can use an arbitrary value of 50% (Krejcie and Morgan, 1970).

In case of descriptive studies involving proportions, the researcher must specify the response distribution (labelled as p in the sample size formula) i.e., the expected proportion of the population that have the attribute the researcher is estimating from the survey. This proportion can be obtained from past studies, a pilot study or through other secondary sources. For example, if a researcher wishes to assess the gender differences in effectiveness of training on vegetable cultivation, he/she should review past studies to know the gender difference values (e.g., percentage of females who are satisfied with training). If this proportion is unknown, it should be arbitrarily set to 50% for use in the equation 1a. In case of descriptive studies involving means, the response distribution is replaced by variance or standard deviation (s^2 in Equation 1b).

Calculation of Sample Size

The sample size estimation follows the various aspects discussed in the previous section. Considering the complexity of sample size estimation, a simple way of deriving sample size based on the nature of the research investigation (pre-testing phase, descriptive and analytical or hypothesis testing) and type of

statistical tests planned for the study.

1. Pre-Testing (of Research Instrument): The pre-testing of the research instruments is a key phase of any social research study. The main purpose of the pre-test is to verify that the target audience understands the questions and proposed response options are used as intended by the researcher, and the respondents are able to answer meaningfully (Perneger *et al.*, 2015). Identification of problems in the instrument—e.g., unclear question, unfamiliar word, ambiguous syntax, missing time-frame, lack of an appropriate answer—lead to a modification of the instrument. The sample size for the pre-test in extension research is often decided based on few flexible criteria, without following any rigorous procedures.

Past studies indicated that a sample size of minimum 30 respondents to achieve a reasonable statistical power to detect problems in the instrument (Perneger *et al.*, 2015).

2. Descriptive studies: Descriptive studies are conducted to explore and describe a test population or their attributes in a systematic way. These studies are designed to estimate population parameters from sample which do not involve testing hypotheses. The data generated through these studies are described by presenting frequencies, proportions and means. The sample size estimation procedures for descriptive studies proposed by Rodríguez del Águilaa, and González-Ramírezba (2014) are described in Box 1.

Box 1: Sample size estimation procedure for descriptive studies

A. For finite populations (known population size)

Studies involving categorical variables

When the descriptive studies involve categorical variables, the researcher can estimate only proportions of particular attribute. Eg. Studies aim for describing a system (e.g. crop or animal production systems, ITK documentation). The sample size for studies involving categorical variables can be computed by the following formula (Rodríguez del Águilaa, and González-Ramírezba, 2014).

$$n = (t_{\alpha}^2 * p * q * N) / ((N - 1) * e^2 + t_{\alpha}^2 * p * q) \text{ Equation 1a}$$

Where n = Sample size to be estimated; t_{α} = value of the normal curve associated to the confidence level; p = expected percentage of population having a particular attribute; $q = (p - 1)$; e = accepted margin of error (usually between 5 and 10%) and expressed as percentage and N = Population size

Studies involving interval or continuous variables

For the descriptive studies involving interval or ratio variables, the descriptive like mean, mode, median and Standard Deviation can be computed. The sample size for such studies can be estimated using following formula:

$$n = (t_{\alpha}^2 * s^2 * N) / ((N - 1) * e^2 + t_{\alpha}^2 * s^2) \text{ Equation 1b}$$

Where n = Sample size to be estimated; t_{α} = value of the normal curve associated to the confidence level; s^2 = variance of the variable for which we want to estimate the mean; e = accepted margin of error (usually between 5 and 10%) and expressed as percentage and N = Population size

Correction for estimates exceeding 5% of total population

If the calculated sample size exceeds 5% of the population size, Cochran's (1977) correction formula should be used to calculate the final sample size.

$$n_1 = n_0 / ((1 + n_0 / N)) \text{ --- Equation 2}$$

Where N = Population size; n_0 = required return sample size according to Cochran's formula given in equation 1a or 1b; n_1 = required sample size because sample > 5% of population

Correction for response rate

The response rate is a crucial aspect in any research study involving surveys requiring voluntary participation of the respondents. Poor response rates often reduce the sample size and hamper the accuracy of the results. Salkind (1997) recommended oversampling i.e. increasing the sample size to the extent that will account for anticipated poor return rate. Oversampling can be achieved through four methods: (1) take the sample in two steps, and use the results of the first step to estimate how many additional responses may be expected from the second step; (2) use pilot study results; (3) use

responses rates from previous studies of the same or a similar population; or (4) estimate the response rate through a systematic study. When the response rate is calculated by using any one of the above methods, the final sample size may be calculated using the following formula:

$$n_2 = n_1 / (\text{Anticipated return rate})$$

Where n^2 = sample size adjusted for response rate; n_1 = required sample estimated from equations 1a or 1b or 2.

B. For infinite populations

In the case of infinite populations (population size unknown), the size of the population exerts no influence and the formulae referring for proportions and means are simplified.

Estimation of proportion (Categorical variable)

$$n = (t_{\alpha}^2 * p * q) / e^2$$

Estimation of a mean (Continuous variable)

$$n = (t_{\alpha}^2 * s^2) / e^2$$

where n = sample size to be calculated; p = expected percentage of population having a particular attribute; $q = 1 - p$; s^2 = variance of the variable for which we want to estimate the mean; e^2 = accepted margin of error; t_{α} = value of the normal curve associated to the confidence level.

After calculating the sample size, please estimate n_2 for correcting the response rate

3. Analytical studies involving hypothesis testing

Correlation and multiple regression

Regression analysis is used to examine the relationship between two interval- or ratio-scaled (continuous) variables. To estimate the minimum sample size for the multiple regression analysis, it is essential to understand the previously reported relationship/association between the dependent and independent variables. For example, if a researcher wishes to identify the factors which determine adoption of a biopesticide, he/she has to derive a value of association from the adoption level and independent variables like extension orientation, innovativeness, environmental consciousness etc from the previous studies. The association is represented by the "reported values of correlation coefficient (r)" between the adoption and independent variables. When the correlation coefficient is identified from previous studies, Table 1.

Gatsonis and Sampson, 1989) may be used to estimate required sample size (Weller, 2015). The table provides the sample size requirements for a given effect size (Correlation coefficient r) with default values of $\alpha = 0.05$ and $\beta = 0.20$. The first column contains the minimum correlation that can be detected and the second column contains the minimum total sample size necessary to detect it.

In case of several independent variables used in a single study, the researcher may calculate sample sizes for all independent variables and choose the largest sample for the study. If the researcher

is expecting a higher correlation between the dependent and independent variables from his/her study, the sample size can be selected based on the assumed value. The same procedure can be used for selecting sample sizes for the study involving estimation of Pearson correlation coefficient.

In case of research themes with no prior work or the correlation coefficients are not reported in the past studies, the method suggested by Maxwell (2000) may be followed. In this method, the correlations between the variables of interest are assumed as "medium", ($r = 0.30$ between dependent and independent variable) and the sample size is determined based on the number of independent variables for a default effect size of 0.80. Table no. 2 provides the required sample sizes derived using Maxwell's method (Maxwell, 2000).

Logistic regression is a limited-dependent variable model and the sample size estimation procedures are described in Box 2.

ANOVA and t test

An ANOVA (Analysis of Variance) test compares a single categorical independent variable (nominal, binary or ordinal) with more than two interval-scaled dependent variables. This is also called a one-way ANOVA, indicating only one independent variable. A special case of a one-way ANOVA occurs when the independent variable has only two categories. This comparison is often called a t-test, because the hypothesis test for difference between the two means uses the t probability

distribution (Weller, 2015). The extension studies involving testing of effectiveness of multimedia on knowledge gain with same test group (pre-post test with paired “t” test) and analysing differences in the socio-economic and psychological attributes of adopters, partial adopters and non-adopters (ANOVA) are examples of these analyses.

In t test and ANOVA analyses, the nominal to interval variable associations are analysed and the association or effect size can be calculated through eta (η) coefficient. The range of η is from 0 to 1, with a larger value indicating a stronger association (Weller, 2015). Columns 3 and 4 in Table 1 indicate the eta values and corresponding sample size requirement for ANOVA and t tests (Hays, 1963). Note that these estimates assume equal group sizes. The sample size estimation procedures for t test and ANOVA using online calculators is described in Box 3.

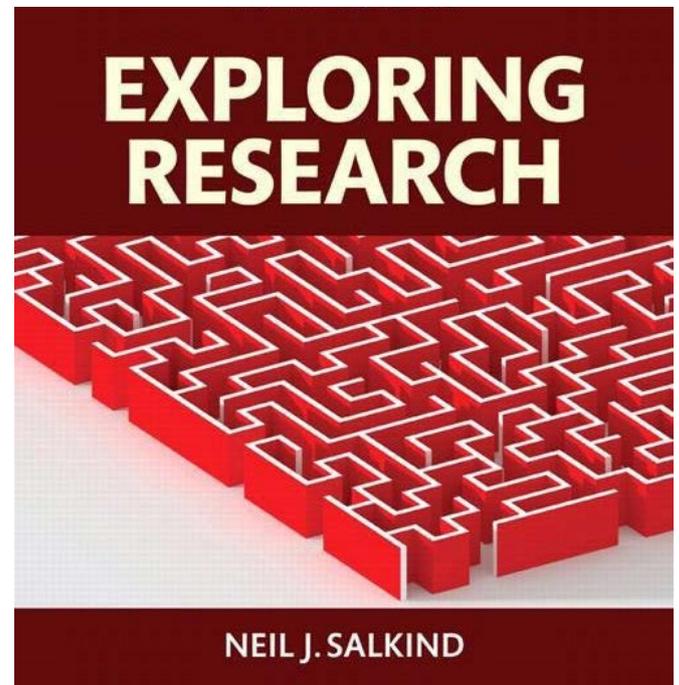


Table 2: Necessary sample sizes based on the number of independent variables for multiple regression ($r = 0.30$; Power = 0.80)

Number of independent variables	Required sample size
2	141
3	218
4	311
5	419
6	543
7	682
8	838
9	1009
10	1196

(Source: Maxwell, 2000)

Box 2: Sample size estimation for logistic regression

The sample size estimation for logistic regression is a complex process and four different approaches are proposed for the calculating adequate sample.

- 1. Method of confidence intervals** – A univariate method which is suitable when the estimates are derived for a single variable.
- 2. Method of sample size evaluation in logistic regression** – A simple and easy to use univariate method, which computes power, sample size, or minimum detectable odds ratio (OR) for logistic regression with a single binary covariate or two covariates and their interaction. The algorithm for this computation was developed by Demidenko (2007) and a sample size calculator is available at <http://www.dartmouth.edu/~eugened/power-samplesize.php>. Though this method was developed for medical studies, the calculator can also be used for extension research as the logic of variable selection and interpretation are similar in both cases.
- 3. Cross-validation** – The cross-validation approach estimates the sample size by observing potential overfitting (Motrenko *et al.*, 2014). Though this method is not associated with any model, it is complex and difficult to use by the amateur researchers.
- 4. Kullback** – Leibler divergence method - This method compares different subsets of the same sample by using the Kullback–Leibler divergence (Perez-Cruz, 2008) between probability density functions of the model parameters, evaluated at similar subsets. It allows us to estimate the sample size for the multi-attribute sample set.

Box 3: Sample size estimation for “t” test and ANOVA using on-line calculators

In general, the extension studies involving t test and ANOVA published in the peer-reviewed journals rarely report the eta squared values, making it difficult for the aspiring researchers to decide on sample size for future studies. However, Table 1 provides the sample size estimates for corresponding eta values. This problem can be solved by calculating eta squared values using the effect size calculators (http://www.psychometrica.de/effect_size.html). The eta squared values can be converted to eta values for estimating sample size. To estimate the eta value, the following procedure may be adopted.

In case of t test, collect the t value along with sample size of each group (in case of independent t test where sample sizes of both groups are different) along with correlation coefficient between the selected variables (in case of dependent t test – paired t test). And then calculate d and r from the test statistics of dependent and independent t-tests by using the calculator no. 4 on the Psychometrica website. Repeat the procedure for all possible independent variables. When the d values are obtained, use the calculator no. 11 and apply transformation of the effect sizes d, r, f, Odds Ratio and η^2 . This way eta square value for each independent variable can be estimated and converted it as eta by taking square root of each value. The required sample sizes can be chosen from Table 1 and select the largest sample size for the study.

In case of ANOVA, collect the F value, sample size of treatment and control groups from past studies and use calculator no. 5 to compute d from the F-value of Analyses of Variance (ANOVA). Repeat the procedure for all possible independent variables. When the d values are obtained, use calculator no. 11 to apply transformation of the effect sizes d, r, f, Odds Ratio and η^2 to estimate eta square value for each independent variable and convert it as eta by taking square root of each value. The required sample sizes can be chosen from Table 1 and select the largest sample size for the study.

Factor Analysis

The Exploratory factor analysis (EFA) and Principal Component Analysis are two commonly used factor analytical methods for scale construction in extension research. This multivariate technique should be used with the large sample size (over 100) for obtaining reliable estimates (Kline, 1994). In data reduction studies like attitude scale development, the researcher should follow the

minimum respondent to variable ratio of 20:1 (i.e. 20 respondents per item selected for scale construction) (Hair *et al.*, 2010). Selecting a large sample conforming to recommended respondent to item ratio, will increase the factor commonality besides decreasing the item loading value for selecting significant loadings in a particular factor (Hair *et al.*, 2010). Table 3 provides the criteria for identifying significant item loadings on factors based on the sample size chosen for the study.

Table 3: Criteria for choosing significant item loading on each factor

Sample size	Minimum value of item loading in a factor/ component in the rotated component matrix (Significance value)
350	0.30
250	0.40
200	0.45
120	0.50
100	0.55
85	0.60
70	0.65

(Source: Hair *et al.*, 2010)

Way Forward

Selecting adequate and representative sample is a key component of extension research. This paper

has elaborated the sample size estimation process for quantitative extension research. Though sample size depends on the nature of research problem and population, the choice of statistical analytical

procedures plays a crucial role in selecting the samples. The sample size estimation methods described in this paper are compiled from various published sources and the extension scientists can use them effectively for conducting quality research. The decision on sample size for the extension study depends largely on the past works. Most sample size formulae described in this

blog demand the coefficients reported from past studies. However, the extension studies published in India haven't reported many coefficients that are essential for estimating sample size for future studies. A good publishing practice involves describing, analysing and reporting the science in a proper way which helps in advancing the knowledge besides guiding the future researches.

Online sample size calculators

A downloadable Excel file containing the macros to estimate sample size for descriptive studies (both categorical and continuous variables) developed by the author is available at <https://drive.google.com/file/d/0BzwtVQNW-WqfYTYzSkVmZ3FDekk/view?usp=sharing>

Other portals that offer "Ready-to-use calculators" to estimate the sample size for extension studies are as follows:

- National Statistical Service, Australia - <http://www.nss.gov.au/nss/home.nsf/pages/Sample+size+calculator>
- Raosoft Inc. - <http://www.raosoft.com/samplesize.html?nosurvey>
- Epi Tools - Sample size calculations - <http://epitools.ausvet.com.au/content.php?page=SampleSize>
- Psychometrica - http://www.psychometrica.de/effect_size.html

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NEW ADVANCES IN EXTENSION RESEARCH METHODOLOGIES

To improve the rigour of extension research, one should use new and effective research methodologies. Here P Sethuraman Sivakumar discusses some of the new approaches in extension research.

Extension is a multi-disciplinary science engaged in solving complex problems in agriculture. With increasing complexities in farming, environment and social system, extension has to achieve multiple development goals ranging from sustainability to increasing farm income and enhancing sector competitiveness. In other words, extension in the current context must reinvent itself from its primary goal of “stretching out” the university science to generation, adaptation and application of new knowledge.

Extension research is the backbone of the “extension discipline”. As a “field-oriented” professional discipline, the extension research has relied heavily on exploration, facilitation and appraisal/assessment by employing qualitative and quasi-quantitative methods. The extension researchers’ perception of a “field oriented discipline” has largely affected his/her selection and use of methods, resulting in “less significant” outputs. Though the extension research was envisaged to develop sound methods and models to help the field functionaries for effective delivery of extension services, very little progress has been made in the past six decades. Absence of a “rigorous approach” for advancing the extension science is the primary reason for these lacunae and there is an urgent need to look into the “mechanics” of conducting extension research.

The purpose of this blog is to assess the existing research approaches in extension with a focus on its methods, tools and techniques so as to suggest new and effective alternatives to derive quality research outputs. The approach followed in this blog is based on the following assumptions:

- Extension is an applied social science with a structured way to address the needs of stakeholders
- Extension research focuses on development of methods to improve field extension
- Most extension research problems are multi-dimensional in nature
- Generalizing results is the key for advancement of any professional discipline
- A systematic, empirical approach can help to produce tangible outcome while advancing theory

Current State of Extension Research in India

Narrow focus on the research problem

Most extension problems are multi-dimensional in nature, caused by the interplay of physical, chemical, biological and human factors. For example, non-adoption of a rice variety by a specific group of farmers could be due to its

disease susceptibility, consumer dislike of taste/ texture or high milling cost. The extension research is expected to use a variety of methods from cultural anthropology (e.g. Participatory Rural Appraisal (PRA), consumer psychology (e.g. hedonic testing), agricultural engineering (e.g. milling studies) and economics (e.g. Benefit-cost analysis) to solve this issue. However, the existing research on adoption focuses only on identifying the problems and assess their relative importance using extension research methods – PRA and adoption indices, without integrating methods from other sciences to establish the cause-effect relationship in an objective way .

Little or no utility to the significant stakeholders

The outcomes of extension research benefits a diverse user group comprising of farmers, small scale industries, traders, input and marketing agencies, academicians, scientists and students besides helping policymakers to decide on critical policy issues. However, the current extension research is often confined to academic journals and professional groups without benefiting its intended users (Prasad, 2014). For example, the attitude scales developed at the academic and research institutions offer little help to the extension field functionaries and policy makers to improve their decision-making.

Heavy reliance on exploratory approaches

The extension research is considered as largely “ex-post facto”. Experimental or hypothesis testing approaches were often viewed as luxury by academicians and scientists. In a field-oriented discipline, this absence of the “manipulative capacity” produces results with limited ability to generalise. For example, the impact assessment of technology or educational interventions is often conducted “ex-post facto” without assessing the situation prevailing before the intervention. Though extension interventions are primarily “experimental” in nature, which are implemented using a specific combination of actions to produce desirable outcomes, using the “post-assessment” approach may not produce accurate results.

Inappropriate methods and techniques

Choosing a “right” research method for a specific research problem is a concern in the extension science. The academic research constitutes over 60% of the total extension research output delivered in a calendar year, in terms of the research papers published in peer reviewed journals. As the PhD and MSc research is time-bound and conducted in a limited resource environment, they follow a tested and popular research approach with limited scope

for experimentation. Using similar methods for a variety of research problems may bring inappropriate results. For example, the marketing behaviour studies employ same methods for studies across a variety of field and horticultural crops, livestock etc. Though the crops differ in terms of duration, method of cultivation and methods of marketing, the researchers follow same tests, scales and schedules for all these studies. Besides, there is tendency among innovative and enthusiastic researchers to rush into innovative research areas or using new methods without gaining adequate insights into the requirements and assumptions of these methods, resulting in a misfit into the research problem and reporting spurious relationships in a subjective way.

In view of the above problems or lacunae, there is a need to analyse the research approaches to identify sound alternatives to improve the quality of research outcomes.

Advanced Methods

Assessing the technology performance and effects

Assessing the technology performance and effect is crucial for extension managers, scientists and policymakers. The assessment helps in (1) deciding the effect of agricultural technologies on the target population, (2) setting research and development priorities and (3) formulating strategies and policy decisions to facilitate innovations and technology. The technology performance is often assessed through diffusion paradigm by quantifying technology adoption at different stages, while the effects are quantified by impact assessment.

Roger’s Classical Normal Distribution Model

The adoption and diffusion research in extension has focused mostly on the Classical Normal Distribution Model following s-shaped curve proposed by Rogers (Rogers 1983). A large number of extension research studies were conducted on the communication channels (e.g. development of communication strategy – audio-visual aids, mass media and interpersonal channels, and testing their effectiveness), innovation (e.g. assessment of suitability), and effects on the social system (e.g. adoption and impact). Though past studies have fostered the understanding of innovation diffusion in agriculture, several research gaps remain. Very few research works focused on the technology diffusion over time linking the innovation diffusion with new technology performance. Besides, the Roger’s model is simplified representations of the reality of diffusion processes (Roling, 1988) which has little ability to predict future adoption of innovations (Mahajan *et al.*, 1990). Research studies conducted on high-

tech products (Moore, 1991), environmentally sound manufacturing technologies (Sroufe et al, 2000) and classroom response systems (Townes,

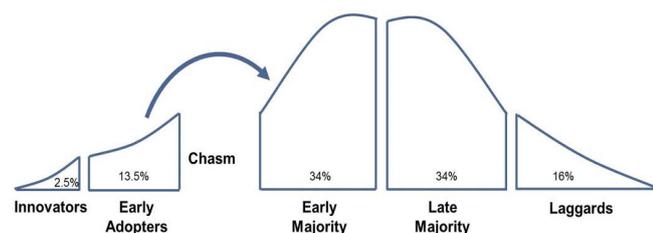


Fig. 1: Chasm in the diffusion process

(Source:<http://eavoices.com/>)

2010) reported the presence of a “chasm” between early adopters of the technology and rest of the adopter groups.

Despite all limitations, Roger’s model is widely used in the diffusion of innovations research. Using a longitudinal research design with a cohort approach helps to assess the technology adoption across time. An IFPRI research on long-term impacts of vegetable and polyculture fish production technologies on a variety of measures of household and individual well-being in Bangladesh is a classic example of this approach (Kumar and Quisumbing, 2010).

Alternate adoption models

Few alternative adoption/diffusion models (described in Table 1) provide wide options to enrich conceptual clarity and methodological rigor to extension research. These methods provide flexibility to assess adoption through cross-sectional approach.

Table 1: Alternate models to study diffusion and adoption of agricultural innovations

Theory or model	Proposed by	Features	Applications
Concerns-Based Adoption Model (CBAM)	Hall and Loucks (1978)	Explains how an individual's concerns influence his or her integration of an innovation in a classroom or work setting	Teachers’ use of action research (Khoboli and O’toole, 2012); technology change and adoption (Davis and Roblyer, 2005).
Technology Acceptance Model (TAM)	Davis et al. (1989)	An information systems theory that models how users come to accept and use a technology.	ICT Adoption Behavior of Rural Young Entrepreneurs (Zaremohzzabieh <i>et al.</i> , 2015)
Bass model	Bass (1969)	Cumulative adoption model based on S curve Assumes that the speed and timing of adoption depends on innovators’ or imitators’ degree of innovativeness and the degree of imitation among adopters	Adoption of pesticide use by Nigerian cocoa growers Akinola (1986). Agricultural change at farm and regional level (Wossink, 1993)

Assessment of effects of extension intervention

Assessing effect of an intervention on the target group is a crucial component for establishing the utility of an intervention. According to World Bank, impact assessment is intended to determine more broadly whether the program had the desired effects (positive and negative) on individuals, households, and institutions and whether those effects are attributable to the program intervention (Baker, 2000). In the National Agricultural Research and Education System (NARES), the impact assessment is used to assess the socio-economic effects of an intervention, problems associated with technologies and user systems, and setting research and development priorities. While the agricultural economists followed a quantitative scientific statistical approach, the extension professionals focused on the “social and behavioural effects” of the

intervention. The common impact assessment paradigms followed in social sciences are displayed in Box 1.

An innovative impact assessment approach developed by Ms. Susanne Neubert of German Development Institute, Germany, MAPP (Method for Impact Assessment of Poverty Alleviation Projects, 1998) combines a quantitative approach with participatory assessment to derive tangible results to address the needs of managers and policy makers. In this method, the impact is assessed through a series of workshops with stakeholder representatives. It has wide applications to analyse complex development goals like poverty reduction, democratization, good governance, economic and sustainable development. A detailed description of various impact assessment methods used in socio-economic research can be found at <http://are.berkeley.edu/~sadoulet/papers/deJanvryetal2011.pdf>

Box 1: Impact assessment paradigms in extension research (Spath, 2004)

A quantitative or "scientific" statistical method

Addresses a fundamental question: *What would the situation have been if the intervention had not taken place?*
Uses an experimental approach - Comparing program participants (treatment group) with a control or comparison group.

Weaknesses – Quantification of impact without exploring the reasons; high cost and requires specialised expert skills

Qualitative method

Inductive approach derived from sociology and anthropology

Using qualitative tools like key informant interviews, participants' observations, case studies, focus group discussions, etc

The results are location-specific and cannot be generalised.

Participatory learning and action method

Involves stakeholders in all stages of the evaluation or assessment, such as determining the objectives of the study, identifying and selecting indicators to be used, and participating in data collection and analysis etc

Assume that the beneficiaries are empowered through the research process itself
Methods and tools - participatory appraisals, action learning methods, etc.

Prediction and forecasting

Predicting the future of a technology using the forecasting procedures helps in (1) assessing the demand of the technology at specific time period, (2) understanding the impact created or expected by the stakeholders and (3) identifying the need for developing and refining technology. In general, a prediction is deriving an outcome based on deductive logic or beliefs while forecast is a means to validating a prediction based on an analysis of varying factors and patterns. Though the prediction and forecasting are largely quantitative, conducted mostly by economists, they are equally important for extension science as well.

There are many overlapping forms of forecasting technology developments and their impacts, including technology intelligence, forecasting, road mapping, assessment, and foresight. Several technology forecasting methods have been developed over the years and it is essential for any forecaster to match the method with the purpose with logic and commonsense to derive accurate estimates. The forecaster has to judiciously select a technique or a combination of techniques depending upon the methodology and end objective in view. The technology forecasting techniques traditionally used to derive technology performance estimates are summarised in Figure 2.

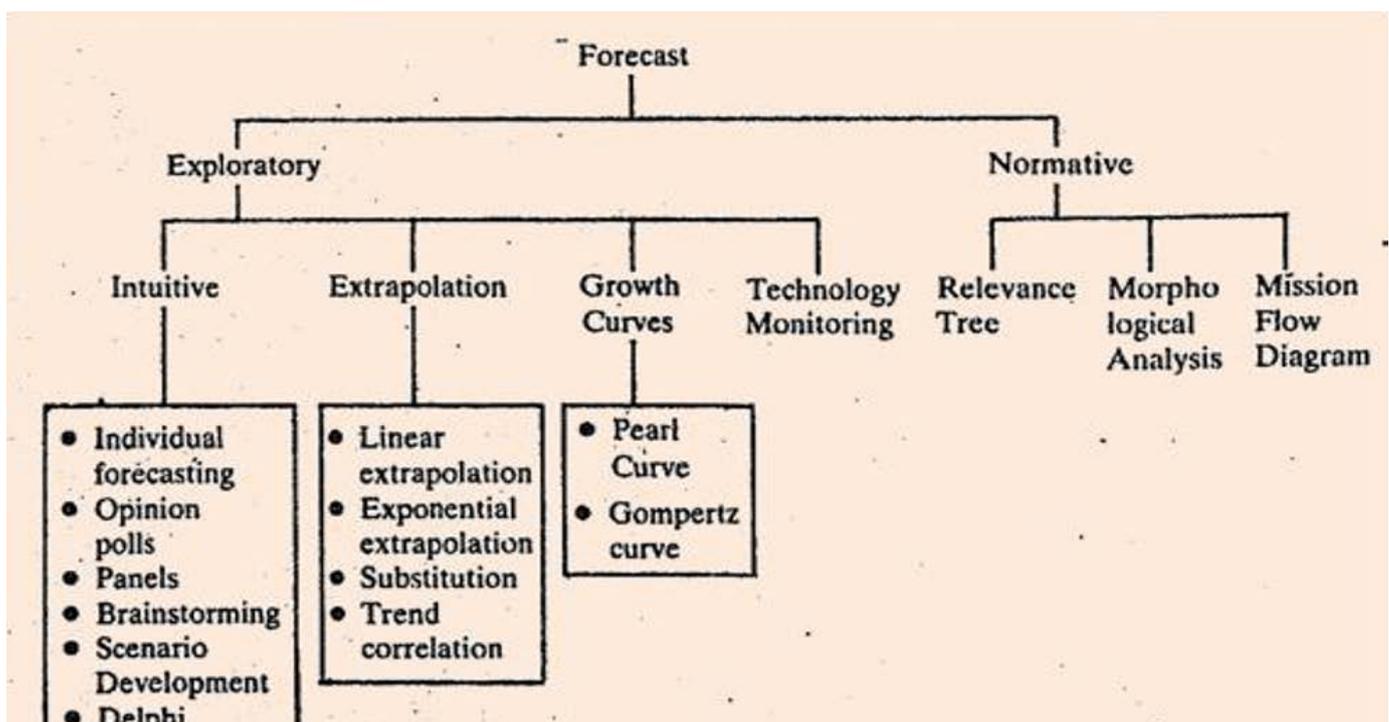


Fig. 2: Summary of technology forecasting methods

The Massachusetts Institute of Technology (Firat *et al.*, 2008) identified nine families of forecasting methods (Box 2). Though many methods are quantitative in nature which demands high-level mathematical/statistical skills, few of them are relatively easy to understand and use. A few prediction and forecasting tools that are relevant for extension professionals are discussed below.

Judgemental forecasting

The judgemental forecasting methods including Delphi and scenario analysis can be effectively used in extension research. These forecasting methods are used in ambiguous situations where

the information on past performance of a technology or a service is not available. For example, if a food technologist wishes to assess the market demand for a novel food like gluten-free pasta, where the data on the market demand of pasta is either not available or not accessible, the extension professional can help to estimate the approximate demand by using the judgemental methods. These methods rely on expert opinion who uses incorporate intuitive judgement and opinions to derive subjective probability estimates.

Delphi method

Delphi is a popular judgemental method, developed by RAND Corporation in Santa Monica, USA during 1950s. The Delphi uses a convergent approach to develop expert estimate on a particular aspect (e.g. demand of a technology, price, cost of a project, etc) using a two or three stages assessment, where experts' opinions are collected and information is combined, and then returned to the experts for re-evaluation. A classic example of Delphi study is the USDA forecasts for soybean and corn prices (Isengildina *et al.*, 2004). Delphi method was also used for strategic planning (Rikkonen *et al.*, 2006), identify locations for Agricultural Service Center (Zangeneha

et al., 2015) and need assessment for crisis communication (McGuire *et al.*, 2012).

Recently, the computer based real time or almost real time Delphi is gaining popularity owing to its cost and time saving processes. The dissensus-based Delphi, an exploratory variant of the classical Delphi, focuses on divergent approach where a variety of opinions or estimates are derived through expert consultation on a particular issue for on a bipolar distribution (e.g. high to low, good to bad) (Steinert, 2009). This method was developed by Turoff in 1970 which is widely used in policy analysis. Two examples of dissensus delphi are argument Delphi (Kuusi, 1999) and disaggregative Policy Delphi (Tapio, 2003)

Scenario analysis

Scenario analysis is a process of analyzing possible future events by considering alternative possible outcomes. It is useful to generate a combination of an optimistic, a pessimistic, and a most likely scenario of any commodity or aspect. This is an important tool in the world of finance and economics, and is used extensively to make projections for the future. "Scenario planning" was developed in the 1950s (Kahn and Wiener 1967) and it has been used in the area of sustainable development (Rotmans *et al.* 2000). The scenario analysis is used successfully to assess the impact of water and agriculture policy scenarios on irrigated farming systems in Italy (Bartolini *et al.*, 2007) and participatory water management planning in France (Graveline *et al.*, 2014).

Scenarios are arrived at by a team composed of key decision makers, experts, and stakeholder representatives during two or three one-day workshops held over a period of weeks or months. The flowchart depicting the steps in scenario analysis is given in Figure 3. Scenario analysis involves constructing or developing scenarios (steps 1-4 below), and integrating the content of scenarios into decision making (steps 5-8 below).

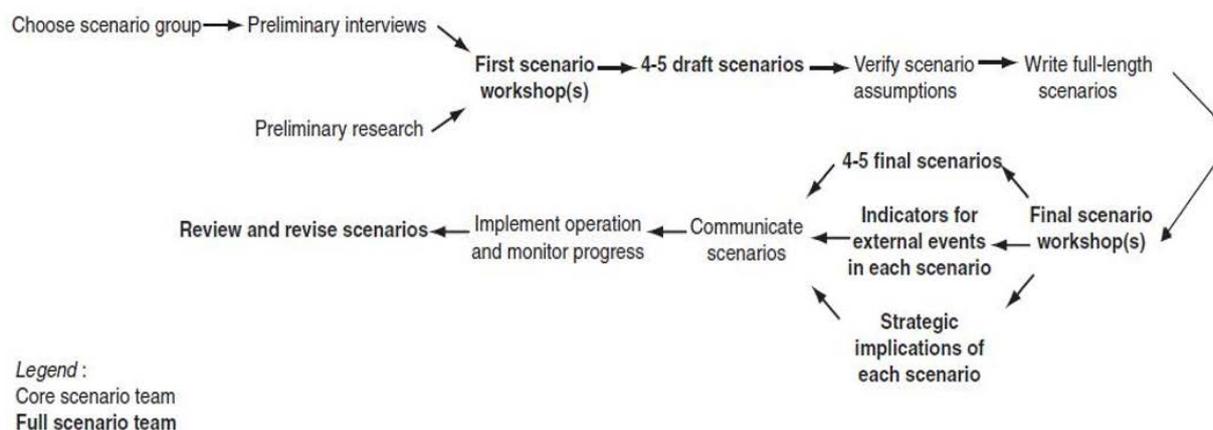


Fig. 3: Steps in scenario analysis

Box 2: Family of forecasting methods

1) Expert Opinion

- Delphi (iterative survey)
- Focus Groups [panels, workshops]
- Interviews
- Participatory Techniques

2) Trend Analysis

- Trend Extrapolation [Growth Curve Fitting]
- Trend Impact Analysis
- Precursor Analysis
- Long Wave Analysis

3) Monitoring and Intelligence Methods

- Monitoring [environmental scanning, technology watch]
- Bibliometrics [research profiling; patent analysis, text mining]

4) Statistical Methods

- Correlation Analysis
- Demographics
- Cross Impact Analysis
- Risk Analysis
- Bibliometrics [research profiling; patent analysis, text mining]

5) Modeling and Simulation

- Agent Modeling
- Cross Impact Analysis
- Sustainability Analysis [life cycle analysis]
- Causal Models
- Diffusion Modeling
- Complex Adaptive System Modeling (CAS) [Chaos]
- Systems Simulation [System Dynamics, KSIM]
- Technological Substitution
- Scenario-simulation [gaming; interactive scenarios]
- Economic base modeling [input-output

analysis]

- Technology Assessment

6) Scenarios

- Scenarios [scenarios with consistency checks; scenario management]
- Scenario-simulation [gaming; interactive scenarios]
- Field Anomaly Relaxation Method [FAR]

7) Valuing/Decision/Economics Methods

- Relevance Trees [futures wheel]
- Action [options] Analysis
- Cost-benefit analysis
- Decision analysis [utility analyses]
- Economic base modelling [input-output analysis]

8) Descriptive and Matrices Methods

- Analogies
- Backcasting
- Checklist for Impact Identification
- Innovation System Modeling
- Institutional Analysis
- Mitigation Analysis
- Morphological Analysis
- Road mapping [product-technology road mapping]
- Social Impact Assessment
- Multiple perspectives assessment
- Organizational analysis
- Requirements Analysis [needs analysis]

9) Creativity

- Brainstorming [brain writing; nominal group process (NGP)]
- Creativity Workshops [future workshops]
- TRIZ
- Vision Generation
- Science Fiction Analysis

Way Forward

The quality of extension research depends on its methodological rigor and ability to produce results that can be generalised across the similar socio-economic systems. Though the current extension research focused on diverse areas with a variety of research methods, they are inadequate to deliver results that are significant, tangible with wide applicability.

The first part of this blog paper has discussed about the weaknesses and limitations in the existing research approaches in general, with an emphasis on methodologies and suggested alternative methods for adoption and diffusion research, impact assessment and forecasting. In the second part of this blog series, I will discuss the

recent developments in the scale construction and questionnaire optimisation, perception/preference measurement, ICT/communication research and consumer studies.

Integrating new methods into the existing extension research paradigm requires a strategic approach comprising of organising capacity building programmes at the university or research institute level (to equip the budding and mid-career extension professionals with state-of-art research skills); improving the quality of academic research by diversifying research themes and methods, enhancing the quality of research publications in the peer-reviewed journals through rigorous review process and reorienting the extension research courses by incorporating new research methods and techniques.



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DO NETWORKS MATTER? A RETROSPECTIVE ON THE POTENTIAL APPLICATIONS OF SOCIAL NETWORK ANALYSIS

Social Network Analysis (SNA) is arguably the latest trend and buzzword among social science practitioners. With its strong theoretical and empirical rooting in sociology and graph theories, it could answer many research questions within a system. It is no secret that modern social media channels such as Facebook and LinkedIn have their theoretical backing from SNA. In this blog post, Subash SP and Sreeram Vishnu try to highlight some of the potential applications of SNA in agricultural sciences.

Information is the new gold, it is the new oil. Anyone who controls information has access to great wealth and power.

(From Killswitch: The battle to control the Internet (2005) directed by Ali Akbarazadeh)

In today's world, almost everyone leads a networked life; from simple, direct communication networks based on our acquaintances and relationships, to internet-mediated social networks which link human beings virtually across the globe. These networks are playing a crucial role in deciding the kind of knowledge one can have, the resources one can access, the opportunities one can explore and the extent and nature of contacts one can create. Can we tap into the potential information embedded in these networks and relationships, in case of agriculture?

Yes!! We surely can, if we apply Social Network Analysis (SNA). SNA is a methodology to map and qualify actors (nodes) and their relationships within a network. It allows for accounting the "flow". This flow can be a resource (e.g. commodity or information); a service (credit or input); or a relation (kinship or friendship). Mapping and quantifying this information can yield potential benefits to a social scientist as it gives rich inputs about the position of a farmer in his/her social network. Invariably, it decides his/her access to various resources and information.

Initially SNA was used in the fields of sociology, psychology and anthropology. With the advancement in graph theory (mathematics) and computing knowledge, SNA tools have been developed to map and quantify networks. The network perspective is becoming a key approach in social and biological sciences (Borgatti and Li, 2009). In this blog post, we provide insights into the application and scope of SNA in agricultural research and extension.

Evolution of SNA

The origin of SNA dates back to ancient Greeks, but major developments occurred in the 1930s. Figure 1 depicts the lineage of SNA. For further details about the history of SNA, please read the book (Scott, 2000). SNA, in its current form, is an amalgamation of socio-metric technique and graph theory. It has evolved through various phases and, over time, has turned into a data analysis technique with wider applications.

Application of SNA in Social Sciences

SNA is more about the social relations and interactions among people in a group rather than about the individual actor as followed by most of the other social science techniques. This

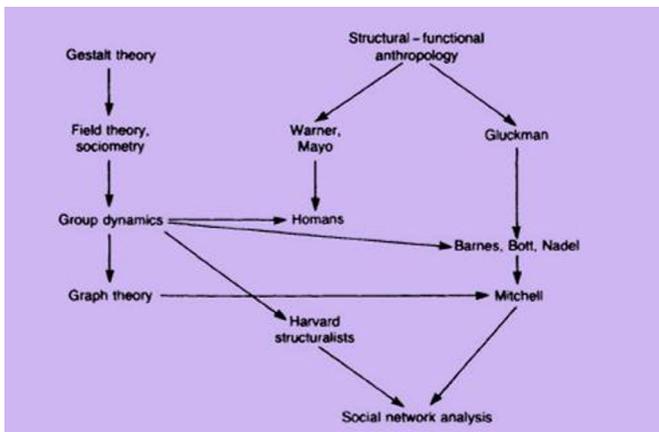


Fig. 1: Lineage of Social Network Analysis (Scott, 2000).

focus of the interactions is more pragmatic as it can answer many difficult research questions on the capabilities and resource access of the actors within a system. Just as the location of a building in a city decides its access and potential, the position of an actor in a system can predict the possible resources and capabilities that he could access and benefit from. It could even answer the cognitive aspects of behaviour including the learning or adoption behaviour of the actors which is shaped by the interaction with other actors or their influence within the system. The rate of technology adoption within a system is dependent upon many social factors, for instance, influence of neighbours, cliques, relatives, progressive farmers and reference groups. This argument is empirically proven as it is supported by many research studies in various contexts.

One of the major imperfections of the diffusion of innovation model of the Rogers (2003) was the individual blame bias. Simply stated, this argument says that for technology rejection/discontinuance decisions, it is always the individual who is blamed rather than the system of which he is a part. In other words, if the shoe does not fit there is something wrong with one's foot! This is because a social science researcher always takes an individual actor as the unit of his study. Whereas, in reality, there may be several other reasons, such as resistance from his social system or its inefficiencies which prevent an actor from adopting an innovation or continuing its use. This can be known only if we study the social system, particularly the social network of the concerned actor. This is what a SNA should try to figure out.

Further, SNA is applicable wherever there is a flow of something or where connections can be established among the units of a network. This something can be a resource (a commodity such as milk) or a service (credit) or even a relationship (information dependency). It has potential applications in various research themes: value

chain analysis (Lazzarini, 2001; Borgatti and Li, 2009), technology adoption studies (Matsuskhe, 2008; Magnan *et al.*, 2015) and impact analysis (Ekboir *et al.*, 2011).

Utility of SNA in Mapping Various Networks: A Few Examples

Ekboir *et al.* (2011) used SNA to monitor changes in a research network to understand the process, innovation, opportunities and challenges. A network of 92 researchers depicting 624 collaborators in 302 organisations for the CGIAR Research programme on Roots, Tubers and Bananas (RTB) was mapped (see Fig. 2). This helped in understanding how the programme is moving in its impact pathway, its partnerships, collaborations and interactions. This is important in framing strategic management and adaptive measures.

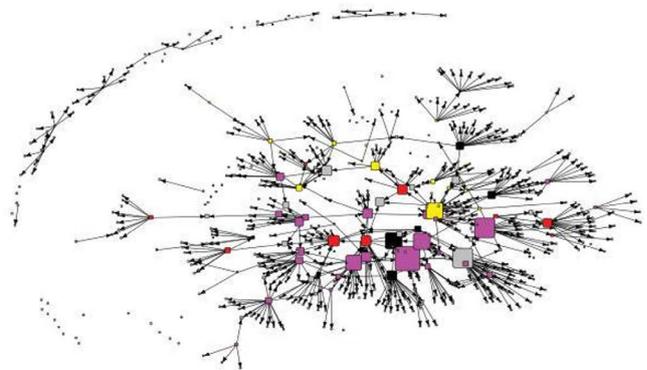


Fig. 2: Intermeditation (betweenness) of CGIAR centres (Ekboir *et al.*, 2011)

Note: Nodes colour-coded by centre affiliation: yellow = Biodiversity, black = CIAT, pink = CIP, red = IITA, grey = other centres.

Lazzarini *et al.* (2001) introduced the concept of netchain to depict the interrelationship between horizontal and vertical networks in a value chain. Netchain is name given to horizontal ties between firms with layers of vertical ties (see Fig. 3).

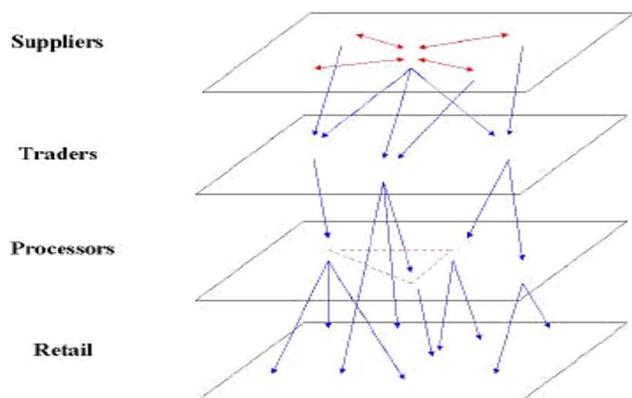


Fig. 3: Netchain (Lazzarini *et al.*, 2001)

Magnan et al. (2015) used gender-disaggregated social network data from Uttar Pradesh to test the gender-specific network effects on demand for laser land levelling (see Error!Reference source not found.).

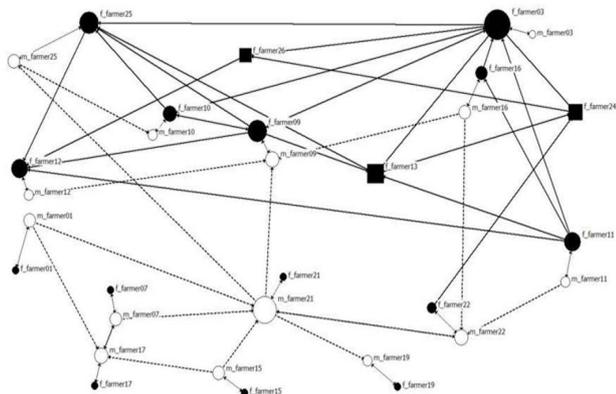


Fig. 4: Gender-specific social network

They found that though the factors determining male and female networks are similar, there is little overlap between them. The study also provided some evidence of female network effects on household technology demand and suggested leveraging female networks for extensive dissemination of technology. The study has also emphasised that small farmers mainly rely on social networks for information; hence, public and private efforts should be relayed using social networks for transmission of technology to a large number of farmers.

Thuo et al. (2013) used SNA to visualise patterns of groundnut farmers' networks with regard to information sources, productivity support and local group affiliations. Their main concern was to understand the role of strong and weak ties in enhancing the productivity of groundnut farmers by providing them the requisite information. Network mapping demonstrated the flow of information on groundnut from a variety of sources, including the strong and weak ties. It also revealed that the network structures can vary considerably even among farmers in similar geographic regions producing similar crops. The network map is shown in Figure 5.

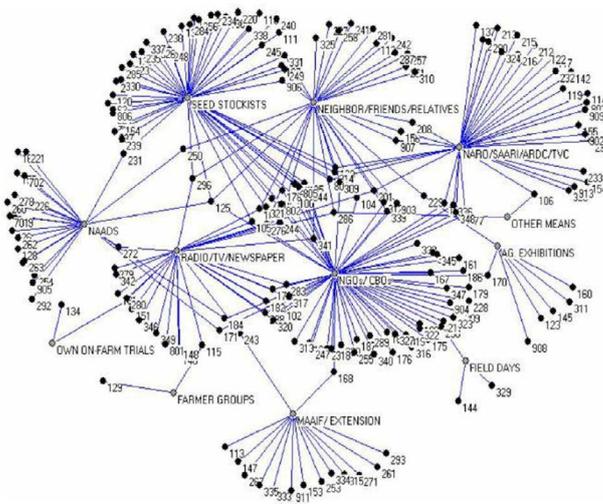


Fig. 5: Groundnut productivity information flow network (Thuo *et al.*, 2013)

Software Packages Available for SNA

A number of software packages are available for SNA. In general, network analysis software can be classified into two types: packages based on graphical user interfaces (GUIs) and those meant for scripting or programming languages. GUIs are easier to learn and execute while scripting packages are powerful. The most widely used GUI packages are UCINET, Pajek, Gephi, MuxViz, NetMiner, GUESS and ORA. NetMiner (Python) and igraph (package for R and Python) are a couple of scripting-based packages. Both free and commercial versions of these different software are available.

Though open source packages are difficult to learn, they have much wider functionality and more features than the commercial ones. There are good training, tutorials and support groups available for them. The software mentioned above could be used for visualizing networks through network maps and quantitatively measure network parameters.

Way Forward

Social network analysis is an emerging field of science which our social scientists can vigorously pursue for designing future studies. The field is rich with theoretical contribution from various disciplines blended with the potential possibilities of visualisation of networks and quantification of various parameters grounded on the graph theory. Though researchers like Spielman (2010) underscored the usefulness of this research technique in

agriculture in developing countries, particularly for innovation system studies, network-based studies are still in their infancy in the Indian context. Though the same set of theories and applications are highly useful and widely used in case of biological sciences (mapping of genes and interaction effects), we also emphasised the application of SNA only in social sciences. Application of SNA is surely going to be a game changer for the fields of agricultural extension and economics, and will make great research impacts in the coming days.

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SCIENTIFIC PUBLISHING IN EXTENSION: ARE WE DOING ENOUGH AND ARE WE DOING WELL?

Enhancing the quality of extension research is a pre-requisite for improving the quality of academic publishing in extension. Much needs to be done on strengthening drafting skills and improving the quality of peer review too, argues SVN Rao, K Natchimuthu and S Ramkumar.

Researchers aim at understanding problems and often providing solutions to address these. Some develop technologies which make human life better and easier by saving time and other resources. Through continuous research they try to address existing and expected problems and come up with technologies/practices which may replace, modify or refine the existing ones. Publications serve as one of the important windows of the research output.

Publications primarily help researchers working in similar areas to gather information on recent developments in their field of study. It also helps the authors to get feedback on their work and get motivated to pursue their research in new directions as suggested. The authors also get credit for their published work through its use as an indicator of performance in career advancement and grant of research funds. For the donors (public and private) who fund research, publications serve as a measure of accountability. Apart from all these, the publications help the wider community of knowledge users to know about the new knowledge generated through research.

Extension Research

Research in extension is required to address the following issues:

- Problem identification and prioritization of research areas as input to research stations – (Participatory research methods with the involvement of the concerned stakeholders including the scientists of various disciplines).
- Understand the role of extension and advisory services in the emerging and dynamically changing context/ scenario of development (globalisation, privatization, food security, food safety, climate change etc.)
- Testing of technologies – both ex ante and ex post; Identifying essential conditions for exploiting different technologies; Assessing the non- technological factors influencing the flow of technologies.
- Analyzing different farming systems; Assessment and prioritization of the knowledge and support needs for different crop -livestock production systems.
- Development and validation of innovative extension models.
- Development of appropriate training modules for capacity building and policy engagement.
- Generating information on when, where and how to produce and market; and identification of innovative methods to communicate to the concerned stakeholders including the farming community through appropriate dissemination methods / strategies.

- Evaluation of the existing extension models and expert systems under different crop - livestock production systems; Impact assessments of programmes (both public and private).
- Identification of best practices in different crops/livestock/fisheries sectors.
- Focus on curriculum development and course content to address the future challenges of extension.

Though the research in extension has wider scope, it mainly focuses on adoption and diffusion of innovations and often revolves around research – extension - farmer linkages. Extension research has many such self imposed limitations.

Though the extension science globally has moved beyond technology transfer to facilitation, learning, organising and building networks, extension research in India is still stuck in studying technology transfer (Prasad, 2013). While research tools and techniques in core disciplines from which extension borrowed its research methods have evolved significantly, extension research still depends heavily on many of the outdated tools (Sivakumar, 2013). In most cases, extension research looks at farmers or extension personnel as subjects and crop/farming system as settings of the study. The concept of 'research' in extension needs to be broadened, recognising that beyond the public research and extension organisations, a range of actors have important and vital roles in the generation and dissemination of agricultural innovation (Prasad, 2014).

Though extension scientists in the NARS can potentially engage in useful research that can influence the technology development process, they are mostly engaged in organizing training programmes, conducting events, dealing with visitors to the institute and handling documentation responsibilities (Gowda et al, 2014). Lack of clarity on the role of extension scientists (extension work Vs extension research) has also contributed to this situation. Though participation in extension related activities provide lot of scope for conducting research and publishing them, academic publishing is a low priority in extension.

Many extension practitioners are involved in extension work but they rarely publish research articles, may be due to their lack of need/ interest for such publications or capacity to write articles from their work experience. Very rarely we find research articles from our colleagues working in 637 KVKs in the country. Same is the case with many NGOs involved in field extension work. In fact we are losing much of the excellent "work experience" gained especially by the field functionaries working in different production

systems by not sharing it through publications. It is a big loss to the extension profession. It is important to harness such useful experiences in different crop livestock production systems and make them accessible to others through publications, one of the important ways to share them.

Academic Publishing in Extension

Most of the current research in extension is from students' thesis work and their compulsion to publish their work either for acceptance of their thesis or for improving their chances for employment. Extension scientists/teachers in research centers, colleges and training centers have to either obtain resources from within or seek external funds to do their research. Requisite resources for research in extension are always in short supply mainly due to lack of clarity between extension research and extension work. Lack of capacity to formulate and submit multi-disciplinary research projects under competitive grants also adds to this challenge.

Academic publishing in extension has suffered mainly due to these limitations in quantity and quality of extension research. There are no two opinions about the necessity and urgency to improve the quality of our existing extension journals, which are in fact suffering from three failures.

1. Lack of willingness and capacity to take up quality research to produce quality output
2. Lack of capacity to prepare quality research papers (drafting skills/articulation/language) and
3. Lack of serious review of submitted papers by the Journal editorial committee/reviewers

The low rating/score given to extension journals by NAAS (National Academy of Agricultural Sciences) is a reflection of all these three failures.

Research: First of all quality of extension research needs improvement. This is a pre-requisite to have good publications in extension in quality journals. A lot was written in the earlier AESA blogs about the current status of extension research and how it could be improved. Usually three categories submit their research findings for publications in either printed or on line journals. These are students, faculty/ teachers of academic institutions, and extension practitioners. Although there are two options for the researchers to present their findings, the students and faculty usually choose the printed journal (s) with good rating rather than on line journals as the former is given more weightage for their assessments/ promotions/ career advancement.

Selection of appropriate journals is always a challenge for researchers. In the case of extension, the number of extension journals (having the word extension in the title) is few. Though there are a number of non-extension journals (social science and general agriculture related) which also publish extension articles, many researchers are not aware of these. To address this issue, AESA has done a marvelous work of compiling a list of journals which are relevant for extension researchers. This could be accessed at <http://www.aesanetwork.org/where-can-we-publish-extension-research-a-note/>

The few who know about the scope of these non-extension journals also refrain from submitting their papers in these journals as most of these are not considered/included by NAAS in their rating system. Low quality of extension research also affects its publishing in quality journals. Though many universities insist post-graduate and doctoral students to have at least two articles from his/her research work in journals of repute (before submitting thesis to the concerned university), this is not enforced strictly. Similarly, field practitioners who submit their theses rarely publish their articles from the thesis as their career prospects are not linked to the number and quality of publications.

A lot needs to be done to improve training on research methodology at the post-graduate and doctoral levels. New research methods (both quantitative and qualitative) are yet to find a place in extension curricula. The students and faculty also do not have access to latest books and journals due to budgetary restrictions in academic institutions. Low budgetary allocation to social science text books and journals is also a reflection of the poor image of extension discipline among administrators and others who take these decisions.

Writing skills: Writing a research paper is an art and requires skills which many researchers (students and faculty) are lacking. These skills could be inculcated among the researchers through conducting appropriate training workshops. But this hasn't received any attention from the numerous professional societies in extension which we often find them at loggerheads. There are more than 10 professional societies for extension in India. There is no synergy among these bodies and in fact they compete for the articles to be published and also for getting grants for organizing workshops or seminars every year. Each of these societies publishes their own extension journals. However, none of these journals have rating above 4.0.

Article Review: Our systems for screening and review of research papers need real improvement.

The editorial committee which is responsible for publishing each journal as per the frequency and time lines set for it often fails to enforce quality. Many a time, it fails to bring out the journals in time due to several reasons that include, less number of articles received, poor quality of the articles received, lack of commitment on the part of the reviewers in sending their comments on the articles on time, inadequate funds to maintain the editorial office and lack of interest on the part of the editorial committee.

Recommendations

Funding for professional improvement and enhanced access to new knowledge: It is necessary for the faculty to understand the dynamic changes happening in extension through trainings, reading journal articles and books. We need to make sure that sufficient funds are available within the different organizations to organize such trainings and subscribe to relevant journals and books.

Reorient professional societies to play new roles relevant for the future of the discipline. These include enhancing skills related to:

3. Formulating good projects
4. Employing various research tools
5. Identifying new areas of research
6. Writing research articles – presentation skills
7. Accessing new research grants

Professional societies must jointly organize workshops for the benefit of the interested students, faculty and field practitioners on payment basis (no loss no profit basis). There are quite a good number of extension professionals available to deal with the identified topics. This of course, needs lot of ground work to plan and execute.

Review quality of existing journals and expand the number of journals (social science and agricultural related) used for career advancement considerations. There is a lot of scope for improving the quality of the extension journals and the purpose shouldn't be to criticize but to provide constructive criticism to enable the editorial committees to improve the quality standards of their respective journals.

Promote list of latest books on extension and related disciplines and sharing of abstracts or links of extension research papers published in different journals. AESA web-portal (www.aesanetwork.org) has made a good beginning on this.

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**NEW APPROACHES
AND TOOLS FOR
EXTENSION AND
ADVISORY SERVICES**

04

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BEYOND TECHNOLOGY DISSEMINATION: WHY EXTENSION SHOULD ALSO FOCUS ON POLICY CHANGE?

Adoption of new knowledge and technologies is often constrained by institutional and policy challenges. Trying to promote new knowledge without addressing these challenges, often leads to poor results. Diagnosing these constraints and experimenting with new ways of addressing these constraints should be a priority for extension, argue SVN Rao, K Natchimuthu and S Ramkumar.

Cattle rearing is an important occupation for resource poor and landless families in rural and peri-urban areas of Puducherry. Cattle are the only asset for the landless poor and their contribution to the family income is quite substantial. Majority of the new generation livestock farmers are agricultural labour, forced to take up dairying due to subsidised loans provided by the government to buy cattle. Urbanization has led to conversion of farm lands for other purposes and this has led to reduced availability and high cost of fodder grass. Food crops (paddy) are being substituted by non food crops (casuarinas) which require less labour and supervision. There is almost no practice of growing green fodder crops in Puducherry and the area under fodder cultivation is less than 90 acres (PONLAIT Report, 2011). With increasing costs of fodder (especially paddy straw) and the low price for milk, farmers do not have adequate incentives to feed their cattle with purchased fodder.

Innovation System Diagnosis

In January 2008, a facilitated fodder innovation diagnosis workshop was organised at Rajiv Gandhi College of Veterinary and Animal Sciences (RAGACOVAS) now Rajiv Gandhi Institute of Veterinary Education and Research RIVER), Puducherry. This was done as part of the Fodder Innovation Project-II implemented in India and Nigeria during 2007–2011 (Hall et al, 2007). This workshop was attended by almost every stakeholder related to the fodder sector and these included officials from line departments such as Animal Husbandry, Agriculture, Krishi Vigyan Kendra (KVK), District Rural Development Agency (DRDA), Cooperative Milk Union (PONLAIT), a local NGO – MSSRF (MS Swaminathan Research Foundation) as well as the representatives from Women Self Help Groups (WSHGs) and land owners/farmers.

The diagnosis workshop noted that several of these organizations have programmes on fodder promotion focusing on distribution of seeds/slips, subsidies for fodder cultivation and training on fodder cultivation. The workshop concluded that unless and until green fodder is produced and made available locally to the landless livestock keepers, the fodder situation in Puducherry is unlikely to improve. The workshop called for formation of a fodder development forum comprising all fodder relevant actors to design, implement and evaluate interventions (with RAGACOVAS acting as the coordinating agency) and to design an institutional arrangement linking fodder growers/entrepreneurs and fodder buyers (landless livestock farmers in this case).

Multi stakeholder forum: A fodder development forum comprising representatives of all fodder

relevant actors was formed in the stakeholder meeting held in February 2008. This multi stakeholder platform identified a cluster of villages to implement the project. This forum met on several occasions to review and finalise the plans of this action research. It also served as a monitoring and learning platform and helped promote joint working relationships on programmes outside this project too.

Piloting a new Institutional Arrangement

Five farmers came forward to grow fodder on a commercial scale in 0.5 to 1 acre of their land, after they were convinced about the relative profitability of growing fodder, the technical and financial support that they could avail from different organizations and the offer to buy-back the harvested fodder by the dairy co-operative society (DCS), Sorapet. The members of the WSHG at Sorapet agreed to buy fodder from the DCS on credit. The Secretary, DCS agreed to receive fodder in 10 kg bundles and sell to the milk pourers when they come to deliver milk to the DCS. The Secretary would then deduct the amount from bills of the milk pourers and the same will be paid to the fodder growers.

Accordingly, based on several rounds of discussions and interactions with farmers and milk producers, fodder was grown on two acres of land in the selected village and was harvested and supplied through DCS to milk pourers on credit basis later to be recovered from their milk bills and finally to clear the bills of fodder growers. Initially there was a component of subsidy from the department of Animal Husbandry (DAH) which was later withdrawn due to paucity of funds.

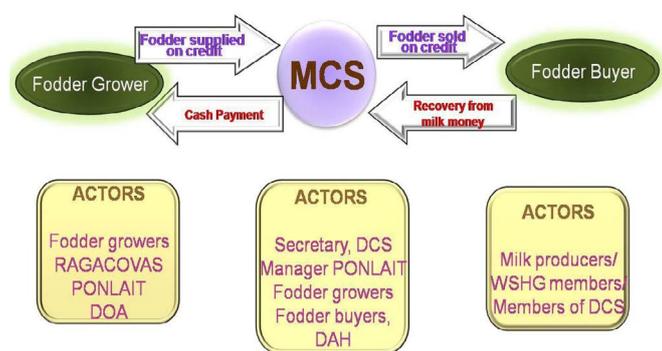


Fig. 1: Institutional arrangement of milk cooperative societies

Initial challenges: The sale of green fodder was initially good and gradually fell owing to the subsidy pull. There were instances of wastage of fodder due to late arrival of fodder at DCS, thick stems of the Napier grass and also due to poor sales of fodder. The secretary DCS found it difficult to sell fodder to members with dry cows (non

pourers of milk to the society) for cash instead of credit. Despite the efforts to include the cost of transportation in the project, this system of routing fodder through DCS did not work.

When this issue was discussed in a stakeholder meeting, the WSHG leaders came forward to accept the responsibility of fodder distribution and collection of money from the fodder buyers with a resolution passed in their group meeting. The resolution was passed by the WSHG members based on the credibility they had on the officials and their recommendations. The fodder was accordingly delivered by the fodder grower at the doorsteps of the WSHG leader (Fig. 2). This system had solved two problems – one, even if the fodder was supplied late in the evening, the leader was able to distribute to the buyers (group members). Second, fodder was supplied to any buyer (irrespective whether they were members of the DCS or not) for cash. This system did work for few months to the satisfaction of all the stakeholders. However, the fodder buyers especially the landless cattle owners had a grouse that feeding green fodder to cows was expensive and it should be subsidized. In all the meetings the issue of “**low milk procurement prices**” came up in one way or the other as it appeared to be a stumbling block for milk production-enhancement programmes.

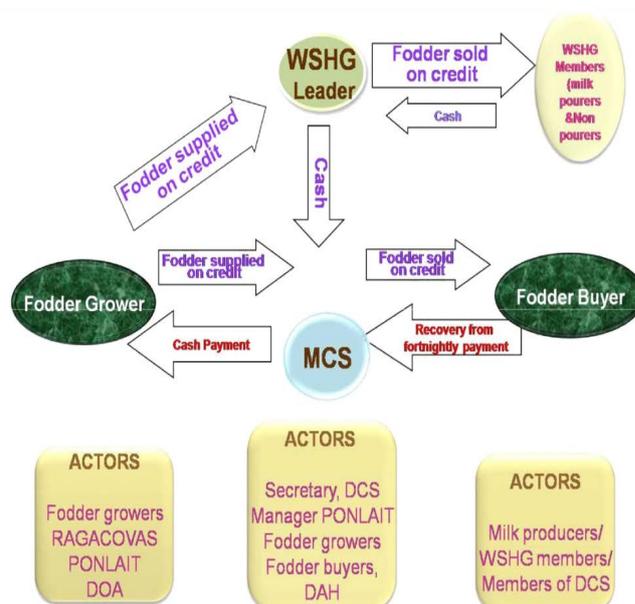


Fig. 2: Institutional rearrangement of MCS including WSHG leader

New challenges: This system worked well as long as the WSHG leaders took active part in receiving and distributing fodder and collecting payment from the buyers. Later, it suffered a serious setback when these leaders got engaged in local body elections. Though their involvement in fodder

transaction, in a way, catapulted them to the political arena, they were no longer in a position to devote time for fodder transaction. Since WSHG members (lower stratum) and DCS secretary (upper stratum) were belonging to different communities the cooperation between them on fodder transaction was not up to the expected level. The fodder growers in both the experiments suffered due to delay in payments and sometimes wastage of fodder due to poor sales.

Perceptions on feeding green fodder: Cattle rearers preferred allowing their animals to graze on public or private lands (non cash cost) and

dry fodder (paddy straw) rather than spending Rs. 20 (cash cost) every day to feed one cow on purchased/cultivated green fodder, however superior the latter may be in terms of quality, Total Digestible Nutrients (TDN), Digestible Crude Protein (DCP) and palatability. The reasons for their preference to paddy straw are that they can stock and use it for 4 to 6 months depending upon the season. Purchasing (during harvest season), transportation and stocking it could be completed on one day whereas the cultivated green fodder (heavier) needs to be obtained from the fodder producer or the DCS on a daily basis which they consider as laborious.

Box 1: Institutions and policies matter

Milk testing: The milk producers especially the WSHG members after feeding the green fodder continuously for two months to their cows perceived that the income through sale of milk to the DCS did not increase and they attributed it to the faulty testing of the milk in the DCS. They were unhappy with the milk testing as it is neither transparent nor done on a regular basis. Not a single DCS out of the 93 functional DCSs in Puducherry has an automatic milk collection unit which is considered as transparent and foolproof method of weighing and testing milk. Testing of milk in these DCSs is never done on a regular basis. In most of the DCSs the milk testers are not working. Unfortunately the milk producers/DCS members have no say in "testing of milk" and in "price fixation" although theoretically they own the DCS and PONLAIT (Rao et al, 2009). So the livestock keepers are right in their hesitation to invest in purchase of green fodder, when they don't see any benefit.

Price policy: In almost all the stakeholder meetings, the issue of low milk procurement price was discussed but without finding any feasible solution to address this. Although, PONLAIT is empowered to fix milk prices, in practice the Government will fix the price which will be in favour of the urban milk consumers (more in number) rather than the few scattered rural milk producers or members of the DCSs. The procurement price of Rs. 17 per litre (even today) offered by PONLAIT is the lowest in the country. In other words, there is no incentive for farmers to invest in any new technology or practice as there is no commensurate return on their investment.

Subsidies without other support: The government of Puducherry has been implementing several schemes which include milch animal purchase, subsidies for green fodder production, calf feed, cattle feed etc. However, these schemes haven't helped increase the milk production in Puducherry. The gradual decrease in milk procurement by the DCSs from an average of about 50,000 liters per day in 2001–02 to 29,000 liters per day in 2010–11 and purchasing milk from other states from zero to 73,000 liters during the same period (PONLAIT, 2011) clearly shows that the subsidies are not helping the state, the milk society or the producers. Moreover, this has also adversely affected the mind set of resource poor livestock keepers as they prefer low quality subsidized inputs over the good quality purchased inputs.



Project Outputs

Even with all these challenges, the project had some positive influence on fodder growers. One fodder grower who raised fodder on one acre of land for sale realised the benefits of feeding green fodder to his cattle and discontinued selling green fodder to the DCS/WSHG. It is economical for him to feed his cattle with *ad libitum* green fodder rather than feeding with paddy straw which is costlier than green fodder. Similarly one old lady who had three repeat breeding cows felt happy with feeding green fodder (grown on 30 cents of leased land) to these cows as all of them were conceived. A farmer has been raising fodder on seven acres of land and supplying it daily to a nearby *gaushala* which is maintaining about 270 cattle. He also sells limited quantity of fodder to milk producers of his village.

A traditional betel nut cultivator after incurring heavy losses turned to fodder production and recovered from the losses. This fodder entrepreneur used fodder cultivation as a stepping stone to enter into supply of canned drinking water to nearby villages, a more profitable venture compared to fodder production. This also reflects on the low economic status attached to fodder production by the farmers of the Puducherry region. Not a single farmer (other than the fodder entrepreneur who is supplying fodder mainly to *gaushala*) is growing fodder to sell it to the landless dairy farmers in the village. The landless continue to send their cattle for grazing on poor quality grasses which they consider as a good substitute for green fodder. They even now feel that it is worth depending on grazing rather than getting additional milk through purchased green fodder. It all depends upon their perceived economics which seems to be working out for them, the reason why they are still rearing dairy cattle. Due to financial crunch, the government has withdrawn all subsidies and the dairy farmers are at the receiving end. Shifting of occupation from dairy farming to goateries is quite discernible mainly because of very good demand for chevon (goat meat) and low price for milk.

Where do we go from here?

Beyond technology dissemination: Poor livestock keepers need access to good quality green fodder and many of them are now convinced about the technical supremacy of feeding their animals with green fodder. But they are not in a position to buy and feed their cattle with green fodder, without addressing the two basic issues of milk testing and milk prices. Any other types of programmes promoting fodder technology, subsidised seeds/saplings, trainings and demonstration will not have any major impact.

Engagement with policy issues: The project team strongly believes that extension should play a pivotal role in influencing policies rather than focusing only on technology dissemination as the former has a strong influence on technology dissemination, as evidenced by this project. In this case, none of the stakeholders in the state have a say or influence on price fixing policy, although everybody was convinced that the milk prices need upward revision. The milk and feed price ratios are decreasing over the years indicating thereby that the prices of feed are increasing at an increasing rate than the prices of milk (Tamizhkumaran et al, 2012). In most of the dairy developed countries, the prices of milk are linked to feed prices. However in India the policy of milk–feed ratios to fix the milk procurement prices is not being adopted.

Research on policy issues affecting technology update: There could be several such instances where technology dissemination is constrained due to lack of an appropriate policy. It will be useful if researchers bring out evidence of such instances to sensitize policy makers. Or else it will be the usual story “policy makers not aware of the research constraints; researchers not concerned about technology dissemination and sensitizing the policy makers is not the job of extension.” Undertaking an innovation system diagnosis helps in raising these issues upfront.

The project team organized a workshop on



“Reclaiming Research in Livestock Development Through Policy Interventions – 12 Innovations in Livestock Development which Need Policy Support” in collaboration with Indira Gandhi National Open University (IGNOU), International Livestock Research Institute (ILRI) and Rajiv Gandhi College of Veterinary and Animal Sciences (now RIVER) in 2011. A platform was provided to selected researchers to present their research

output (which is getting bogged down due to lack of appropriate policy) to policy makers (Rao et al 2011). The recommendations made during the workshop evoked a mixed response.

Either we may have to organize more such interfaces or should do something differently. We look forward to your views and experiences in this regard.

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HOW CAN TECHNOLOGIES MAKE AN IMPACT? - INNOVATIVENESS, IMPROVED DELIVERY AND INSTITUTIONAL MECHANISMS

Agricultural research rarely goes beyond production of new technologies and its pilot testing in few select villages. Promoting wider application of the new knowledge it has produced is considered as someone else's responsibility. This artificial separation has effectively constrained agricultural research from learning about the challenges in promoting large scale adoption of new technologies and also its other potential roles in the innovation process. The sustainable rural livelihoods project recently implemented by the Central Research Institute for Dryland Agriculture (CRIDA) is an exception to this general trend as it was about promoting technological changes at a large scale through development of appropriate institutional arrangements. Sreenath Dixit who played a major role in this initiative reflects on its process and outcomes as well as some of the lessons in this blog.

In the summer of 2006, Central Research Institute for Dryland Agriculture (CRIDA), a constituent research unit of the Indian Council of Agricultural Research (ICAR) was invited to submit a proposal for Component 3 (sustainable rural livelihoods theme) of the World Bank assisted National Agricultural Innovation Project (NAIP). By then CRIDA had successfully led a couple of projects on natural resource management aimed at improving the livelihoods of the rural poor. After several rounds of consultations with potential partners, a comprehensive proposal was prepared for award of sponsorship.

The project *"Sustainable rural livelihoods through enhanced farming systems productivity and efficient support systems in rainfed regions of Andhra Pradesh"* was developed based on a robust on-farm participatory framework for implementation in an action research mode. As desired by NAIP, a consortium of partners was constituted. This included five NGOs, two private extension service providers, one State Agricultural University and one CGIAR centre. Perhaps, no other project had brought on board such diversity of partners (Table 1) with it at that time, as it was largely thought to be safe to have partners only from the government sector.

In early 2007, CRIDA presented its proposal before the project screening committee. When the project outlined its hypothesis of enabling the poor with better NRM options by having an institutional mechanism to support technology adoption, not many in the screening committee could appreciate it. Pat came a question from one of the senior members *"where is research in this project, all you are presenting looks like an extension project"*. We really had to struggle to get the concept of development research clearly to the screening committee. It was tough for us to convince the 'hardcore scientists' who talked and understood research mostly in terms of "T1 to T6 with a control".



Box 1: Project objectives

- To improve the livelihoods of the rural poor through better management of natural resources and increased productivity, profitability and diversity of the farming systems
- To facilitate agro processing, value addition and market linkages for enhanced on farm and off-farm employment and income generation
- To build the capacity of primary and secondary stakeholders through knowledge sharing, collective action and use of ICTs
- To develop institutional mechanisms and support systems to internalize the project outputs by the community

Teething Troubles

After several rounds of presentations, the project was approved for implementation in eight backward districts of Andhra Pradesh. Initially, it took almost a year's time to put systems in place.

The task was more challenging simply because it was not easy to develop a common vision for a complex project that was to be implemented by a consortium with a large diversity. The job seemed complex, as it involved organizations with different working cultures and capacities.

Table 1: Partners and their roles

Partners	Strength	Responsibilities
CRIDA	Strong expertise in biophysical sciences, experience in leading multi-disciplinary, multi-institute projects	Lead Center: Coordination & monitoring; overall technical support to project interventions.
ANGRAU	Strong presence across the state, leader in location specific research	CA (Adilabad); technical support & capacity building in Ananthapur and Kadapa clusters.
ICRISAT	International presence and experience in soil fertility management	Soil fertility enhancement related interventions and monitoring runoff in watersheds across clusters; capacity building for INM
WASSAN	A large network of grassroots NGOs working on watershed development	CA (Rangareddy); institutional innovations & support systems across clusters.
MARI	Strong local presence in Warangal with reputation among development departments	CA (Warangal); capacity building on community led rehabilitation of traditional water harvesting structures across clusters.
BIRD-AP	Experience in livestock development and watershed development in rainfed areas	CA (Mahabubnagar&Anantapur); technical support to livestock related interventions across clusters.
SAIRD	Strong local presence in tribal hamlets of Nalgonda district	CA (Nalgonda); technical support to village level seed production across the clusters.
CWS	Experience in policy advocacy in rainfed agriculture	CA (Khammam) and capacity building on social regulation of ground water use across clusters.
AAKRUTHI	A young private extension service provider with experience in farmer-led seed production	CA (Kadapa); supporting contract farming innovations across clusters.
I-KISAN	Experience in ICT mediation in agriculture, market linkages	ICT and market linkage activities across clusters.

CA: Cluster Anchoring

When it came to partners' field exposure, there was disappointment in waiting. Some of the partners that had a very good theoretical understanding of how livelihood systems work had little or no experience to execute on-field interventions involving farmers. This exposed that the criteria adopted to select partners were not very exhaustive. Although this appeared as an impediment to begin with, it was addressed through enhancing the capacity of the project staff to rise to the occasion. Initially, some of the partners felt that field monitoring by the lead centre (CRIDA) was too close to be comfortable. The very same partners however appreciated it during the later phase of the project, for it imparted confidence to speak more authoritatively about their philosophy.

Project Management and Monitoring

After much thought and deliberation, a unique two-tier project management framework was developed. Field level monitoring was completely decentralised by assigning one district each

to a partner. This was overlaid by another level of monitoring by a team of 3-4 scientists representing lead centre. These teams called as Cluster Coordination and Monitoring Teams (CCMT) formed for each of the eight districts facilitated technical monitoring. Monitoring was the new mantra to get the project grounded and going in the eight districts.

Many outreach projects suffer for want of close monitoring which depends directly on the mobility of the project staff. Keeping this in mind, a dedicated vehicle was kept at the disposal of the project office. This addressed the issues of delay and denial that such projects face in general in accessing vehicles for mobility from the central pool of vehicles. The project also addressed the issue of adequacy of manpower by funding good number of positions (senior research fellow/ research associate). Each partner had 2 or 3 positions and including those with the lead centre the total number of contractual positions was well over 30.

Box 2: Key Interventions

- **Resource conservation:** Mainly rainwater harvesting by adopting site specific options
- **Crop, livestock & horticulture:** Interventions to integrate all the three to enhance profitability & reduce risks
- **Value addition and market linkages:** Providing basic infrastructure for post harvest value addition and linking the initiatives with the market
- **Institutional innovations:** Constitution of *Salahasamithis*, village advisory bodies to articulate community needs besides owning responsibility for project interventions; commodity interest groups, custom hiring centers, ICT-enabled village resource centers and sustainability fund
- **Capacity building:** Cross cutting theme to build capacity of the community members to absorb project outcomes

The project implementation framework provided for a package of site-specific and need-based interventions to evolve so that the local resources and capacities were harnessed to the best extent to address livelihoods of the poor. Keeping participatory processes at the heart of the programme, natural resource management was promoted as the key strategy for addressing livelihoods issues. Within the broad strategy of NRM, sub-strategies were evolved to harvest and use rainwater to improve crop productivity and cropping intensity.

Project Outcomes

These can be largely categorised into two groups: technical and institutional.

Technical Outcomes

On the technical front, the major gain was in terms of rainwater harvesting and its utilization. During

the course of the project, nearly 250 rainwater harvesting structures were built, repaired or renovated. This led to the creation of an additional 4,38,000 cu. m rainwater storage capacity which in turn benefited 1600 farmers by bringing over 400 ha into the protective irrigation regime.

The overall cropping intensity jumped from 130 to over 180 %. Besides, water productivity was enhanced by promoting micro irrigation systems made available through custom hiring centres; animal productivity increased and mortality came down significantly and diversification of cropping was notably increased by introduction of vegetables, short duration pulses and horticultural crops. We can go on and present numbers to substantiate these. But the focus of the project, unlike other "productivity enhancement initiatives" was not on productivity alone. It was on bringing a shift in the approach to these kinds of initiatives. In other words, the emphasis was on 'doing things

differently' although more or less the same things were done here as well. But it is very difficult to get people to appreciate this subtle difference, as many would say "this is like any other watershed development project", unless one takes time to understand the processes behind the initiative.

Institutional outcomes

The uniqueness of the project was not only its innovativeness in delivery but in setting up a backend that was responsive and dynamic. This was ably assisted by certain radical changes that NAIP had brought in. For instance, NAIP's effort to empower the Principal Investigator by giving him/her recruitment and financial sanction powers was indeed revolutionary. How earnestly this was done varied greatly among implementing centres. But those that used these powers could see its impact on the ground. This used to be apparent during project review meetings. Most importantly, the flexibility of deciding what needs to be done to achieve the set objectives was very crucial to the success of the project. Another unique aspect was that there was no pressure to report only success. Failures, better worded as learning, were openly discussed during reviews. This gave the partners tremendous confidence to try new ideas.

At the implementation level, the process of articulating what kind of support the community needs from the project was institutionalised. The *salahasamitis*/village action teams (10-12 member body largely representing all sections of the village) were the ones that voiced what needed to be done. For instance, in Jamistapur cluster, Mahabubnagar villagers asked for support to lay a drying yard and drinking water tub for cattle; in Anantapur, members of a women SHG asked project support to repair an abandoned construction to take up calf rearing as a livelihood activity. This helped the project to ensure that demand-driven interventions were promoted. Besides, this process also ensured that the community contributed in cash or kind towards part of the required investment.

Lessons Learned

Managing multi-institute consortia: Formation of the consortium for a mega project like this is very important. Many times the leader of the consortium picks organizations that have been known or working with it without taking an objective assessment of the skills a partner is going to bring along. It is important to have a complete knowledge of the strength of partners particularly in the field and their abilities to transform ideas into workable interventions. One needs to go beyond the rapport being enjoyed between each other although it is important.

The more diverse the background of the partners, the better it is to address complex issues such as that of rural livelihoods. However, too much diversity can pose issues for coordination, as partners would not be speaking in the same frequency. Respect for partner's organization and skills besides according due recognition through appropriate credits is the bedrock of trust and confidence within the consortium. A commitment to the participatory philosophy while dealing with partners gave rise to important outcomes. For instance, the innovation of groundwater sharing through underground pipeline networking at Rangareddy district happened only because of this diversity and respect for each other. Allowing partners to deeply commit to the project vision and supporting their ideas was actively pursued all along. And this gave rise to new possibilities of accommodating community needs while promoting better technologies.

Managing multi-disciplinary team: Over 30 scientists of the lead center (CRIDA) specialized in different disciplines (bio physical and socio economic) were part of the project coordination and monitoring team. They provided the quintessential inter-disciplinary approach to the project. Many other consortia that were led by one or two scientists could not leverage the strength of partner especially where the project was implemented in more than four districts. Delegation of responsibility to the teams of scientists (CCMT) was very crucial for frequent monitoring which ultimately produced desired outcome.

Technologies do not diffuse in vacuum: This project is an eye-opener for all those who profess the predominance of technologies in improving the livelihoods of the poor. For, it has been very well brought out by this project that, no matter how good the technology is; it does not work unless the community is supported/ enabled to benefit from it. Many more lessons could be drawn by the organizations engaged in the research-extension continuum. This brings us to think about the premise on which governments design their development programs. For instance, the project showcased how small investments could revive the defunct rainwater harvesting structures, whereas we see in development projects, provision only for building new structures. Another important lesson for all those organizations engaged in extension as a means to bring about change is the supportive role grassroots institutions can play. So far very little effort has gone into mainstreaming institutional innovations as a strategy to bring about behavioural change. And the outcome of this project makes a strong case for one.

Listen to your stakeholders: Development organizations often consider that the innovations required to trigger development often exist outside of their stakeholder systems. But the project had a different experience. There is enough scope for fostering innovations within the stakeholder environment. There are several instances during the course of the project when innovations came along just by allowing the community to express themselves. One of the most important innovations of the project was to bring back into life the defunct rainwater harvesting structures by investing in them very modestly. This would not have come to the fore if the project has not encouraged the community to suggest ways and means of augmenting water availability.

The Road Ahead

Though this project scored well in keeping its promise and coming out with innovative solutions to improve rural livelihoods, it had the tag of a "special project". To this extent, it makes it difficult to mainstream the learnings in the existing system. There is no dearth of learnings from projects like this one. But unless such learnings are internalized in the existing system, such projects won't serve their objectives. There is a gaping void between the learnings that keep accruing and the existing system. Unless the void is bridged, we may go on implementing such projects for years on without any impact on the system. This brings us to the real issue of how this learning is going to be put to use.

CRIDA at its own level has ploughed these learnings into a large national initiative on climate change (see more on <http://www.nicra-icar.in>).

For instance, the successful learning of promoting innovative institutions in NAIP has been brought forward to Technology Demonstration Component of National Initiative on Climate Resilient Agriculture (NICRA) being implemented by 100 KVKs across the country. However, there are other leanings such as delegation of more powers to the Principal Investigators that were followed while implementing NAIP, need policy level commitment for mainstreaming.

The project provided all organizations whether they are at the apex or grassroots level important lessons to carry home. But these need to be well documented for use in posterity. For, learnings at organizational level and their better use will determine how well they will survive in the challenges that future has in the offing.

End Note

Personally, this project gave me a gratifying experience. While it helped me put my extension expertise in practice, it honed my inter-personal and negotiation skills. It also got me to appreciate the strengths of the NGOs in community mobilization and institution building. The overall project management also taught me how deal with budget keeping in view the basics of financial management. Mostly thought as a mundane activity, this is very important in donor perspective. On a much more personal note, the project helped me to develop patience, improved my ability to accommodate divergent views, deal with dissent and look at setbacks not as problems but as challenges to surmount. In all, I would put it as the best project I have ever involved in my career spanning over 20 years.

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FARM BUSINESS ADVISOR: THE MISSING LINK FOR FARMERS

Farm Business Advisors (FBA) overcome the last mile distribution gap of agricultural information and technology to small-scale farmers. Of all the iDE country FBA programs, Bangladesh has hosted the largest and most diverse. In this blog, Jeremy Davis and Abir Chowdhury share their experiences from promoting FBAs in Bangladesh.

Since our inception, iDE (International Development Enterprises) has positively impacted the lives of over 30 million people by leveraging technologies, supply chains, and market systems to increase both agricultural productivity and economic returns for rural farmers and microenterprises. In the decades since our founding in the early 1980s, we have maintained agriculture for entrepreneurs as a focus, continuously refining our 'Farm Business Advisor' (FBA) micro-entrepreneur model, based on evolving local contexts. iDE has developed the FBA role to overcome the last mile distribution gap of agricultural information and technology to small-scale farmers. This has been achieved through a continuous positive feedback loop in rural communities that leverages user insights, product innovation, and business model design, integrated into a simple service model. In addition to filling smallholder demand for hard-to-access quality farm products and services, FBAs also serve as alternative sources of agricultural extension. Although existing public service models are present for extension in Bangladesh's rural areas, the limited local government investment in extension does not cater to the needs of everyone. FBAs can fill this gap.

The FBA Approach

The FBA approach originated in Cambodia and Nepal in the mid-2000s, quickly expanding across other iDE country programs. FBAs work on a commission basis, providing both inputs and aggregating product for sale to wholesale markets. FBAs are entrepreneurs who go door-to-door and field-to-field, supporting small-scale farmers to grow crops that can be sold for attractive returns. FBAs provide an essential last-mile market link for farmers located in remote areas far away from commercial centres. The model requires FBAs to visit the farmer's field directly, where they learn what challenges the farmer faces— problems such as lack of irrigation, poor soils, damaging pests, or difficulty getting crops to buyers. Together, the FBA and the farmer work out a strategy, which might include investing in new equipment, like drip irrigation or introducing higher-value crops into their annual agricultural cycle. They sell farmer inputs, such as seeds, fertilizers, drip irrigation kits, and other agricultural tools, earning a commission on each sale. FBAs keep in regular contact with their farmer clients to answer questions, solve problems, and ensure that investments are yielding the expected results. Consistent with a market facilitation approach, FBAs do not receive any financial support to start their businesses; support is limited to training, capacity building, mentoring, and building linkages with customers, traders and other market actors.



FBA as private-sector extension agents

In addition to the sale of inputs and outputs, FBAs provide their farmer clients with context-specific market information and agricultural advice. This behavior is purely market-driven, as it helps them retain customers, build trust, and provide a value-added service that traditional inputs retailers and traders cannot. In order to reach the last mile, FBAs are shown how to engage with the private sector to facilitate informational sales and technical training sessions at the community level to promote new products to producer groups.

These sessions place private sector actors, such as company sales representatives, in the role of facilitator at village-level sessions to deliver training on inputs and production practices as embedded product marketing to producer groups. These sessions are initially cost-shared with the private sector, with support gradually phased out until they are convinced of the value and are willing to assume 100% of the costs. An additional success factor for FBAs is the incorporation of production planning into the suite of activities that are done with their smallholder clients. These organized planning sessions are a means to harmonize supply and demand between markets and producers, and allow the FBA to coordinate the inputs they will sell as well as determine volumes of product they will be able to aggregate and sell to buyers at harvest time.

FBAs complementing public extension

It should be noted that the intent is not for FBAs

to replace public sector extension, but rather to complement it as part of a pluralistic extension system. FBAs typically maintain close contact with the local public sector extension agent and consult with them on problems that are beyond their own expertise. They also serve as an 'extension bridge' by introducing and linking the public agent to their farmer clients.

Of all the iDE country FBA programs, Bangladesh has hosted the largest and most diverse. Over the course of the last half decade, more than 1,000 FBAs have been trained and supported. The FBA model engages the Government of Bangladesh extension officers while providing support to FBA businesses through attending events and verifying technical advisory information. What the Bangladesh team has discovered is that each FBA is truly a unique business, each having a different business plan to meet its specific challenges and needs. For example, some FBAs are school teachers during the day who spend their evenings selling agricultural inputs, seeds, fertiliser, pesticides, etc., another is a pharmacist who expanded his shop to include quality vegetable seeds. While this may seem daunting, iDE has embraced the diversity of the FBAs in Bangladesh and developed a methodology to support them based on the roles they play in their communities. FBAs self-select whether they provide input or output support (or both) to farmers. Some FBAs had pre-existing agri-businesses and used the training they received to expand their services and offerings. Others were lead farmers with existing associations or farmer groups.

Challenges

Many challenges remain. To date, only 10% of Bangladesh FBAs have been women, mainly due to cultural norms that make it difficult for women to travel alone or interact with men who aren't in their extended family. Limited access to capital constraints many FBAs from maintaining the working cash flow they need and extending short-term credit to clients. Scalability is an on-going concern as, to date, private sector lead firms, while extremely collaborative, have not shown willingness to adopt the model

by recruiting and training FBAs on their own. Finally, as with most market-based approaches, inclusiveness can be a struggle. To grow their business, FBAs tend to focus on more well-off commercial smallholders rather than the poorer market segment who need their products and services the most. The diversity and sizable number of FBAs in the Bangladesh program has supplied a volume of lessons learned, data that iDE continues to analyze and explore as we press forward on increasing the income and improving the lives of the rural Bangladesh population.

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FARMERS' FAIRS: CAN WE MAKE THEM IMPACTFUL?

The Kisan Melas or Farmers Fairs are considered as important mechanism to popularize agricultural technologies among farmers. But in recent times, the organizers of such agro fairs are finding it difficult to attract the farming communities. In this blog, Tanusha and Mahesh Chander suggest ways to make these fairs more effective and meaningful to farmers.

Farmers' fairs or *Kisanmelas* are in existence for a long time. The main purpose of organising such fairs or melas is to create awareness among farmers about new technologies developed by researchers- primarily from the public sector agricultural research centres and agricultural universities. Also, these fairs help farmers enhance their knowledge on new schemes or programs. Such fairs often attract an umpteen number of farmers, scientists, students, and extension personnel from the KVKs and the agriculture and allied departments. Private sector, especially the input companies are also participating in these fairs. Organizing such events demand a lot of investments. Scientists and development professionals need to spend several weeks to organize such events. But are farmers deriving real benefits from these? Can such events be made more impactful?

Kisan Melas: A Worthy Investment?

Kisanmelas are largely funded events with the financial support from State/Central government agencies. For instance, nearly Rs. 15-20 crore were spent on Krishi Vasant (2014) and the recently held *Krishi Unnati Mela (2016)*. The central government has enhanced financial support to Regional Agriculture Fairs from Rs 6 Lakhs to Rs 15 Lakhs per fair. Investing such large amounts is important to make these events grand and successful. But on the flip side, these investments do not yield adequate returns if farmers fail to attend these events. Increasingly, farmers are abstaining from these events, whereas, many urban dwellers seen frequenting these casually.

The farmers find these fairs not attractive enough to foot the bill on travelling charges and other expenses. Moreover, the growing use of social media and other ICT tools in the current era of digital media (http://www.agriculture.com/news/technology/farmers-making-use-of-social-media_6-ar50861) has opened the doors to avail any information at just one click instead of travelling to these events. However, the organizers of these events are often under pressure to ensure presence of a large turnout of farmers. Ambitious targets are set for different organizations to bring scores of farmers for the event. Even incentives are paid to farmers to ensure their presence. This may increase the presence of farmers but in turn diminishes the importance of these fairs. The people either are not actively involved or just come to have a good time. It is high time that we reflect on the current status of *KisanMelas* and take measures to upgrade these events to maximise returns on these huge investments.

Box 1: KisanMelas in India

These days, KisanMelas are organized every year by almost all of the agricultural universities. Most of the ICAR institutions organize such fairs at least once in two years. Govind Ballabh Pant University of Agriculture and Technology (GBPUAT), Pantnagar, organizes the event biannually -- one for Rabi crop season (October) and Kharif crops (March). Other ICAR institutes, like IARI, IVRI, NDRI, etc, and some SAUs hold them on annual pattern.

The objectives for the following mega events are similar:

- *Krishi Vasant* (2014) at Nagpur (<http://www.icar.org.in/en/node/7374>)
- *Krishi UnnatiMela*-National Agriculture Fair (2016) at New Delhi(<http://www.icar.org.in/en/node/10264>)
- The Agricultural Fairs organized by State Agricultural Universities (<http://www.krishijagran.com/General-News/2015/10/GB-Pant-Universitys-Farmers-Fair-a-Teerth-Yatra>) State Veterinary Universities (<http://www.icar.org.in/en/node/10486>) or ICAR institutes like the Indian Institute of Vegetable Research (<http://www.icar.org.in/en/node/10141>).

The Directorate of Extension, Ministry of Agriculture and Farmers' Welfare, Government of India, has a scheme of sponsoring Regional Agricultural Fairs in different agro-climatic zones of the country (http://vistar.nic.in/organisation/Farm_Information/kisan_mela/Guidelines.asp). Under this scheme, several SAUs and ICAR institutes organize Regional Agricultural Fairs every year, like the one organized by the Indian Veterinary Research Institute in 2015 (<http://www.icar.org.in/en/node/8690>).

Not only the public institutions, but also the private sector (<http://pune.kisan.in/>) and NGOs (<http://www.agrotech-india.com/home.aspx>) are taking interest in organizing agricultural fairs. The corporate sector's support to organizing farmers' fair is found to relieve the overburdened public institutions that often have financial crunch too, in organizing such fairs effectively.

Enhancing the Effectiveness of Fairs:

Some of the suggestions to make these fairs more beneficial to farmers are given here:

Advance publicity: Often farmers are not aware of the fairs being organized even in their vicinity. It is therefore important that farmers are informed well in advance through newspapers, radio, TV, personal contacts, mobile publicity vans etc. The extension agencies like KVK and ATMA have important role in bringing information to the notice of the farmers. The services of these agencies could be utilized to ensure larger participation in farmers' fairs. For instance, in *Krishi Vasant* and *Krishi UnnatiMela*, the KVKs and ATMA played huge role in ensuring the participation of farmers. The ATARIs were given targets to bring farmers with financial support to meet the cost of farmer participation. In the digitalized era with growing number of mobile and smart phones, awareness can be further raised among farmers through mobile text and voice messaging including Social Media channels like Facebook and Whatsapp.

Seeds and seedlings stalls: Seed stalls have always been one of the major attractions for farmers in such events. The agricultural universities, the National Seeds Corporation and private seed

companies display and put on sale new varieties, plants and vegetable seeds and seedlings. The good quality seeds for the coming season should be made available at these stalls at reasonable prices. Farmers may also be given required information regarding sowing/planting of these varieties through leaflets and folders on these seeds and planting materials. Many social media platforms like Facebook and Whatsapp groups are now spreading information about promising new varieties. However, when they look for such varieties, they don't get the seeds in required quantities. If the farmers' fairs are able to cater to this need, the farmers would find visiting these fairs valuable.

Technology display stalls: Common in all the farmers' fairs, these stalls display the new kind of technologies that have entered into the market. These include everything from milking machines, growth promoters, chaff cutters, sprayers, drip irrigation systems to tractors. These stalls could be more meaningful, if opportunity of hands-on experience is provided to the farmers through method/process demonstrations on the site.

KisanGoshti: This is one very important part of Farmers' Fairs, which offers a platform for farmersto interact with scientists who can facilitate solutions to the farmers' problems. The queries of farmers may be documented for the experts to deliberate

and share solutions. The experts speaking on the occasion should base their talks on the problems of farmers rather than merely speaking about the government schemes (Mahesh Chander's Notes, In: Vijayan and LaxmipriyaUpadhyaya, 2016). The visiting farmers should be able to find solutions or answers to their problems they face in their farming operations. Often they meet disappointments on this count demotivating them to attend these fairs.

Crop-livestock demonstrations/Animal shows:

This is another fascinating event for the farmers. Organising crop yield competitions in different zones prior to the mela and bringing such award winning farmers to the farmers' fair may help draw more farmers to the event. The best animal selected based on the pre-determined criteria and prizes distributed to the owners in different categories may inculcate the good habit and interest among farmers for raising good quality animals. Also, different breeds of animals and highly prolific animals at these fairs inspire visiting farmers.

The National Livestock Show and Championship organized every year in February at Muktsar by Punjab State Department of Animal Husbandry is one good example of such show (<https://www.youtube.com/watch?v=tdr4EDu0XDQ>, <https://www.youtube.com/watch?v=KG2hwCtfg0U>). Live crop, flower and animal shows during *Krishi UnnatiMela* (2016) at Delhi in March was an appreciable effort which should be followed by SAUs and ICAR institutions with region specific attractions.

The extension principle "seeing is believing" works well in such fairs when farmers witness live demonstration of the technologies or systems in action rather than descriptions and narrations. Although it is a bit tough task to handle large number of live method demonstrations, it could add to the efforts fruitfully. Management of animals, water harvesting, drip irrigation, integrated farming, handling of new technology tools, new varieties, seeds, etc. can be demonstrated. The didactic approach should give

more of experience to farmers and motivate them to adopt such techniques.

Portals and Knowledge models: Instalment of a few Internet kiosks during *KisanMelas* would help to serve farmers at large. Farmers could be taught the use and handling of the ICT tools which would help in enhancing their knowledge at a fast pace. The agropedia(<http://agropedia.iitk.ac.in/>) stall at the KisanMela (Pantnagar) was a huge hit. The organisers explained about the portal and knowledge models to the visitors who were enthusiastic about learning how to draw knowledge models, how to upload content in library as well as in agrowiki and agroblog(Agropedia, 2010). The LCD presentations on improved practices, information kiosks placed at vantage points in the Mela ground may add to the attractions for the farmers.

Involving Progressive farmers: Farmers would learn more effectively, if they see any success stories. The progressive farmers could be used as a source of practical information worth sharing to attract other farmers, since they would find the results more applicable to themselves. Such progressive farmers are seen as role models by the farmers (Mahesh Chander, 2016), thus, the extension services may consider involving them in activities like Farmers' Fairs (<https://blog.gfar.net/2016/05/03/agripreneurs-the-emerging-role-models/>).

Free check-up stalls: A benevolent provision for the check-up of the animals, soil health analysis, faecal sample testing of animals etc. should be made free of cost for the visiting farmers. They would know about the current health status of soil as also the health status of their animals. Remedies provided to them on the spot may encourage farmers to visit these fairs. The vaccination camps for the livestock can also be set up where animals would be vaccinated depending upon the seasonal requirement.

Customer care centres: The farmers should be able to contact the authorities as and when required through fully operational



customer care centres. Often participants encounter chaotic situations where no information is available from any quarters, especially when VVIPs are visiting these fairs.

Make melas more thematic: *KisanMelas* could also be organised on a more theme based pattern so the public is cognizant what there is in store for them. This would also help in organising the different sessions and stalls more focussed.

Something for Everyone: These fairs should be made more inclusive to cater to the needs of young, adult and old, women, men or youth. There should be something for every category of visitors from rural areas. Special efforts should be made to target groups like farm women, rural youth, students etc. The students of the agricultural universities should actively participate in these fairs. Interactive sessions among students and farmers should help both in understanding the conditions on the field and test the applicability of the book knowledge. Also, *KisanMelas* could be used as a platform by these students to showcase any innovative idea. Students should come up with the development of working models applicable to village conditions which a farmer can apply. To encourage such groups, events or competitions

linked with participation of farmers need to be planned. Various kinds of competitions like fodder cutting or fodder chaffing, milking the cattle, etc. help sustain a high interest for the farmers and farm women.

Boarding/Lodging and other civic amenities: Often this is the most neglected segment of any Farmers' fair. Farmers get demotivated when they are not assured of proper staying arrangements. Appreciably during recent *Krishi UnnatiMela*, there was comparably better arrangement for drinking water, clean toilets, food and stay arrangements. Here again, chaotic situation was witnessed in the matter of farmer registrations, which caused lot of annoyance among farmers.

Way Forward

When people thought radio is no longer appealing or dead, it bounced back in the form of FM channels and community radio, making it even more popular among masses due to interactive and participatory formats. The same holds true for *KisanMelas*, which need to be made more interactive, participatory and farmer friendly.

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BRANDING AGRICULTURE: CREATING BRANDS FROM COMMODITIES

Farmers' can enhance their income if they start branding their commodities. Extension and Advisory Services should support farmers with branding their produce, argues Mandeep Pujara

Due to economic growth and increase in income levels, the demand for agricultural commodities and value added products are increasing. As consumers income rise, demand becomes more discriminating, i.e., a wider variety and a higher quality is sought, particularly by the expanding groups of families having higher income living particularly in the urban areas. If the producers have to take advantage of this situation, their share in consumer prices needs to be enhanced.

In India, the producer share in consumer rupee for food grains is 55 to 65 per cent, for fruits it is 30 to 40 per cent and for vegetables it is 40 to 50 per cent. There is a need to narrow the gap between producer prices and consumer prices through proper marketing support, value addition through entrepreneurship development and branding. Brand less commodities cannot easily survive the ups and downs of the markets and development of brands for agricultural commodities is one main way forward to realize better returns for producers.

Why Branding?

Branding is a way to escape from merely competing on volume and price alone. Brands (Box 1) help differentiate products and enhance their value beyond their functional attributes. They build preferences among competing products and therefore create long-term sustainable competitive advantage. Though there is a cost associated with building such a differentiated market position, it is essential that this be weighed against the benefit of increased market share and price premium opportunities.

Box 1: What is a brand?

According to Kotler (2003), Brand is a name, term, sign, symbol or design or a combination of these, that identifies the goods and services of one seller or group of sellers and to differentiate them from those of the competitors. Brands are viewed by customers as an important part of a product and branding adds value to a product. Thus, customers attach meanings to brands and this helps them to develop brand relationships. A brand is the combination of a name, words, symbol or design that identifies the product and a company and differentiates it from the competition (Giddens et. al., 2002).

Branding serves as a way for consumers to quickly and easily identify one product from another and to associate them with quality attributes related to the brand name. Giddens et. al.. (2002), found that in general, the number one brand in a market can maintain a 10 per cent price premium over the

number two brand and as much as a 40 per cent premium over the generic store brand. Additionally, the study showed that customers who are loyal to specific brands spend three to four times as much on food items than do customers who purchase items based on lowest price. In issues of branding, it is again very important that consumers have a positive experience with the product, so that they will associate the name or brand with a high-quality, satisfying product. An association with poor or

inconsistent quality can lead to the need for discounted prices.

Process of Branding a Product

A brand must be clear, specific and unique to your product. For example, the "Wheaties" brand differentiates the cereal from its competition due to its association with health and "sports excellence." To achieve the same successes with your products, you need to execute the following steps to establish an effective brand (Box 2).

Box 2: Steps in establishing an effective brand

- **Find a name:** Choose an appropriate name that is easily remembered and specific to the product. The name should be restricted to three words or less - anything longer is difficult for customers to recall. This process may require legal screening to guarantee availability of the name and customer input to assess attractiveness and appropriateness of the name.
- **Develop a slogan:** The selected slogan needs to be two to three words, catchy and easily remembered. To generate slogan ideas, you must stay focused on the buyer. Why should they buy the product? What will they like about the brand? How does competition compare? The slogan should take into account answers to these questions.
- **Create an appropriate symbol or logo:** It can be as simple as a geometric shape or as elaborate as a silhouette of a person or object. Use the name, slogan and symbol on every piece of correspondence related to the product--e-mails, invoices, letterhead, business cards, advertisements, promotions, etc. This system will eliminate inefficiencies in creative and production fees and extend the branding process throughout everything you do. In a sense, it will prevent "recreating the wheel" with each new media effort.

Benefits of Branding

Companies use branding and the consumers' ability to identify brands, to improve sales in four ways:

- Market new products,
- Protect market position,
- Broaden product offerings and
- Enter new product categories.

Branding in Agriculture

The majority of small agribusiness owners make their branding debut by repackaging their existing products under the name of their farm, ranch, organization or business, to promote brand recognition and to encourage the spread of experience attributes through word of mouth (Giddens et. al., 2002).

Marketing branded agribusiness products is important for several reasons. As stated previously, branded items are generally able to earn a higher price for the producer and can lead to brand loyalty, which leads to a strong customer base and the ability of the producer to better serve the needs of the market. Branding a product, adds value by differentiating the product

and making it stand out from the other items in the market. It also conveys additional information about the attributes of the product beyond its appearance. Branding also adds value to products simply because consumers generally believe that known branded products have better quality or more attributes than unbranded products. Another merit of branding is the sense of pride or community that can be experienced by the producer from successfully creating a brand identity.

Challenges in Developing Brands

The greatest challenge faced when developing and building a brand is creating just the right name, slogan and symbol for the product. It takes a great deal of time and consideration! It needs a long-term commitment. One has to think in terms of years rather than months.

It is often difficult to achieve initial customer recognition of a new product, regardless of branding. Identification of the segments, pricing competitively, positioning of the brand and promotion of commodity, as a category, are keys to success. Branded items are more recognizable and memorable.

Effective advertising (before and after the sale) is important. Advertising and promotion before the sale are essential to obtain first purchases and follow-up advertisements after the sale, promote customer satisfaction and repeat purchases. Repeat purchases are one of the primary objectives in brand development. Repeat purchases are critical for long-term success of businesses and contribute to brand loyalty.

Key Challenges that impede Branding

Value seeking Indian consumer: The value conscious Indian consumer is always on the lookout for the lowest price. The perception that branded products are costly is deeply rooted in the Indian psyche. To many consumers, a branded product still means a product with an attractive label rather than an assurance of quality.

The great Indian retailer: India has been a land of shopkeepers. Indian retailers enjoy high trust quotient by virtue of their superior service and relationship with their customers. This in turn means, consumers trust the retailer's choice implicitly and hence do not feel the need for branded products. However, this trend has been changing with increasing awareness about various products. Retail consolidation has also been a prime mover in the picking up of branding efforts in agri produce.

Scalability challenge: A brand needs to stand for something to someone. The diversity of the Indian population in turn means extensive localization and hence becomes unviable to make investments towards building a brand across a large geography. Only players with deep pockets have the capabilities to invest and build a brand. Since the very nature of agri-business is oriented towards supplying to the local community at large, branding efforts are sporadic.

Market structure: The system of aggregation of farm produce (at *mandi* level) by itself is against branding. This method strives to consolidate without any allusion to the source and hence wipes out any opportunity for differentiation at the first point of sale. It does not incentivize farmers to provide a much superior produce and charge premium accordingly. This in turn goes against the grain of branding.

Poor farmer awareness: The average holding in India is way too small for any farmer to make efforts towards branding. Although dairy has seen the co-operative movement being successful in creating great brands like AMUL, there have been no concrete efforts in other spheres of agri products. The farming community in India is still

caught up on efforts to sell and does not have the awareness of the relative merits of branding.

Way Forward

It is only a matter of time before the challenges are overcome. What are the ways to overcome this branding conundrum?

Quality First: "Cheap & best" possibly exists only in the Indian lexicon. However, increasingly people are realizing that both cannot always exist together. Continuous efforts need to be put on highlighting the superior quality of branded produce.

Visual differentiation is a key method of highlighting quality. For example, when branded sugar came into vogue, very clear communication about how the sugar is whiter and uniform in crystal size was highlighted.

Don't Undermine Value – Seeking: Indian consumers cannot be divorced from seeking value. Use any scope of differentiation to highlight superior value to customers. For example, long or rounded grains can be highlighted to prove that less quantity is required to be cooked.

Don't Scare Consumers: One of the strategies adopted many times by brands is to scare consumers about adulteration in unbranded commodities. That is not a good way to build a good agri brand. It might give temporary results. However, it does not add any value to the brand in question.

Role of Extension in Promoting Branding

Linking farmers to markets is currently recognized as one of the mandates of extension and advisory services. This involves providing advisory on good practices in crop production, strengthening producer-buyer linkages, development of long-term business relationships with market outlets, facilitating linkages with input suppliers, financial institutions and market outlets and helping to negotiate. Now a days, farmers are increasingly getting interested in branding their commodities so as to gain maximum share out of the consumer rupee. Farm Grocer (Box 3) and MajhaHaldi (Box 4) are such examples.



Box 3: Farm Grocer

Farm Grocer is a start-up by young farmers', based at Saha Food Park, Ambala (Haryana), dealing in authentic farm products, linking farmers and consumers together through a value chain. The objective of the company is to link authentic farmers' products directly to the consumers, through direct marketing and retail centers, providing full traceability of producers and package of practices being adopted. Similarly, the business model provides opportunity to farmers and entrepreneurs to supply their products to Farm Grocer. The company is based at HSIIDC Food Park, Saha (Ambala) and has manufacturing facilities of around 50 farm products. Company is primarily dealing with Farmer Producer Organizations (FPOs) for sourcing of raw and semi finished products.

Product Range

Pulses :- Unpolished & Uncolored;

Basmati Rice :- Long, Non-Sticky, Aromatic;

Spices & Namkeen :- Home Made Quality;

Honey :- Multi-flora collected from Himalayas;

Herbal Products :- Ayurvedic Products with compliance to GMP;

Tea and Green Tea :- Special blend from trusted sources;

Milk & Dairy Products :- Directly from dairy farms with full traceability of animal health;

Fruits & Vegetables :- Fresh Seasonal fruits and vegetables

Monthly Grocery Pack

Apart from retail sales, the products may also be supplied in a Monthly Grocery Pack, so that consumers can get best farm products all together

A new online platform, www.farmerfriend.in has originated recently at Amritsar to promote farmer owned brands. It is currently trying to bridge

the gap between farmers and the society, by providing a platform wherein farmers can contact the customers directly and vice versa.

Box 4: Majha Haldi

Yadwinder Singh from Chogawan village in Tarsikka block, Amritsar, took initiative to redefine the traditional agriculture by diversifying from wheat-rice cropping cycle, to turmeric. But after a few years of hard work, he felt the share of consumer rupee in their income is negligible as compared to the middlemen's share. ATMA, Amritsar, helped him to find new solutions and guided him about the process of making a brand and to get it registered, to make more profit. Now he grows, processes and packs turmeric at his farm site and along with that he has a farm outlet too, to serve the local consumers.

However, most farmers do not have the knowledge of branding. Extension and advisory services can support farmers in branding their produce, by providing advisory support on the following aspects:

- a. Changing consumer behavior
- b. Laws related to production and sale of

branded products including labeling

- c. Specific demands for branded products (types, quantity, quality specifications)
- d. Independent and group marketing model
- e. Development of farmer owned brands and
- f. Promotional opportunities for farmer owned brands.



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PLANTWISE: COMPLEMENTING DIAGNOSTIC AND ADVISORY SERVICES OF EXTENSION?

Self- medication kills!! and worst is if the advice flows from a mind vested with intention of self-interest. For decades, the farmers have no other go but the local input dealer shop to share his concern and take a solution. The local extension with its best effort could not possibly reach millions of advice seekers for whom the burgeoning issues of crop loss due to pest and disease are becoming unmanageable. Plantwise, a programme that works with national plant health systems through establishing sustainable networks of local plant clinics addresses this problem effectively argues
Malvika Choudhary

Plantwise(<http://www.plantwise.org/>) is a global programme, led by CABI (<http://www.cabi.org/>), to increase food security and improve rural livelihoods by reducing crop losses. This is achieved by establishing sustainable networks of local Plant Clinics, run by trained Plant Doctors, where farmers can find practical plant health advice. Plant Clinics are reinforced by the Plantwise Knowledge Bank, a gateway to online and offline actionable plant health information, including diagnostic resources, pest management advice and front-line pest data for effective global vigilance. This programme operational since 2011, is currently in its third year of implementation. It partners with 33 countries globally out of which eleven are in Asia.

Implementation of Plantwise

Partnership with Government: The program is implemented by CABI Country Coordinators in partnerships with the National Government. Each year the program implementation is reviewed and planned by a National Steering committee which comprises of top officials across the plant health system. CABI implements this program largely in collaboration with national partners from the Department of Extension under the Ministry of Agriculture. The extension officers are trained as Plant Doctors to run the clinics regularly and address the concern of farmers by giving them recommendation for cost effective and sustainable crop protection.

Box 1: Plantwise Training Components

- How to become a Plant Doctor? (field diagnosis, operation of clinics)
- Plant healthcare (managing plant health problems, choosing options)
- Monitoring Plant Health Performance (monitoring and evaluation methods)
- Extension Messages (developing locally relevant extension materials and Pest Management Decision Guides)
- Data Management (using plant clinic data for national purposes)

Establishing Plant Clinics: Plant clinics work like human health clinics run by doctors. In Plant Clinics, the Plant Doctor (extension staff) record data about the farmer, his current practices, the problems and the advice given. The one to one interaction between the Plant Doctor and farmers make them understand the need for monitoring and taking preventive eco-friendly measure and thereby reduce pesticide use and reduce crop loss due to pests. The extension officers and their support and supervisory staff, according to

their respective roles and mandates, are trained in Plantwise modules (Box 1) to strengthen their capabilities. The trainings can pertain to field diagnosis and making recommendations; clinic and data management; and monitoring and quality control of services provided in the clinic.

Pest Management Decision Guides (PMDGs):

Plantwise organises write shop with national subject matter specialist and other knowledgeable people from research and academia leading to development of Pest Management Guides (PMDGs). Clinical recommendations are based on the "Green" and "Yellow" list. The initial green portion of the document advocates on prevention, monitoring and control of pest using cultural and biological methods. Due to persistence of pests, if further intervention is required, then list of chemicals approved by WHO are recommended for use. With the help of technical backstopping materials produced during the facilitated workshop, the practices to be adopted are explained to farmers.

These materials are the form of farmer friendly fact sheets which are distributed during the clinic sessions and photo sheets that give a good account of pest and its damage.

Linking Clinics to Diagnostics Clinics: Another

focal point is linking the clinics with diagnostic clinics where the Plant Doctor can send samples for further analysis in case of their inability to diagnose the problem. These clinics can be at nearby research institutes or universities and colleges where the facilities are available. A directory of such diagnostic institutes is compiled, categorised and made available to Plant Doctors.

Knowledge Management: Plantwise hosts a website/ knowledge bank where the wealth of advisory information (which would otherwise is lost) is captured and is put to national use for various purposes such as identifying research needs, pest surveillance, forecasting and development of new technologies. The information flowing through this system is managed at different levels - local, regional and national. The local information is transformed to knowledge which is analysed by the National Plant protection Organisation (NPPO) which finally authorises to make it available as an open access resource on Plantwise-Knowledge Bank (www.plantwise.org/knowledgebank). This web portal holds information on pests, their distribution, method of diagnosis and control measures. It has various other interesting sections like interactive blogs and pest distribution maps and is linked to similar national and international knowledge portals.

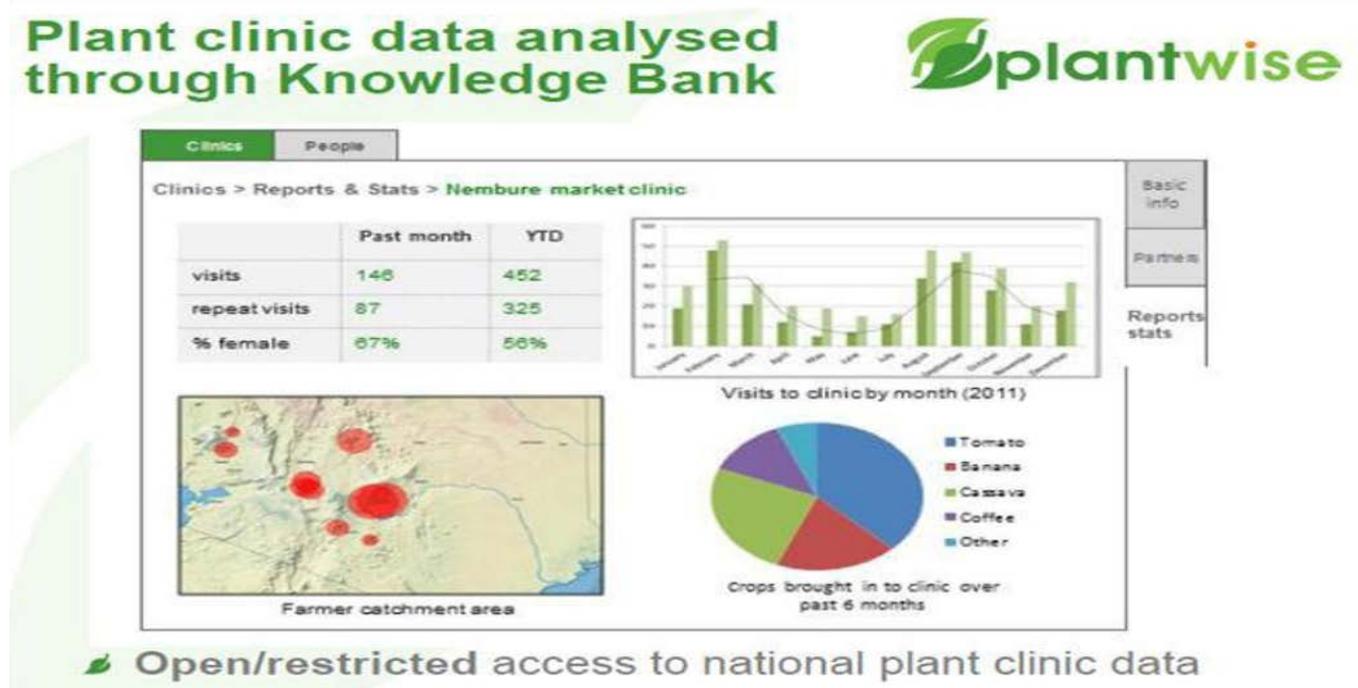


Fig. 1: Plant clinic data analysed through knowledge bank

Monitoring and Evaluation: To ensure the quality of performance of these clinics, a module to train the senior extension staff in Monitoring and Evaluation (M&E) has been developed. A monitoring plan which is supportive in nature helps the Plant Doctors to self-evaluate their

performance for further improvement. It also guides the officers in supervisory roles to conduct performance analysis of the clinics and present it to their seniors and other stakeholders. An external evaluation focussing on impact of plant clinics on socio-economic conditions and

livelihoods of small marginal farmers is also planned.

Stakeholder assessment: Another significant focal area of the program is about forging linkages amongst the stakeholders of plant health system. A rapid assessment of stakeholders and their roles and linkages with other actors in the plant health system is undertaken. Plantwise works closely with extension services to strengthen its linkages between regulatory, research, input supply and farming community.

Ensuring sustainability: There are various worthwhile programs which have run into oblivion as soon as the funding phases out. To address this issue, Plantwise is working to achieve sustainability during various phases of implementation. This forms a part of Plantwise strategy, wherein countries shift from initial assessment to pilot stages fully supported by CABI. Once the impact is clear and the national partners get interested to contribute and thereby increasing their ownership towards the concept, the programme further progresses to the consolidation stage for up-scaling. The contributions made by the national partner can be in form of manpower, kind, funds or policies.

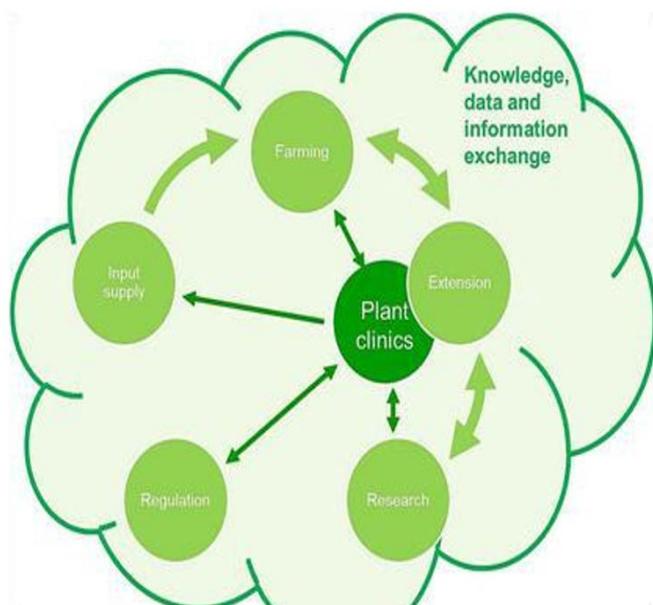


Fig. 2: Knowledge, data and information exchange procedure in plant clinics

Plantwise in South Asia

In South Asia Plantwise operates in 4 countries- Sri Lanka, Nepal and Bangladesh and India. The agreements are signed with the Ministry of Agriculture (MoA) in both Sri Lanka and Nepal and the program is being scaled up with contributions from national partners. In Bangladesh, formal signing of agreement is in offing and the planning is tentatively been done for implementation. In

India Plantwise is currently implemented through NGOs like MSSRF and SEVA. There has been exceptionally huge scaling up in Sri Lanka where the number of clinics has reached 175 followed by Nepal where the 25% of the clinics are nationally owned.

Nepal: As part of consolidation for better functioning, the clinics are being grouped into clusters containing 2-5 clinics. This also helps in making Plant Doctors understand the objectives of Plantwise and creating a feeling of accountability of being part of bigger programme. The data managers are appointed at local level to collate the information coming from the clinics and sending it to the central level for national use. This makes the flow of information regular and smooth.

A supportive monitoring system where the plant doctors evaluate their performance in self assesment mode keeps them motivated and inspired for improvement. Though sometimes the plant doctors find the prescription sheet they use little difficult to complete, they do submit the forms with complete details as they recognise the significance of the information that would come out of this record. Extension material and Pest management Guides do help the plant doctors as reference material, though their validation from local subject matter specialist do take time and needs some streamlining.

For greater publicity a documentary prepared on Plant Clinics was broadcasted on national channel followed by news headlines in primetime channel. This has resulted in deeper percolation and visibility of Plantwise programme in Nepal. Radio jingles were also tried which resulted in more awareness among farmers about Plant Clinics and increased farmer attendance in Plant Clinics. The whole hearted participation and appreciation of the Minister (Agriculture) and the Secretary (Agriculture) as well as the efforts of the Director, Plant Protection who is also the National Coordinator of Plantwise in Nepal have raised the esteem of the program in the country. The recent National Stakeholder meeting held in October 2014 witnessed wholehearted participation of various stakeholders in plant health management.

Sri Lanka: In Sri Lanka, the integration of National Responsible Organisation (Plant Protection Services) with the Local Implementing Organisation (Extension) at the district level serves as an excellent linkage mechanism between the Research and Extension wings. The district coordinators play an important part in scaling up both Plant Clinics and management of data. Plantwise works efficiently with the existing extension system of Sri Lanka in implementing the Plant Clinics through their network and Plant Doctors meet at monthly

intervals to report on the progress of the clinics. Though the clinics are not required to be run on the weekly basis, twice a month provides a good operational model. The national partners contribute both in terms of funds and staff time to support the clinic operations. This makes large number of Plant Clinics as part of the extension network and contribute to the development of a robust plant health system in the country.

In Bangladesh and India though the programme is yet to be implemented with national governments, these countries have displayed an impressive work with NGOs. Though, it is desirable to work with the national extension system to ensure sustainability and wider reach, NGOs are providing opportunities to train their staff as Plant Doctors to provide

services in local language and offering technical backstopping to these clinics with the experience they have gained so far.

Way Forward

The Plantwise strategy is based on a vision to improve food security and rural livelihoods around the world through reduction in crop loss due to pests. It aims at achieving sustainable impacts at a scale by supporting development of an effective plant health system at the national level which can support farmers in facing current and future agricultural challenges. Thus Plantwise bridges the gap between farmers and the knowledge they need to grow more and lose less to pests.



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EXTENSION WITHOUT AN EXTENSION MANUAL?

Without an extension manual to guide millions of extension interventions, the effectiveness of extension work cannot be improved upon to meet the objectives of the agriculture sector, including the ambitious drive for doubling farmers' income, argues Suresh Kumar.

Everyone is concerned about enhancing the effectiveness of extension. Several extension approaches as well as initiatives are being undertaken to inform and educate farmers on new knowledge related to farming, and assisting them to improve their production, productivity and income. But there have not been commensurate efforts in improving the efficiency and effectiveness of using these approaches.

What has always struck me during my long association in this sector is the need to suitably appreciate/acknowledge the contribution of extension to achieving farm sector goals and to improve the effectiveness of extension interventions. I vividly remember the challenge of convincing the farmers during the earlier exciting years of promoting hybrid and high-yielding varieties (HYVs) which ushered in the 'Green Revolution', thus proving all the skeptics wrong. This challenge continued when I had the privilege to establish and operationalise the Training & Visit (T&V) system in Maharashtra over a period of more than five years when I was the Director of Agriculture in Maharashtra. There were many success stories of the T&V system, which have also remained unappreciated. T&V had some excellent features which need to be incorporated into the present system (as also recommended by the Doubling Farmers' Income Committee¹), but that deserves another blog, another day.

Extension Reforms

Extension reforms were introduced since the late nineties. A new institutional set up with the Agricultural Technology Management Agency (ATMA) at its core was established, from 1999-2003 as a pilot phase in select districts and expanded country wide with additional human resources and extension activities subsequently. Irrespective of these developments, the good old extension practices which existed during my time continue to rule, including demonstrations, farmers' training, farmers' fairs and farm visits. The scope of these extension activities is considerable. During 2017-18, ATMA alone organised 17,53,592 extension events (see Table 1). This excludes the work done by other organizations, including the Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs), Non-Governmental Organizations (NGOs), and the private sector.

¹ MoA&FW.2017. *Report of the Committee on 'Doubling farmers' income, empowering the farmers through extension and knowledge dissemination'. Volume XI. New Delhi: Ministry of Agriculture & Farmers Welfare.* <http://agricoop.gov.in/sites/default/files/DFI%20Volume%2011.pdf>

Table 1: Extension activities under ATMA (2017-18)

Sl. No.	Extension activities	Number
1.	Training courses	28,085
2.	Farmers' training	14,76,357
3.	Demonstrations	85,234
4.	Exposure visits	9,131
5.	Farmer fairs	1,48,914
6.	Farm Schools	5,871
	Total	17,53,592

Source: <http://agricoop.nic.in/>

Traditional extension methods – such as folk troupes, folk songs—that were important during my time, continue to be relevant even today while new ones keep emerging. The concepts of farmers' friend and farmers' producer companies (FPCs) are key extension reforms in recent times. ICTs are also emerging as core strength of extension. Various new initiatives and interventions ensued, including Farmer's Portal, Kisan Call Center, mobile phone text messages to farmers, field videos, community radio, Kisan Channel and so on. Every SAU/ICAR and government institution has a website for providing technical advice to farmers. The scope of these extension tools is massive. mKisan portal², inaugurated in 2013, has sent more than 2100 crore text messages. Kisan Call Centers (KCC) cater to nearly four crore farmers through its wide network. Millions of messages are sent every day to farmers by various organizations/service providers; and there are nearly 800 websites in their service. This provides a snapshot of the extent of extension reach and the challenge of optimally using these activities and interventions³.

Impact of Extension Methods

The biggest challenge for an extension worker is how to convince a farmer to adopt new technologies as well as changing the habits of a lifetime/traditional practices. This is a herculean task on the ground. Despite employing the best extension approaches, I still remember that after the introduction of the T&V system, Dr Daniel Benor would demonstrate to us how an unwilling farmer can be pursued to adopt better technologies. This remains the gold standard for extension. The T&V system also published/produced very good booklets, which proved quite useful for all of us.

Impact/effectiveness of various extension methods and extension practices depends upon the quality of their performance/use. Even a likely improvement of 10-20% can make a big difference to the effectiveness of extension in the short term. Therefore the scope for improvement is much more in the medium and long term. Success of the entire extension strategy for doubling farmers' income and achieving various objectives of the farm sector, including food security, depends upon the quality of extension services which in turn depends upon how the various extension interventions are practiced. The vast resources being provided for these extension activities need to be optimally utilised. How should each of these (for example demonstrations, farmers' fairs, farmer visits, KCC) be planned, implemented, monitored, evaluated, reviewed, and improved upon? How should the new ICT tools be optimally used? Beyond improving the effectiveness of individual extension practice there is the challenge of integrating the use of various practices for synergy and avoiding duplication. Challenging as the role of extension is, it is expanding given the increasing complexity and importance of the farm sector. The DFI Committee, in its Draft Report XI, has assigned a key role to extension in the strategy and policy proposed for doubling farmers' income. It has recommended 24 roles (Table 2). Extension is expected to broaden its focus from productivity and production to income of farmers, as well as facilitate project-based extension and tackle emerging challenges including climate change. How will extension functionaries be equipped to understand, and then effectively carry out, the roles expected as per recommendations of the DFI Committee over and above the already onerous responsibilities being carried out by them?

² <https://mkisan.gov.in/>

³ <http://agricoop.nic.in>

The issue of integrating extension resources was highlighted by the DFI Committee, which had identified 107 categories of institutions providing extension support/services apart from a very large number of other institutions that could be leveraged for extension support/services.

These include 1.57 lakh common service centres (CSCs) and self-help groups (SHGs),

1.71 lakh milk cooperatives and a vast network of credit-linked extension groups.

How should extension collaborate with this large number of institutions, considering that it is already struggling to coordinate research systems? Convergence of extension systems will be a major challenge for extension planners.

Table 2: Roles recommended for extension providers

- | | |
|--|---|
| <ul style="list-style-type: none"> • Providing information on going schemes and programs in agriculture & allied sectors • Capacity building, Skilling in emerging areas • Advocacy on farmers' interests • Counselling for farmers' well-being • Credit facilitation • Critical assistance in risk management including climate change, crop insurance etc • Documentation and Reporting roles • Enforcement of Farmers' Charters • Issuing Advisories on soil health management, water conservation, pest management etc. • Facilitating access to production and post production inputs & data • Facilitation & feedback • Friend, philosopher and guide to farmers | <ul style="list-style-type: none"> • Engaging in research planning • Promoting projectised mode of extension delivery • ICT enabled services • Intermediation • Linking farmers to markets • Building managerial competence • Linking various support & service networks • Organizing user/producer groups • Planning, Monitoring and Evaluation • PPP Promotion • Promoter of farmer led innovations • Redressal of grievances • Technology selection, etc • Feedback to research system |
|--|---|

Source: MoA&FW 2017

Enhancing Capacities of Extension Personnel

There are nearly one lakh public sector extension personnel in the country; and almost the same number or perhaps even more representing the private and NGO sectors. In light of a multitude of roles required and expected to be performed by these extension functionaries, the challenge of extension is how each of these extension support/organisation functionary can perform the various extension activities effectively as desired and demanded. This requires improving the effectiveness of individual practice as well as the integration of these practices and extension resources.

While some sort of training is being provided currently to extension functionaries by training institutes (MANAGE/SAMETT), it is not possible to continuously train everyone and that too in

the most effective manner. Therefore there is an urgent need to prepare high-quality extension manual/s for extension functionaries. The following suggestions are made in this regard, which could be implemented gradually.

1. There should be separate manuals for different groups/types of extension functionaries relevant to their specific needs, instead of one omnibus manual. There is need for a separate training manual for trainers and another one for extension planning and extension practices.
2. The manual/s should be made available in both formats – hard copy/print as well as soft copy/video – suitably indexed to provide ready reference.
3. Material in the manual should constitute extension knowledge which could be used for various purposes, such as preparation/deciding of extension curricula.

The material should be suitably tagged so as to provide links to relevant modules. The manual should be updated annually in light of relevant experience acquired during the preceding year. This may be done by obtaining feedback during annual conferences of field officers. A conference at the national level may be preceded by conferences at the state level.

4. The manual should be uploaded to the internet and remarks about the content as well as personal experience of practitioners, experts and farmers incorporated for use during update. A suitable format could be devised for accomplishing the aforesaid.

5. The Department of Agriculture and Cooperation may designate a nodal institution, such as MANAGE, for preparation of manuals. It may otherwise designate any other institution.

6. There is a need for the designated institution to collaborate with other subject matter/ specialist institutions/experts for extension advice on subjects such as marketing support, climate change, IT support, irrigation extension, watershed extension. National Institute of Agricultural Marketing (NIAM) could be one example of a collaborating institution for marketing extension.

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REVERSE EXTENSION: NEED FOR A RELOOK ON THE PRESENT EXTENSION SERVICE

Extension needs new theories, frameworks and a shift in its current approach if it has to remain relevant. Reverse extension offers one way of reinventing its future, argues RM Prasad.

Reflections from practice is an important type of learning which helps everyone to draw lessons and use these for continuous improvement in his/her ways of working. The benefits of such reflections are:

- Improved critical thinking
- Empowerment
- Great self-awareness
- Personal and professional growth

For a profession, this kind of learning from practice helps us to discover new and better methods and approaches to improve the professional conduct of its members. It involves a process of relating, reflecting and mainstreaming good practices in the field.

Reverse Extension

Perhaps many of us may be aware about the concept of Reverse engineering, which is defined as the process of extracting knowledge or design information from anything man-made and reproducing it based on the extracted information. It is the process of dissecting an object to see how it works in order to replicate or enhance the use of the object. In similar lines, there is a need to relook at the concept of extension education being preached and practiced today.

Reverse Extension-Dimensions

Reverse extension has four dimensions:

1. Categorical
2. Socio-organisational
3. Managerial
4. Situational.

Categorical dimension

This refers to the concept, practice and usefulness of extension education perceived by the society at large. In this context, the need for Reverse Extension becomes obvious from the following observations:

- Extension education as currently conceptualized is inadequate, addresses all problems as technical and rational. Must broaden its mission and create a new vision (Lauzon, 1977)
- It is time to abandon the term Extension because of what it has come to mean in practice and the network of faulty assumptions at its core (Ison and Russell, 2000)
- Extension must broaden its programme portfolio to better engage the society it serves. 'Engagement' means staying attuned to the issues faced by people (McDowell, 2001)

- Extension professionals have to expand their repertoire of community interaction models and engage citizens as agri-food citizens and leaders in order to move towards sustainable development (Colasantiet al, 2009)

Though sporadic efforts are made to revive the field of extension education, it still remains alienated from various stakeholders who support and sustain development process. There are even instances where the need of extension service is doubted by the end users.

Socio-organizational dimension

This is with reference to the organizational structure of extension services. Though pluralism is the norm, extension service is dominated by the public system, while private extension service is gradually gathering momentum. The support for public extension and accountability is declining and the efficiency of services by public extension is often questioned. The institution characteristics (rules, norms, practices) of public extension (Box 1) need to be reviewed.

Box 1: Institutional characteristics of public extension in India

The public extension system in our country is characterized by the following:

- Rigid hierarchies, patterns of control with highly centralized modes of planning
- A tradition of assessing performance in terms of technology adoption
- A History of rewarding only success and Reluctance to report and analyse reasons of failure
- A tradition of working independently and a mistrust of other agencies
- A tradition of upward accountability for resource use rather than output achievement and client satisfaction Sulaiman and Hall (2004)

To overcome some of the inherent limitations, measures like renaming of ICAR Zonal Project Directorates as ATARIs (Agricultural Technology Application Research Institutes) and “farmer first” are introduced by ICAR (What changes are envisaged through these nomenclatures still remain ambiguous!) Similarly, concepts like ATMA plus, agro service centres, etc are being introduced. Are these organizational structures really able to tap the full potential of the principles and philosophy of extension education in the changing scenario?

Managerial dimension

The inefficiency of extension system in India is often attributed to the poor governance of extension service. There are many challenges facing extension:

- **Demographic challenges:** Average age of the farmers and farm labourers in the country is 50plus. Promoting and retaining rural youth in farming is a great challenge.
- **Technological challenges:** How to maximize factor productivity and minimize cost of cultivation is a major challenge.
- **Management challenges:** Various options in minimizing risks in farming are limited, lack of convergence efforts by different agencies is evident.
- **Professional challenges:** Extension personnel lack professional competency and related

capacity to meet emerging needs and expected responsibilities.

- **Organizational challenges:** Unchecked growth of non-governmental extension system prevails, need for public extension to be made more vibrant and competent is felt.
- **Economic and ecological challenges:** Sustainability of the farming system and livelihood security of the farmers are at risk.

Extension programmes need to shift from a delivery model that prescribes technological practices to building capacity among farmers. The aim is to empower farmers so that they can identify and take advantage of available technological and economic opportunities. To ensure good governance in the delivery of extension services, administrative, structural and legal reforms must be carried out (Prasad, 2014).

Situational dimension

In the changing scenario of development for sustainability, extension education essentially involves the following:

- Judicious and improved management of natural resources
- Enhanced climate resilience
- Development of value chains
- Reskilling and de-risking

Extension service should address the dual challenge of supporting market competitiveness for commercial agriculture, and also poverty in rural areas (productivity as well as vulnerability). The agenda for extension needs shift from an exclusive focus on agricultural production to a broad range of services related to marketing, environmental concerns, poverty reduction, and off-farm activities (production, marketing, livelihood support).

Farmers need information that can be utilized instantly for making rational decisions in relation to production and post-production activities. Extension organizations should emerge as knowledge centres and nodal agencies for information communication (production & post production). In this context, besides technical knowledge, proficiency in management and soft skills are also needed.

Four Themes to Learn from

Extension could learn mainly from the following four areas:

1. Conservation agriculture
2. Climate resilience
3. Value chain development
4. Innovation and skill development

Conservation agriculture

Conservation Agriculture (CA) aims to achieve sustainable and profitable farming through a set of natural resource management practices. It minimizes disruption of structure and composition of natural resources and ensures natural biodiversity. Agroecosystem analysis, which is a thorough analysis of an agricultural environment, considers various aspects from Ecology, Sociology, Economics and Political science.

Whenever a farmer is involved in farming, he evaluates his farming situation to identify the problems and search solutions so that he can make the farming system function in a sustained manner. In this way, the farmer is performing an agroecosystem analysis.

Environmentalists view agriculture as locked into an economic and technological system that encourages intensive practices and environmental harms. The issue is one of contrasting perceptions, which are reflected in the current policy debate on the impact of agriculture on the environment. Learnings from the practice of agroecology applied in the field can help extensionists to explain their position.

Agroecology is the study of ecological processes that operate in agricultural production system.

Extensionists have to learn from the principles of agroecosystem analysis as in the case of Farmer Field Schools. Extensionists have to ensure that eco-technologies are promoted which can stabilise and restore the carrying capacity in fields. Good Agriculture Practices (GAP) must be developed to ensure that the food is produced by caring about health and environment.

Climate resilience

Resilience is about creating/enhancing three different capacities:

- Capacity to respond to a disturbance or event to avoid or reduce damage to the existing system (Ecological resilience- e.g., Promoting organic farming)
- Capacity to recover from damaging events (Social resilience – e.g., Ensuring food safety)
- Capacity to transform or change the existing system to one that is more resilient to disturbance (Economic resilience- e.g., Promoting Integrated farming)

Resilience mechanisms to be promoted by extension system must include the following:

- Adaptation by use of bio-resources: Refers to adjustments in ecological, social or economic systems in response to harmful impacts Mitigation by promoting biodiversity: Action of reducing the severity, seriousness or loss by lessening the impact of disasters
- Coping by food safety: Refers to the specific efforts, both behavioural and psychological that people employ to reduce or minimize stressful events.

Learnings from technology demonstrations under National Innovations in Climate Resilient Agriculture (NICRA) help to enhance resilience of agriculture to climate change and climate vulnerability. The interventions related to technology demonstrations cover four modules, viz., natural resources, crop production, livestock and fisheries and institutional interventions.

Value chain development

Value chains play an important role in transforming agricultural commodities from raw material to end products demanded by the consumers. The value addition in different phases of production can be mapped into a value chain map for easy understanding. The map depicts inter-linkages between successive stages in the value chain. Farmers, traders, wholesalers, retailers, big retail chains and consumers are major actors in the value chain. With the enhanced efficiency of value chains, farmers benefit from better prices, higher

and quality yield and assured markets, services and input supplies. Value chain analysis should look into cost-cutting innovations along the value chain to benefit price conscious poor consumers, besides focusing on value-added products.

Learnings from the functioning of Farmer Producer Organizations (FPOs) reveal that farmers can increase their share in the consumer price by organising themselves as producer organizations. By resolving the issues of trader exploitation, exploring new markets, accessing timely credit and quality inputs and value chain development, farmers can reap benefits through commitment and collective action.

Innovation and Skill development

Agricultural innovation typically arises through dynamic interaction among the multitude of actors involved in cultivation, processing, packaging, distribution, and consumption of the agricultural products. These actors represent quite different perspectives and skills, such as precision farming, safety standards, intellectual property, resource economics, logistics, land rights, etc.

Farmers are dependent on human resources, which implies that where technological, managerial and other organisational development exists, need for skills development is imperative. Skills development should be seen as an investment. Appropriate skill trainings in innovative practices and solutions have to be organised for farmer empowerment.

The need for skills development is widely recognised. The importance thereof is clear in terms of the growth and development of individuals (micro level), organizations (meso level) as well as the society as a whole (macro level).

Learnings from STRY (Skill Training of Rural Youth) under Sub mission on Agricultural Extension of NMAET and ARYA (Attracting Rural Youth in

Agriculture) can provide valuable inputs for extensionists in the area of skills development.

Reverse Extension needs New Theories/ Framework to move forward

Reverse extension cannot rely on the conventional theories and concepts of extension education. It needs new theories and framework and a shift in approach.

- Beyond diffusion of innovations: New look on innovations; use of multiple sources of knowledge; extension as a co-learning process
- Beyond linear ToT (R-E-F-linkages): Credit, Marketing, Product development linkages needed
- Beyond technological interventions: institutional innovations and value chains
- Beyond Research and Extension System: Support and service system –also policy and institutional changes
- Beyond existing institutions and practices: Farmer companies, RPOs, SPVs, Agribusiness incubators
- Beyond allocation based targets and achievements: Outcome based targets and achievements
- Beyond networks: Convergence and partnerships at several levels

Finally, it is to be clearly understood that reverse extension doesn't mean going back to the old paradigm of learning from farmers and seeking feedback from users on the performance of a new technology. Instead, it argues that practitioners have found new and dynamic ways of dealing with their practical challenges and exploring new opportunities, while the extension concepts and teaching have remained rather static. We need to catch up, learn, reflect and use these learnings to reinvent the profession of extension.



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EXTENSION CENSUS -THE PREREQUISITE FOR STRENGTHENING EXTENSION

Without having sufficient knowledge of 'who is doing what' in the increasingly pluralistic extension and advisory landscape, the country would fail to achieve convergence and provide quality extension support to farmers, argues Suresh Kumar.

The Committee on Doubling Farmers Income (DFI) in its draft report, Vol. XI (Department of Agriculture, Cooperation and Farmers' Welfare, Ministry of Agriculture & Farmers' Welfare, Government of India, 2017) has proposed to transform agriculture extension as an important engine for doubling farmers' income. It has made various recommendations while setting the strategic direction for agriculture extension over the years so as to double farmers' income by 2022. It has also examined the paucity of extension manpower, and suggested various measures to achieve the same.

Serious Manpower Constraint

The committee has recommended minimum ratio of extension service provider to farming family: 1:400 in Hilly areas; 1:750 in Irrigated areas; and 1:1000 in Rainfed areas. The Committee has provided the current status of manpower in Agriculture Extension in Table 4.1 on page 66 of the report. It has revealed that the current ratio of operational holdings per extension functionary was 1:1162. However, while many states may get at par with the needed ratio if 30% of vacancies are filled up, other states, including big states such as Bihar, Gujarat, Karnataka, Kerala, Orissa, Rajasthan, Uttar Pradesh and West Bengal, would continue to suffer because of manpower shortage and hence would need additional sanctions.

Present experience indicates difficulties not only in new sanctions but also in filling up vacancies. Although the number of operational holdings is as per the 2010 census, this shall keep increasing with the continuous break up of holdings. Therefore, while making efforts for new sanctions and filling up vacancies is important, yet efforts need to be made to achieve the objective with the existing status of extension manpower.

Pluralism in Extension Delivery

While recognising pluralism in extension delivery, the report noted that (paragraph 1.4.1) currently extension services are provided by various agencies representing public and private sector players. The list of extension service providers is indicated in Fig. 1.2 of the draft report.

It shows 107 categories of public and private extension service providers. This includes 22 institutions of DCA&FW, 4 institutions of DARE including ICAR, KVKs and CAUs, four institutions of DAH, D&F, 8 belonging to the Ministry of Commerce, 22 Inter Governmental Institutions, and 16 categories of private extension service providers.

Besides these, on page 68, the Committee has identified the vast network of institutions in

delivery of credit-linked extension activities, including the immense cooperative network and public and private sector banking network.

On page 69 the Committee has identified various other agencies that provide core extension, including 1.57 lakh common service centres, and self-help groups. There are 1.71 lakh milk cooperatives as well as cooperatives and institutions for fisheries, bee keeping, etc.

The Committee also notes that extension resources active in the field and thus available for extension is huge and belongs to diverse organizations and sectors, and are not limited to only those working within the ambit of the Ministry of Agriculture and Farmers' Welfare agriculture or the agriculture sector. Organizations listed in the DFI Committee report are those known to the ministry. There would be a large number, particularly in the private sector, which may be unknown to the ministry as it would only be aware of those service providers in the agriculture sector known to them.

Convergence

Despite the large network of public and private extension service providers the Committee has recognised several important concerns on page 9 of the report. One of its main concern is as follows:

Does there exist an institutional mechanism to review and converge the number of extension functionaries and the extension approaches adopted by private sector?

The report notes that "While the private sector plays an important role in agriculture extension it is natural that they would concentrate more on providing information to farmers that is related to their commercial interests, and on marketing their products. These efforts need to be made complimentary and supplementary to public extension efforts. There is scope to develop a mechanism to converge all the private extension efforts onto a single platform and achieve the needed coordination to serve larger areas and an increased number of activities. Synergy in effort by the two systems will benefit the farmers better. This will become an example of Public-private platform of extension machinery".

Broadened Mandate of Extension

In paragraph 2.4 (page 22) of the report, "Agriculture demands added role from extension manpower" the Committee has listed 24 roles under agriculture extension in Table 2.1. The success expected by government in revitalising the agriculture sector and doubling farmers' income depends upon extension being able to perform these 24 functions as anticipated.

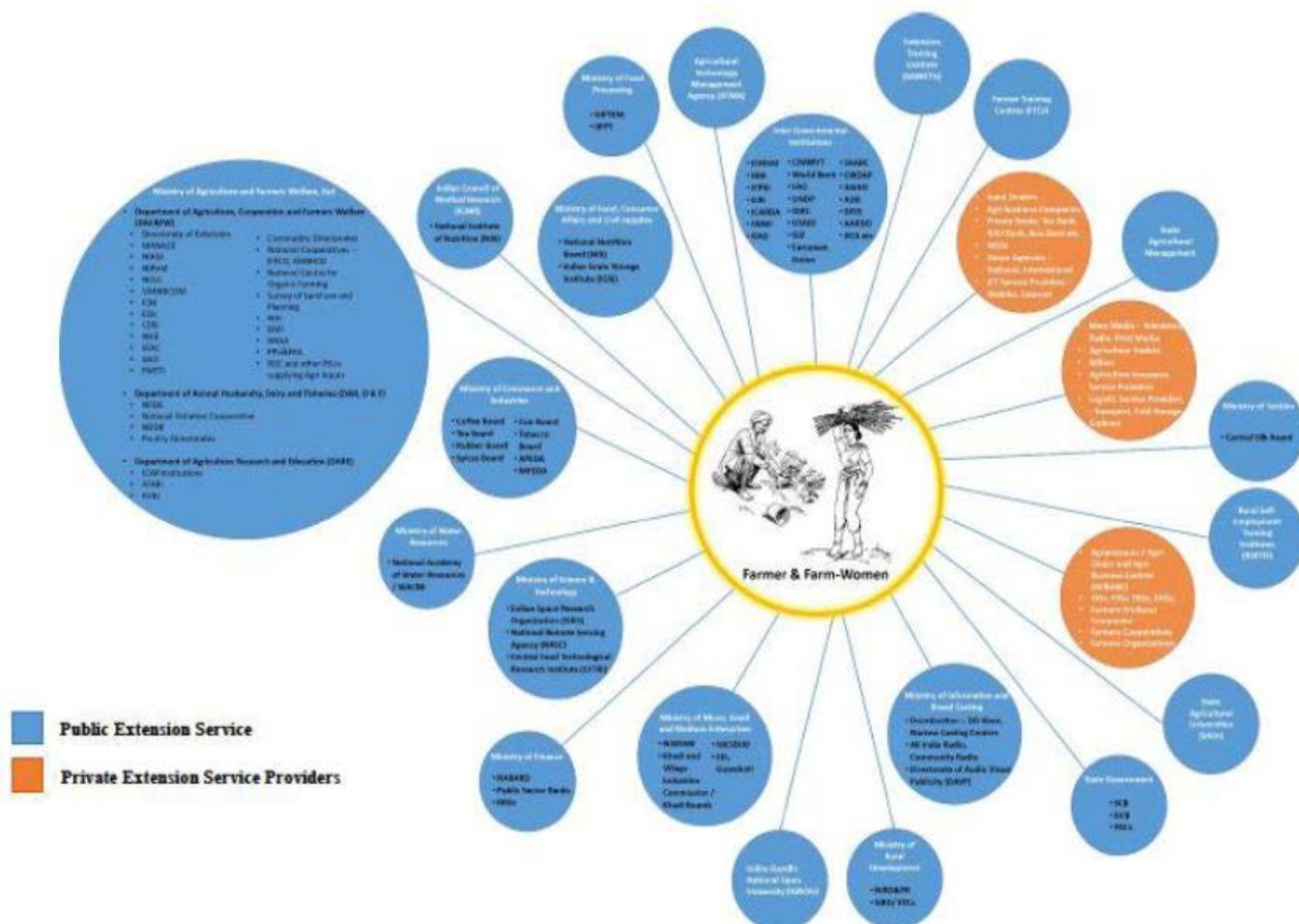


Table 1: Roles under Agricultural Extension

- Providing information on going schemes and programs in agriculture & allied sectors
- Capacity building, Skilling in emerging areas
- Advocacy on farmers' interests
- Counselling for farmers' well-being
- Credit facilitation
- Critical assistance in risk management including climate change, crop insurance etc
- Documentation and Reporting roles
- Enforcement of Farmers' Charters
- Issuing Advisories on soil health management, water conservation, pest management etc.
- Facilitating access to production and post production inputs & data
- Facilitation & feedback
- Friend, philosopher and guide to farmers
- Engaging in research planning
- Promoting projectised mode of extension delivery
- ICT enabled services
- Intermediation
- Linking farmers to markets
- Building managerial competence
- Linking various support & service networks
- Organizing user/producer groups
- Planning, Monitoring and Evaluation
- PPP Promotion
- Promoter of farmer led innovations
- Redressal of grievances
- Technology selection, etc
- Feedback to research system

Source: MoA&FW 2017

Tackling Resource Constraint

Performing the above-mentioned roles require massive resource commitment in terms of manpower, finances, and infrastructure. Resource commitment on this scale cannot be provided whether by central government or state government. The only option is by converging all extension efforts as recommended by the Committee. This, therefore, becomes a prerequisite for taking various other initiatives and efforts as recommended by the Committee for meeting the challenge of doubling farmers' income.

Database of Extension Service Providers (ESPs)

Creating a database of all extension service providers and resources is the first step towards convergence of extension efforts. Accordingly, an Extension Census needs to be conducted to map all extension service providers and extension resources. Methodology for the same will need to be evolved – including formats for collection of data, creating a platform for collection of data, actual collection and compilation of data, and creating protocols for their storage, protection, and retrieval. This will, furthermore, call for a digital platform wherein information can be uploaded by the concerned

extension service providers. Further steps for convergence can thereafter be taken, which itself is a big exercise.

Content of Extension Census

ESP census needs to be a census of extension resources that is not restricted just to extension personnel. A few suggestions may be considered:

1. For each ESP extension resources may be indicated including personnel, infrastructure and activities including funding commitment;
2. Personnel may include numbers and skill sets as also whether they are regular or contractual;
3. Work done over the years;
4. Terms and conditions of resource deployment, including geographical area;
5. Census may include every ESP who can contribute and should not be restricted only to those belonging to the agriculture sector. A large number of other organizations may be willing and keen to contribute, including contribution under CSR.

Way Forward

1. The Department of Agriculture, Cooperation and Farmers' Welfare of the

Ministry of Agriculture and Farmers' Welfare should designate a nodal institution to conduct census, and to create and manage the database as its custodian. MANAGE appears to be the natural institution for this task. Alternatively, the ministry may designate another suitable organisation.

2. The nodal organisation should set up a dedicated cell for this purpose instead of

trying to carry out the work through existing staff.

3. The nodal institution should conduct a workshop for probable major ESPs in order to flesh out the concept in detail. Basic information may be collected and compiled in the workshop.
4. A start can be made with the information compiled from the workshop.

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INDIA RICECHECK PROGRAM: A NEW EXTENSION METHOD IN MAKING?

While everyone would like to see impact of new technologies at a wider scale, very few appreciate the need for adapting new technologies to meet the varied requirements of different socio-economic, bio-physical, organisational and institutional settings. The Ricecheck programme, which follows a procedure of extensionist-assisted farmer – group's self- learning tries to address these concerns. Shaik N Meera, Noel Magor, John Lacy and V RavindraBabu share their experiences here.

My (Shaik N Meera) recent visit to New South Wales Australia, focused on understanding the concepts and operational issues in implementing *Ricecheck* program. Even though it appears not to be anything new for extension professionals, I feel the way 'concepts' are operationalized is worth learning. Being participatory and linking inputs to outputs and outcomes, is the best part of this.

All this is done by farmers (we only facilitate), no top down recommendations from R&D organizations and it is a typical output oriented than a process oriented approach – best suited for commodity based extension efforts. While implementing this in Andhra Pradesh, India during 2013, a question came to my mind as when was the last time did we (extension professionals) operationalize/ facilitate basic extension methods (such as group discussions) involving farmers? This blog is an attempt to answer this question.

Given the highly diverse and dynamic nature of rice farming in India, the AICRIP (All India Coordinated Rice Improvement Project) conducts multi-location trials and recommends location specific varieties/ hybrids and technologies. What is practical and profitable for farmers at any given site depends on the unique combination of bio-physical, socio-economic, organizational and institutional circumstances.

As a consequence, it is almost impossible for researchers to develop standard technologies that can be adopted on a large scale and can easily be replicated in different contexts. To address this problem, a participatory approach is proposed keeping in view the diversity of location specific conditions, with farmer experimentation, discussions, experiences, standardizing and adaptation of technologies.

This approach has been proven effective in Australia, Philippines, Chile, Brazil etc. There are 4 key principles and few checks for the '*Ricecheck*' programme. In India, Directorate of Rice Research (DRR) under the Indian Council of Agricultural Research (ICAR) has initiated this programme in West Godavari district of Andhra Pradesh in collaboration with the Andhra Pradesh Rice Research Institute, Maruteru (Acharya NGRanga Agricultural University, Andhra Pradesh) and the International Rice Research Institute (IRRI), Philippines. For the Rabi 2014, this approach is being piloted in Telangana, Tamil Nadu and Odisha states of India.

Box 1: What is Ricecheck Program?

Ricecheck is an innovative farmer participatory extension methodology where farmers decide - what are the best practices for their fields based on the 'experience' rather than on 'recommendations' from experts. The core activity under this approach is facilitating group discussions among farmers. Ricecheck is a procedure of extensionist-assisted farmer-group self-learning. It can be defined as a dynamic rice crop management system that presents key technology and management best practice as key checks; checks farmer practices with best practice to compare results and learns through farmer group discussion to sustain improvements in productivity, profitability, and environment safety. In other words, Ricecheck is learning by checking and sharing for best farming practice.

Ricecheck program benchmarks farmers' fields to identify practices (checks) for lifting yields and profits. Here comparison is made with best yielding farms rather than with the experimental plots (at research stations). In Ricecheck programme, every farmer feels that all the key checks and practices are interrelated. Its holistic many factors affect crop yields and hence farmers need to understand the relation between each practice with the output (may be number of tillers) and with the outcome (may be yield).

So, What's new in this?

In this program, the top yielding practices (checks) are identified by groups of farmers from their own crops and not top down from experimental fields. The researchers and extension officers will facilitate the process. These checks are listed simply and objectively. Once identified, we encourage farmers to adopt these checks in their respective fields. On weekly basis, group discussions are held (facilitated by extension officer/ scientists) to know how each practice is implemented and each check is achieved. On weekly basis, crop monitoring and recording practices are maintained. With this, farmers will get opportunity to understand how their practices are differing from neighbouring (best farmers) practices.

How *Ricecheck* Program is Implemented?

- Firstly, groups of 15-20 farmers are formed. This will be followed by a facilitated discussion on practices that contribute to higher yields and will also be supplemented by scientific practices wherever required. At the end of this exercise, we will have 'standard rice practices' for that village/ region identified by the farmers rather than by the scientific community.
- These practices are then categorized into 10-15 key checks. If we achieve these 'key checks' it is likely that productivity will go up. The assumption here is that without 'recommending good agricultural practices' to the farmers, they 'adopt what is good for them' in a participatory way.
- We know that in the same village while few farmers achieve 6-8 t/ha, many get only 2-3t/ha or below. Why is this happening? What practices are contributing to higher productivity? What practices are detrimental to achieve higher productivity? By bringing all these farmers together and facilitating sharing of their experiences help in setting a benchmark of 6-8 t/ha for all the farmers. The process of achieving this will then be monitored.
- Essentially, it is important to identify the key actors/ organizations that will facilitate the process. During the season in a sequential manner, best practices (contributing to achieve

key checks) are discussed among farmers on monthly/ fortnightly basis. Next week, when farmers meet together, they would discuss what were 'actually practiced in their field' and why few couldn't be followed? All these are documented in records/ matrix sheets.

- At the end of the season, we will have a matrix of all the farmers - how many key checks are achieved by each and how each key check has contributed to higher yields.
- Over the next few seasons key checks and practices are standardised for that village/ cluster of villages and with all the farmers starting to adopt standard practices hence, higher productivity is achieved.

Experiences in Andhra Pradesh: Work in Progress

We have selected West Godavari district of Andhra Pradesh as it is one of the districts where rice farmers have rich experience of farming. The Ricecheck components have been customized and standardized to suit the Indian context. A total of four discussion groups (involving 80 farmers) were established and 4 group meetings were organized during the dry season 2013-14. In the first meeting, key factors (total of 45 checks) contributing to the productivity were identified through facilitated discussions. During season long group meetings, all these key checks and their level of adoption among farmers were documented. The extent of deviation from the mutually agreed key checks was also recorded. The field level constraints in

adopting all the key checks were documented and were communicated to R&D organizations as feedback.

Results related to 2 groups (40 farmers) are provided here. About 45 Checks and 15 key checks

which were contributing to the higher yields in that region were identified. The adoption level among farmers were documented and analyzed. Field level constraints in adopting the key checks were documented and communicated to the R&D organizations at the end of the season.

Box 2: Ricecheck components deployed/piloted

- Recommendations booklet/knowledge source Rice Knowledge Management Portal (RKMP)
- Packaging key technologies as key checks
- Farmer discussion groups
- Crop checking and crop records
- Ricecheckdatabase–inputs, results, benchmarking reports
- Ricecheckresults used to update checks each season

Key Checks Identified

Farmers Discussion groups are key to the Ricecheck program. In the first meeting, two groups were involved in identifying what were the best suited checks for their village. Their ideas were collated and each of the practices for each technology was read back to the farmers.

Farmers were asked to add any missed technologies, practices or to clarify practices. The practices are not to be debated by researchers present and if some practices are believed as incorrect, there is an opportunity to clarify it in the draft recommendations. Finally, the following key checks were identified by the groups (Box 3).

Box 3: The key checks

1. Use high yielding varieties that is recommended for the growing conditions of your location and season
2. Use high quality seeds from a reliable source (preferably commercial source)
3. Apply a seed treatment against fungal diseases
4. Prepare a well levelled field through shallow puddling that is weed free and with clean bunds
5. Establish your nursery on time
6. Manage your nursery to obtain healthy seedlings
7. Maintain water levels using 5-2-5 Principle (5cm- 2cm-5 cm)
8. Appropriate seedling age to be followed (21 days)
9. Plant in lines and achieve a plant stand of hills per square meter
10. Apply organic fertilizers and complex as well phosphorus and potassium fertilizers with the last puddling
11. Apply top dressed nitrogen in splits and drain field before application
12. Correct micronutrient deficiencies
13. Control weeds soon after transplanting
14. Regularly monitor your fields for pests and use only approved and appropriate control agents at recommended doses
15. Drain the field before harvest and harvest when it is completely dry

During the entire season, a series of group meetings were organised with an interval of 30 days. These meetings were aimed at promoting the key checks & practices to be undertaken during the subsequent month. Previous month's

adoption level from each farmer was recorded during the meeting. Level of achievement in terms of adoption and constraints in adoption of checks were analysed. The preliminary results are provided below:

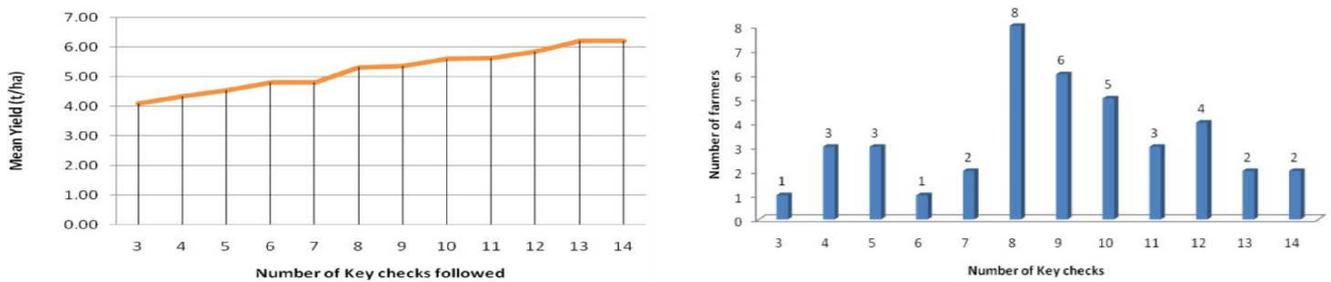


Fig. 1: Level of achievement in terms of adoption and constraints in adoption of checks

Yield range (in t/ha)	Number n=40	%	Range of Key checks
4.1-5.0	9	22.5	3 to 7
5.1-6.0	28	70	8 to 12
Above 6.0	3	7.5	13 to 14

*Pearson Correlation between yield and number of key checks followed = .957 (Significant at the 0.01 level 2-tailed)

Synthesis and Application

- A serious recognition is being given to farmer experimentation in this approach in contrast to the older agricultural extension approaches based on the idea of 'information' as a commodity to be exchanged.
- A desire to document - to 'know things' in ways capable of sustaining discussion (instead of filling boxes in reports) and initiating interventions is a key component here. This will in turn lead to the establishment of an emancipatory learning environment.
- At the micro level, this approach contributed to 56% increase in rice yields on an average.
- The Ricecheck package –simple key checks, recommendations, groups, crop checking, records, database, feedback to farmers and a range of delivery methods are all important
- Discussion groups are still the key to learning and continuous improvement
- Ricecheck as a participatory extension approach is successful in improving the farm productivity. However, while planning to implement such approach, customisation

of the processes is required to suit local conditions.

Key Insights for Extension

Learning is Important

Though the Ricecheck System helps farmers achieve high yield through proper crop management, its major highlight is the learning process. The learning process takes place before, during, and after each planting season. Farmers can compare their actual performance and management with the expected outputs (yield, quality, and environmental) and outcomes as indicated by the achieved key checks. Due to limited resources or for other reasons if farmers haven't adopted the key recommendations, these problems can be identified and therefore, improvements in the next season can be made.

Facilitating Group Discussions

The extension officer, agronomist or village leader can lead the groups. Group learning is preferred to individual farm visits or field days as farmers can interact, communicate and learn from each other. The farmer groups are the ideal medium for communicating and training farmers.

Box 4: Using the learning steps

The most important feature of Ricecheck is to encourage farmers to monitor and check their crops to see if they are adopting the checks. This is achieved through a number of learning steps (Lacy 1994). These are:

- Observing the crop and measuring growth and management performance
- Recording measurements and interpreting and comparing results and
- Acting to overcome weaknesses in management (non adopted checks)

The aim is to educate farmers to improve their learning and performance at each step as well as moving from step to step over time. The aim is to encourage as many farmers as possible to progress through all the steps.

Field days have a different role. They are appropriate for researchers to create awareness about new technology and are able to cater to large number of farmers. It is a top down approach with researchers showing results and inviting questions from farmers. It is not usually a forum to allow discussion of the merits

of the technology because there are too many farmers present. Farmer groups can be used for this. Individual farm visit is another alternative form of communication but considering the very small number of extension officers and agronomists (in relation to farmers) its scope is limited.

Box 5: Discussion group formation

Groups should be based on localities and communities where farmers know each other. The farmer and farm chosen for the group meetings should be respected by the other farmers and keen to hold the meetings. The host farmer, extension officer, agronomist or village leader organising and facilitating the meetings need to fix convenient meeting times at important decision times (eg: first topdressing etc). It is important to set up a communication system so that all farmers are invited to the meeting. The training in Ricecheck provides a reason and focus for attending the group meetings and becoming a group member. Not all invitees will attend or wish to remain in the group as the learning style will not suit some farmers.

Group leader skills

Group leaders have to be motivated, technically competent and should have good communication skills. The ideal group size is 10-15 farmers as this allows all farmers to speak and participate.

The leader needs to encourage farmers to make comments and promote discussion. Important issues that require that answers might be recorded on a piece of paper. The leader should ensure that the answers to these questions are presented at the next group meeting.

As adults (farmers) have preferred learning styles there is a need to use a number of learning activities at group meetings. Some adults learn best from observing (for instance, posters, others by measuring- "doing" (eg; the transplanting check 25cm x 25cm spacing). Some prefer writing and for instance, the recording of rice practices suits these learners. Some learn best from talking (whereas sometimes talkers can create issues by talking too much) while some do not say much because they are "listeners". Others like comparing rice crops or demonstration plots or reading (eg; Ricecheck fact sheets and records). Some learners prefer interpreting information (eg; drawing conclusions from records). In other words, use of a range of learning styles ensure farmers engagement and learning and this will boost up attendance at the next meeting

Crop data analysis

The Ricecheck crop evaluation report provides feedback to each participating farmer showing how their crop practices compare to the Ricecheck key checks, other farmers and to high yields. Adoption of the checks is automatically evaluated. Poorly adopted recommendations or checks can be quickly identified and communicated to extension, research and other stakeholders. The

database has the ability to compare any of the crop parameters with yield and produce graphs of the results. Use of graphs at farmer meetings is an excellent tool for promoting discussion and farmer learning and motivating farmers to improve practices. A simple matrix can also help farmers to understand the relations between various checks and productivity.

Epilogue

Ricecheck provides the framework for collaboration between farmers, research and extension. It recognises farmer learning and values farmers' knowledge as important as that of research and extension. As an extension method it is bottom-up, small group driven and requires superior facilitation skills.

This program can be initiated with a core group of farmers in a number of districts/regions in different States with whom extension workers and researchers interact regularly. Current management practices and knowledge gaps among farmers will be assessed in a participatory and interactive process and these form the basis upon which the program will be built. This knowledge base will provide opportunities for extension agents and researchers to collaborate with the farmers to enhance their knowledge base. This will in turn motivate them to learn and further improve practices to achieve better productivity.

Way Forward

While everyone would like to see impact of new technologies at a wider scale, very few appreciate the need for adapting new technologies to meet the varied requirements of different socio-economic, bio-physical, organisational and institutional settings. The Ricecheck programme, which follows a procedure of extensionist-assisted farmer -group's self- learning tries to address

these concerns. In other words, we are using Ricecheck as a case to illustrate the importance of adopting such innovative approaches (or) beyond field days and demonstrations.

During the last couple of years, ICAR has re-invented the concept of 'Farmer First'. This concept recognises the complex, diverse and risk prone realities of the majority of Indian farmers

and calls for enhancing farmer-scientists contacts with multi stakeholder participation. While theoretically this concept may sound good, but what is lacking is operationalising such concepts in the field conditions. We as extension professionals need to develop a series of 'toolkits' (expand the number of options in our extension tool box) to make little changes in the way extension is carried out in India and elsewhere.

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EXTENSION AND PARTICIPATORY IRRIGATION MANAGEMENT: CAN IT COMPLEMENT EACH OTHER?

Participatory Irrigation Management could be an effective model of community based extension, if extension engages more effectively with water user associations opines, Souvik Ghosh.

Community-based approaches, which involve farmer groups, have gained increasing importance for agricultural development in recent years. In extension too, this is considered important as it promised to overcome both the state failures and the market failures inherent in extension (World Bank, 2005). Farmer associations can play an important role in aggregating farmers' demands for extension and in representing farmers in participatory models of extension management so as to make extension more demand driven (Feder *et al.*, 2010). Extension should therefore ideally work with farmer groups to strengthen their capacities to articulate demands, help them link to new sources of knowledge and enable innovation. However, experiences from irrigation sector in India reveals that extension has not engaged sufficiently with the large number of water user associations in the command areas.

Box 1: Challenges for effective irrigation management in India

Irrigated agriculture contributes about 60% to overall agricultural production in India (Planning Commission, (2013). Because of its yield augmenting impact, irrigation development has always been a priority for India's agricultural development in the successive five year plans. Consequently, irrigation potential increased from 22 million hectare in 1950 to 123 million hectare currently making India the world leader in the irrigation sector (CWC, 2010). However, there is a significant gap (32 million hectare) between the potential created (123 million hectare) and utilized (91 million hectare). In India, the irrigation sector faces problems such as low irrigation efficiency (30-35%), deteriorating physical structures, inadequate maintenance, low cost recovery, under-utilization of created potential (only 74% utilized), uncontrolled water delivery, tail-end water deprivation, seepage loss, siltation, water logging and soil salinity. Inequitable and unpredictable water supply among farmers over space and time is also leading to injudicious use of water in the irrigation commands and increasing inequity within the same unit of command area (Ghosh *et al.*, 2005).

Approaches such as Participatory Irrigation Management (PIM) and Irrigation Management Transfer (IMT) emerged as solutions in response to the problems of non-performance of publicly supplied irrigation system. India's National Water Policy (2002) highlighted participation of farmers in irrigation management, Accordingly, several states in India have been implementing the PIM programmes and transferring the management of irrigation systems to water user associations (WUA) with a view to provide equitable, timely and assured irrigation (Box 2).

Farmers who were considered as beneficiaries till then are now considered partners in planning,

development, operation and maintenance of irrigation systems.

Box 2: Water User Associations

WUA is an association of all farmers owning land within a hydraulically delineated portion of a command area ranging in size approximately from 300-600 hectare. The WUA assumes full responsibility for operation and maintenance of the minor/sub-minor and all structures under its jurisdiction area. It ensures construction, maintenance and repair of all the watercourses, field channels and field drainage in the said area. WUA establishes its own operation and maintenance fund to meet the operation and maintenance expenditure and collects water rates from farmers. WUA decides cropping pattern keeping in view of available water for allocation, time of irrigation requirements and required repair and maintenance works in the command.



Participatory Irrigation Management (PIM) in India

About 14.623 million hectare of irrigated land has been covered under 63167 Water User Associations (WUA) in the country till the end of eleventh five year plan (Ministry of Water Resources, Govt. of India, (2012). In India, PIM followed two approaches - legislative and motivational. Andhra Pradesh and Madhya Pradesh first enacted legislation and opted for fast and extensive introduction of PIM. Maharashtra and Gujarat adopted motivational strategy followed by legislation. Odisha presently having highest number of WUAs (> 15000 with about 1.5 million hectare jurisdiction of irrigation command area) too adopted motivational strategy for certain period and when attained certain level of momentum, adopted a top down strategy, i.e., legislation. If there is an imposition of sets of rules and organizational structure on the understanding of few selected experiences, it will face difficulty in enforcement mechanism. Perhaps because of this, the performance of WUAs has been mixed.

Performance of WUAs

The gap between the prescribed and performed functions of WUAs is attributed to certain factors, which need to be addressed. Effect is found to be varied between sources of irrigation as well as

across the command areas of different irrigation systems (Ghosh and Kumar, 2012).

Group dynamics: Ghosh et al.(2010) tried an approach to measure group dynamics effectiveness of different WUAs under different irrigation systems identifying different dimensions and their relative importance in it. They found that many of the parameters in group dynamics effectiveness index (participation, decision-making procedure, group atmosphere, empathy, interpersonal trust and social support) were quite low in case of major and medium irrigation WUAs whereas these were high in the case of minor irrigation (both flow and lift) WUAs. It also means that the smaller the irrigation system, the better the group dynamics.

The reasons for this kind of differential group performances may be attributed to the fact that in case of minor irrigation, irrigation management transfer (IMT) to the WUA has inculcated a sense of ownership with full access and control of the system. In contrast, in case of major and medium irrigation systems, the efforts are undertaken based on the assumption that things could be set right by organization of the irrigators at the local level despite the availability of insight that without changes in management at higher levels it is very unlikely that these local organizations (WUAs) will be successful over time.



Other uses of water: The concept of WUA does not consider other uses of water (domestic, industrial use, etc.) and also the needs of landless people in irrigation command area. Without proper education and interface with all categories of farmers, there will not be widespread acceptance to the idea of farmers assuming management and maintenance responsibilities beyond the on-farm level. Poor people's relative benefit typically depends on allocation of water rights, which is in proportion to land size rather than, for example, on the basis of an equal quantity of water to every farm households.

PIM and Extension

Presence of WUAs in the irrigated area offers great potential for extension to improve its effectiveness. Extension can play an important role in capacity building of the WUAs not only on operation, maintenance and management of irrigation system but also in implementing efficient crop planning, synchronization of farm operations, linking WUAs to other sources of knowledge, support and services and establishing effective forward and backward linkages. Networking of WUAs for sharing of information and expertise between them would also be useful. As use of productivity enhancing inputs in agriculture is often influenced by the available irrigation water regime, the PIM under WUA umbrella would complement the other extension services well with more assured benefits from the extension efforts. Extension also need to give attention on the equal sharing of benefits among the landholders and the landless by working out the modus operandi of involving landless in WUA's activities like repair and maintenance works in irrigation network, allowing cultivation on common lands in the command, fishing rights in the minor flow irrigation system's reservoir, etc to ensure equal benefits to all. Present structural arrangements of WUA ensure involvement of both agriculture and irrigation department functionaries; thus efficient cropping and water use in the irrigation command. Involvement of other line department functionaries (livestock, fishery) would help in developing capacities of the rural households in a holistic manner with diversified livelihood options in the irrigated areas.

Missing Links

Though extension could enhance the capacities of WUAs and multiply its own impact and effectiveness by engaging with WUAs, extension hasn't sufficiently exploited this potential. A lot of discord still exists between the state departments of agriculture and irrigation in most cases. At the most, the Department of Agriculture (the main

Unpredictability and unreliability of water supply:

The unpredictability and unreliability of water supply from the main system to the local units is a major cause of the problems at local level. The small and marginal farmers are unaware of the WUAs in many cases especially in larger irrigation systems, where they face more problems in accessing water, as their lands are concentrated in the tail ends unlike those of large farmers. It has resulted in the dissatisfaction of the small and marginal farmers towards decision-making process, thus reluctance in participation in WUA activities.

Institutional challenges in transferring powers and responsibilities:

Transfer of irrigation management responsibility from the government irrigation authority to local management demands both allocative and investment decisions by the farmers' group. The problem at main system level is mainly problem of allocation of rights and entitlements and therefore, of governance. Several socio-economic and political factors outside the water sector influence the irrigation management. Success of irrigation management transfer depend on a whole set of institutional arrangements and willingness to comply and enforce and/or change the rules in the light of changing circumstances. The issues of rights figures prominently in debates on irrigation management in India now. Inefficient water uses, social power capture by rural elites in the name of participation, inadequate support from government agencies and reluctance to fully transfer powers and functions to the WUA are some of the bottlenecks. Currently, there is an inadequate understanding of the linkage between socio-cultural, institutional and ecological factors affecting the outcome of the PIM reforms in India (Saravanan, 2010). There are also concerns about the effectiveness of the PIM approach and sustainability of WUAs (Reddy and Reddy, 2005; Kulkarni *et al.*, 2009).

public sector extension agency) has helped WUA in crop planning and providing inputs mainly seeds during some years (mainly initial years). Further initiatives for strengthening technical capacities related to post-harvest and marketing aspects and improving governance of WUAs are clearly lacking. It is a matter of great concern that effective and functional linkage between different agencies is still an issue in spite of co-ordination mechanisms such as the Agricultural Technology Management Agency (ATMA).

Way Forward

- Participatory Irrigation Management should embrace a new paradigm of inclusive and participatory irrigation

governance and extension should support this transition.

- Extension should learn from successful evidences of farmer managed irrigation systems and use the insights from this learning to support other WUAs. It should also provide technical, managerial, marketing and entrepreneurial support to WUAs to serve its members better.
- Extension should use co-ordination mechanisms such as ATMA to bring about much more convergence to support WUAs and should support WUAs to emerge as a community based extension mechanism in irrigated areas.

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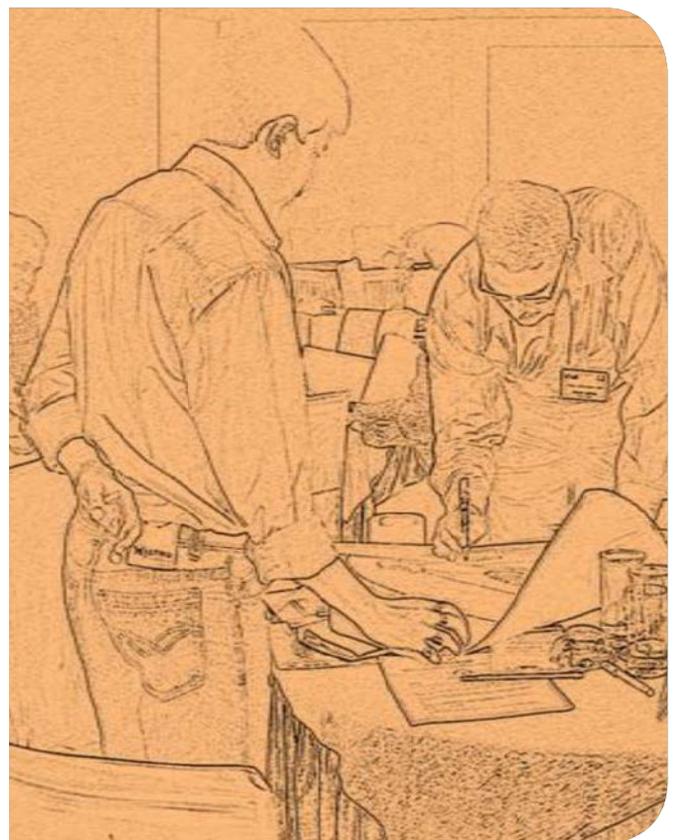
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IS IT TIME TO ORGANISE A SEMINAR ON HOW TO ORGANISE SEMINARS?

These days everywhere you turn, you see and hear about seminars, conferences and workshops. But very few of these add value by contributing to improving the quality of debate, programme implementation or the policy process. It is time to organise a seminar on how to organise a seminar, argues Suresh Kumar.

Though I have attended several seminars, workshops and conferences and came back disappointed, I never thought of writing about it, till I read Dr RM Prasad's recent meeting note in AESA (<http://www.aesnetwork.org/international-conference-on-extension-educational-strategies-for-sustainable-agricultural-development-a-global-perspective/>). Dr Prasad wrote about his experiences of participation in an extension conference recently in this meeting note and a few extension scientists commented on his note. As I did not attend this conference, I can't speak for the conduct of that event. My views and suggestions are based on my own experience of attending workshops and seminars. It would not be fair to single out agriculture or agricultural extension here. Comments are valid for such events organised in every sector.

Dr Prasad's note raised several interesting points especially those aimed at improving the quality of deliberations and recommendations. These include the need for specifying outcomes (leading to focussed recommendations including areas for future research); emphasising quality over quantity; proper time management; encouraging young researchers and the need for adopting innovative approaches for organising such events. Those who commented on this meeting note broadly agreed with the thrust of Dr Prasad's arguments and his constructive criticism and also made specific observations on lack of rigour in extension research (including lack of research competencies) and on the need for innovative approaches in conducting such events (Box 1).



Box 1: Comments on Dr Prasad's Meeting Note on the International Conference on extension (December 2013, Bangalore)

Both Professor SVN Rao and Dr Sivakumar pointed out to the need for more rigorous selection of abstracts and reduction in number of abstracts and presentations to have more focussed deliberations in such professional meetings. Both of them also argued for shifting the attention of the organisers of the events from organising food, accommodation and transport of large number of participants (which is happening currently) to enhancing quality of presentations, discussions and recommendations.

Dr Saravanan Raj, Dr Lenin Venu and Dr Sivakumar argued for giving more opportunities for presentation to young researchers and PhD students, instead of pushing them to poster sessions. Professor Rao also highlighted the need for improving research capability among the faculty as a pre-requisite for improving research quality.

The importance of a doctoral colloquium in such seminars, workshop and conference was highlighted by Dr Sivakumar. He also indicated the need for organising an interactive session with the editors of top rated journals. While agreeing to the analysis of Dr Prasad, Dr Mahesh Chander observed that he is looking forward to an ideal extension conference as a model to follow.

The discussions mainly covered three broad but inter related issues, namely, improving the quality of extension research (including the quality of Post Graduate Research), enhancing the capability of extension faculty and improving the conduct of workshops, seminars and conferences.

All these aspects are critical not only for extension but also for all disciplines, as a nation cannot develop beyond the capability of its faculty. If I was to name one item which is most crucial for national development, I would unhesitatingly name quality of faculty as this determines quality of both education and research, the two pillars of growth.

Improving the Quality of Extension Research

It is high time for universities and research centres to have their own Research Master Plan and a Community of Practice (CoP) around each of the research themes. The research program may be finalised jointly by education, extension and research wings. I believe that this mechanism is already in place in most cases. Same may be fine-tuned and internalised. Every research (student as well as faculty research) should contribute to this agenda. Subject of the thesis may be selected from out of the Research Master Plan. Each student research program may be part of a long term research project. Format of student research needs to be structured so that every research project could fit in the research master plan.

Quality of PhD thesis is core of academic excellence as this distinguishes academics from non academics. Every PhD thesis needs to be put on open defence through a suitable mechanism. Once a mechanism like "Extensionpedia" is created, the thesis could be uploaded on the portal

(or any other similar portal) and put up for scrutiny of the CoPs.

This thesis could be discussed in a seminar for those themes to be attended by experts who could then give their opinions in the light of discussions there and the comments received from CoPs. In fact, defence of PhD thesis could be an important part of workshops and seminars. Dr Sivakumar made an excellent suggestion for a doctoral colloquium alongside where the PhD students could discuss their work. Thus, PhD students need to be invited for these professional events. Presumably the PhD thesis could be discussed as part of the Colloquium.

Improving Research Capability

Professor Rao identified it as one of the most important issue affecting quality of research. This is important for all disciplines including extension as the faculty capability virtually caps the scope of national development. This capability needs to be upgraded as part of life time capacity enhancement programme and not through a few isolated initiatives. Scope and modalities of such initiative need to be determined through wide consultation at all levels and finalised after a national consultation. The 12th Five Year Plan Working Group on Agricultural Extension had recommended testing competencies of extension functionaries and extension institutions quantitatively through a suitable professional system. This concept of quantitative testing of competency could be extended to ICAR and SAUs and for that matter to every organisation. Without quantification, large scale programme for capacity enhancement will not yield results. Once quantified it is possible to know where we stand, plan interventions and monitor the changes. For instance the 13th Five

Year Plan could then mention the existing extension and research capability levels at beginning of the Plan and the target towards the end of the Plan.

Conduct of Seminars and Workshops

As discussed earlier, this is the main focus of this blog. DrSivakumar's suggestions for improving quality are unexceptional and deserve to be acted upon. I would like to place a few more suggestions on how we can improve the conduct of seminars, workshop and conferences here:

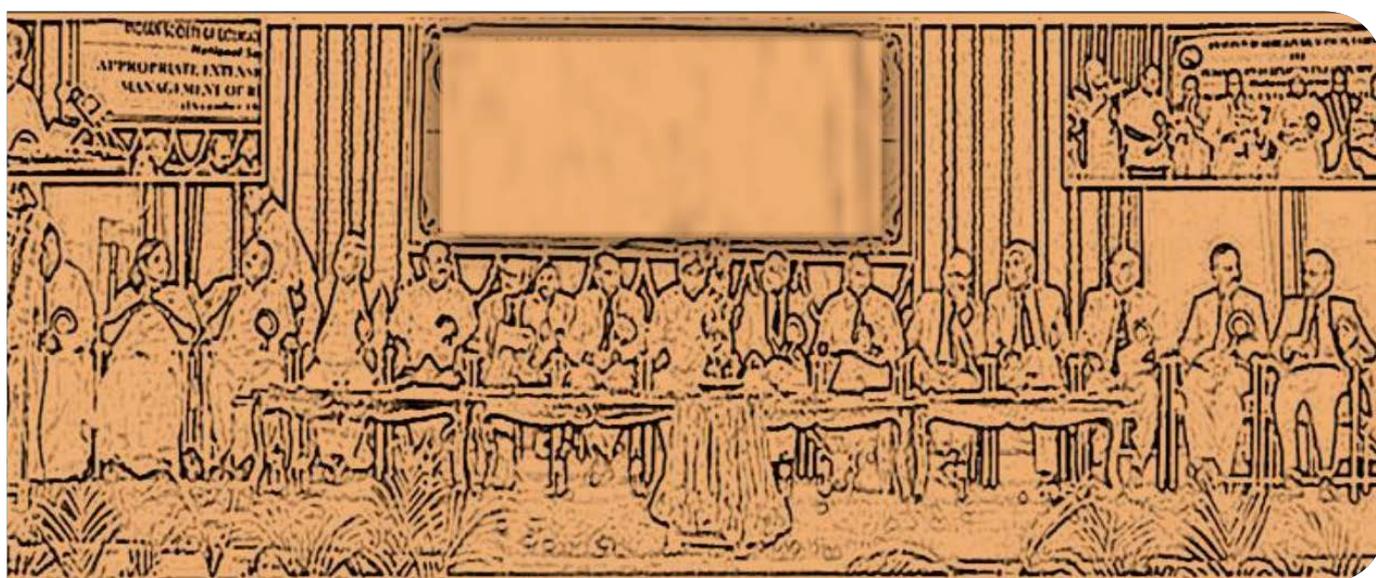
Themes: There is need for formulating theme wise issues and concerns in extension needing co-development. This "directory of issues and themes" needs to be uploaded on a platform such as "Extensionpedia" so that every stakeholder could contribute to this list of themes. This was also mentioned by Dr Prasad as an illustration of the seminar outcome. This list may be finalised at a national seminar to which senior functionaries from Planning Commission and Ministries may be invited. Authorities using the inputs and providing funding also need to be consulted for their inputs so that the directory represents the concerns of every stakeholder including, practitioners, faculty, senior managers and policy makers. This shall ensure that the themes represent the national need. Each seminar, workshop and consultation and even research study could use this directory to firm up the theme/s of their event and research.

Objectives and Participants: One or more objectives need to be clearly spelled out. The objectives could be development of themes, assisting PhD and MSc students and researchers, exposure to new ideas, improving education etc. The nature of participants from diverse backgrounds needs to be considered carefully in line with the objectives of the event. There are good reasons to restrict participation to

have sufficient time for quality deliberations. In some cases there could be adequate reasons for ensuring wider participation from a variety of sources that could provide synergy. The objectives should determine the number as well as the nature of participants. . To maximise benefits, the proceedings could be broadcast as in case of medical conferences. Teaching videos could be prepared for colleges and professionals. Workshop papers should ideally serve as a text book for the subject and may be made available on the website.

Workshop papers: In my blog on "Extensionpedia" I had suggested that for each theme in extension, a base theme paper may be uploaded for co-development by CoPs and the theme paper finalised after a national workshop of each CoPs. This co-developed theme paper could form the base consultation paper for all seminars, workshops and conferences. The workshop papers should be related to these themes and should contribute to adding and modifying the contents. These papers could be also dropped in a drop box of the particular theme and be also uploaded. The workshop organisers could use the theme paper and also the additional papers related to this theme. This workshop may result in a revised anchor paper which may be then uploaded for co-development. One option for ensuring quality of papers and allow wider participation is to evolve the concept of Paper Bank - theme-wise pre-approved papers de-linking papers for consideration in specific workshops. A Paper Bank could be prepared for each theme. Organisers could select papers from the paper bank. Contributors could also offer pre-approved papers for various seminars.

Inaugural session: Participation of dignitaries is important as the participants would like to know the thinking of international, national and state level decision makers and experts about their



long standing concerns, their thinking about the future and also to interact with them. This however, does not happen due to the limited time available to the dignitaries which is consumed by inaugural addresses and welcome ceremonies. Welcome ceremonies could be made short and the time could be used more optimally as the time of dignitaries will always be limited. The participants who come from long distances and have rich experience would like to interact with the dignitaries but the same is not possible both due to shortage of time and there being no provision for it in the inaugural session. Provision for reactions of participants need to be included in the inaugural session. Ideally priority may be given

to participants who send the list of questions in advance.

Everyone's and my own experience regarding time management in most seminars is the same (Box 2). If the power points slides are made available in advance, the participants could read the same before the session starts and this would help in finding more time for discussions. This should be default option. It would also compel the participants to come prepared. Time management of academic events is something all academics need to ponder both for optimal use of their time and more importantly for the respect and sanctity of the academics and the academic discipline.

Box 2: Time Management

Organisers invite policy makers and decision makers and well-known names in the discipline because they enrich the program and it reflects on the image of the seminar. The opening session comprising opinion and decision makers consumes a lot of time after which they leave and attendance thins out depriving participants of opportunity to interact. Many participants leave by the time of final session.

Experts invited to participate in these events need to be allowed enough time to enrich the seminar and their number determined by available time and expected role. If too many are invited they cannot be allowed enough time. The Chair is then compelled to ration time and keep reminding them to finish presentation quickly like a policeman regulating crowds or rapid fire talk shows. Continuous pressing of bell by the chair rather than academic discussion then becomes the most distinguishing feature of technical sessions.

Plenary session (which is perhaps the most important) often doesn't have time to build consensus. This session usually starts late and is also consumed by dignitaries delivering their addresses. There is not enough time to finalise recommendations which are often finalised after the workshop is over. Sometimes the time taken to come out with the recommendations is very long as the organising team members have to attend to normal work and clear the backlog of work that has piled up during the workshop.

The recommendations are then sent to concerned authorities (when the issues may no longer be relevant and those who attend these events may not be in position or may not recollect the discussions and may have lost interest) and it will remain as one among the mountain of documents waiting for their attention. The opportunity of their presence is lost, probably forever.

Ideally the inaugural session should be devoted to review of action taken on previous recommendations which should provide the backdrop and anchor the inaugural session. The address of the dignitaries shall then cover actions already taken by their organisation on previous recommendations, proposed course of action as also guidance about learning's from the past and agenda for the future which should guide the proceedings. Currently in the absence of knowledge about previous recommendations, the inaugural proceedings tend to be conducted in a vacuum. Past needs to provide backdrop for the future. If the list of recommendations pending with the departments under control of the dignitaries attending the inaugural session is sent in advance to them they would review and initiate action as otherwise it would reflect poorly on them. This would also pre-empt decision makers making vague promises for the future. Presumably this would require the organisers to enclose list of

previous recommendations as first item in the agenda notes.

In fact, even dignitaries shall welcome this approach as it shall help them to address the pending issues and review the implementation of previous recommendations. To focus the session as recommended it may be renamed as "Recommendation Review Session-Looking at the Past" or "Action Taken Review Session-Looking at the Past" or any suitable name as the term inaugural session somehow gives impression of a session meant to inaugurate and make some general comments..

Plenary session: This session should be devoted to finalising the Agenda for Future by modifying the Directory of Recommendations based on the discussions in this event and may be suitably renamed instead of Plenary Session. Quite often when the recommendations are made the decision makers are not available and an opportunity is lost

as the workshop recommendations shall compete for space with a host of other documents. Plenary session is the ideal place for the policy makers to listen to the recommendations and contribute so that the recommendations reflect their concerns and acceptance. The recommendations should be finalised in the plenary session only.

To ensure that the decision makers come prepared for the plenary session summary of recommendations of each session should be communicated to concerned policy makers after each session. Efforts should be made to make sure that the departments or agencies that are expected to implement the recommendations participate in this session. Sufficient resources should be ensured to make sure that they participate and benefit from these events.

In other words, while the inaugural session looks in to the past to know what had happened and what action has been taken on past agendas, the plenary session sets agenda for the future. The sessions in between the two sessions or the working sessions facilitate leanings from the past to set agenda for the future and need to be structured accordingly giving enough time for the speakers to present their views and for the participants to interact. As mentioned earlier if the power points slides are made available to the participants in advance they could come prepared and the time of presentation could be saved and the sessions could be devoted for interaction and finalising recommendation after discussions and building consensus. Organisers should also accept responsibility for follow up of these recommendations and there should be a system to bring the recommendations to the notice of decision makers.

Directory of Recommendations: Having an up-to-date list of previous recommendations is a prerequisite for recommendations made in this blog. A theme wise portal/directory of recommendations may be prepared, incorporating recommendations made by various workshops and seminars and also based on recommendations from commissions, committees and expert groups. Unique identity may be given to each recommendation. The directory should also indicate agency which should take action and the status of action taken. Concerned agencies may be requested to indicate reasons for not accepting the recommendations. Seminars should focus on improving previous recommendations through addition/deletion/modification and review action taken on previous recommendations and deliberate on improving implementation of recommendations. Meetings shouldn't be about repeating the same

recommendations that are already made.

Workshop Resources: These should be allocated separately for administrative/ logistical and academic purposes. Academic resources may be provided for both preparatory works as also for follow up of the workshop recommendations including follow up with concerned authorities. Non academic staff may be trained for logistical work of the seminars or a retired academic may be hired for this purpose.

Credit: Workshops/seminars should be treated as an action research project and the staff may be given adequate credit. Currently, I believe credit is given for only papers published in a seminar. It should be considered an honour to conduct a premier workshop. Credit may also be given, depending upon the quality of paper for contribution to the anchor papers on the 'Extensionpedia' without linking with seminar presentations. This may reduce pressure for preparing seminars for presentation in seminars. It is hoped that treating seminars as action research project should allow them to spend more time on these activities thus, improving the quality and value of these professional meetings.

Rating the workshops/seminars: Regular evaluations on the quality of workshops and seminars may be conducted and each workshop/seminar may be rated by professional groups on set indicators. Rating should determine funding for subsequent events by the organisers.

Funding: Clearly funding by various national agencies need to be enhanced to ensure quality. Funding may be linked to the rating of earlier workshops/seminars and also on the condition that the organisers adhere to the good principles of organising events (as discussed here). In addition funding should be made available from other sources who benefit including educational and research organizations and even commercial circles.

A national seminar on how to organise seminars? This suggestion is made in full seriousness. It should result in detailed guidelines and a manual. There should be a review of how workshops and seminars are organised in other disciplines and premium institutions in India and abroad. Perhaps MANAGE or NAARM or similar organizations may take up a project on this. Most funding agencies may be invited for their inputs so that the funding agencies may insist upon adoption of these guidelines to ensure value for these investments. This seminar could be the ideal seminar which Dr Mahesh Chander is dreaming about.

Way Forward

Many of us have been informally discussing about the need for improving the quality of professional meetings and perhaps this is something on which everyone agrees. My intention (and also others who contributed their concerns) is not to belittle the hard work that goes into organising such events. Quite often the prevailing conventions, habits and practices about seminars and workshops and resource constraints limit the choice of organisers and constrain them from thinking out of the box.

We must also admit that all professional events

such as seminars, workshops and conferences contribute substantially through interactions and networking among professionals, whose value shouldn't be underestimated. Having said that, these gatherings do not deliver for the academic bandwidth available as sufficient attention is not often given to improving the quality of deliberations in these events. I hope, adoption of these suggestions made in this blog would help us reinvent the way we organise professional meetings. While this blog has mostly dwelt on organising professional events, other issues briefly touched namely extension research and quality of faculty also needs urgent attention.

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NOT JUST CROP CAFETERIAS! AN EVIDENCE-BASED VARIETAL EVALUATION AND SELECTION PROCESS TO CREATE SEED DEMAND AND MARKET

Crop cafeterias, while generating evidence about varietal performance can also be a platform that connects different stakeholders in the seed value chain, and support large scale promotion of new varieties. In this blog, Swati Nayak and Mosharaf Hossain share their experiences from promoting IRRI's crop cafeterias in Odisha.

The development of climate resilient rice varieties is a successful outcome of various breeding programmes under the agriculture research for development initiative over the last decade. These varieties have yield advantage under stress conditions and no reported yield penalty under normal conditions (in comparison to a similar farmer variety). Therefore these varieties can reduce the vulnerability of millions of rice farmers by stabilizing productivity and ensuring food security. Thanks to the community of breeders and scientists engaged in rice research, now there are several varieties with multiple stress tolerant traits, varied duration, grain type, and yield rates. This in turn have given farmers many new options while choosing more appropriate varieties that suit their specific circumstances.

In order to make choices, farmers need to be aware, sensitized, and motivated to grow these varieties. To achieve large scale impact, we need to ensure large scale promotion of these varieties and guarantee adequate availability and access to the seeds of these varieties. Rice seeds are affordable to most farmers as often these seeds are subsidized by the government. However, there are other challenges in making sure that adequate quantities of these seeds are made available at the right time. This requires an established acceptance of the variety as well as a sustained production-supply chain for the same. In order to influence the adoption behavior of farmers by addressing each of the factors leading to that, the eastern Indian state of Odisha is witnessing an innovative extension approach. Popularly known as evidence hubs (or more precisely 'varietal cafeterias'), these platforms are much more than that.

An Evidence Hub – a relatively newer knowledge platform – is meant to exhibit multiple crops/varieties as well as to analyse their performance under different management or ecological conditions. However, their reach is often limited to more scientific evaluation, ignoring the link that could be established with community/user groups as well as the market at large. The new generation evidence hubs promoted by the International Rice Research Institute (IRRI) in the Indian state of Odisha have the potential for changing the overall purpose and impact of such knowledge platforms (Box 1).

These platforms, furthermore, are enriched with the additional concepts of experiential/comparative learning, participatory discussions, and stakeholder engagement for varietal evaluation, selection and promotion. Acting as a platform for hosting multiple rice varieties, this also incorporates the entire process of evaluation

and generation of recommendations. These hubs serve the broader goal of strengthening the seed market for newer varieties by creating policy level triggers and recommendations generated through formal institutions of influence such as the Department of Agriculture, State Seed Corporation, etc.

EVIDENCE HUBS- What is New?

These new generation evidence hubs are different from the traditional ones because of the integrated event for varietal evaluation and generation of rankings (Table 1).

Box 1: IRR and STRASA

IRRI (International Rice Research Institute) is one of the world's premier research organizations dedicated to reducing hunger and poverty through developmental research on rice. It has nearly 60 years of contribution in the domain of agriculture research and development, with offices across 17 countries in the world.

STRASA (Stress Tolerant Rice Varieties) has been a flagship project implemented by IRR (in association with Africa Rice) since 2007, and it is funded by the Bill and Melinda Gates Foundation. This project has contributed tremendously to the development and delivery of several abiotic stress tolerant rice varieties for millions of farmers in the unfavorable rice growing environments.

Table 1: OFTs vs Evidence Hubs

Characteristic	On Farm Trials (OFTs)	Evidence Hubs (EHs)
Hosting	Primarily done in farmer fields, hosted by individual farmers or KVK farms	Can be done in departmental farms, community land, farms of research institutes, and private institutions.
Lay out	It varies based on the objective. Could be demonstration of a single technology or a comparative evaluation with treatment vs control plots	It is focused on comparative evaluation. Multiple technologies (varieties here) are put up for evaluation in sub-plots (treatment and control).
Number of technology	Number of technologies tested are limited	It can be large in number with multiple sub-plots and replication plots in place.
Data and information	Data/information collected are primarily scientific	Data/information collected are scientific, as well as discussion/insight based
Participation method	Largely individual (farmer and lead scientist)	Group based/collective
Evaluation methods	Based on measured data	Observation, measurement and feedback based. Use of scoring technique
Data triangulation/ Validation	One trial doesn't have much scope for data triangulation	One evidence hub with several replication plots for each variety has the potential for data triangulation and validation.
Stakeholders engaged	Farmers, scientists/extension agents	Farmers, private & public institutions, researchers, delivery agents, key market players, extension agents
Extension sector	Widely known concept in public extension domain	More popular among research institutions, private institutions or extension agencies
Events	Not mandatorily organized or integrated with laid-out trials	Participatory evaluation event or varietal expositions are essentially integrated into the trial
Risks	The risk of failure and damage to trial plot is higher	The risk of failure is minimized with alternative replication plots
Immediate outcomes	Technology performance evaluation	Technology evaluation, promotion and demand creation

Stakeholders

Known as EH events, these engage many of the important stakeholders in a more strategic and participatory manner with the broader objective of creating demand and market for new (or lesser known) varieties. Therefore, it is important that

the stakeholders invited to the evaluation and selection event represent the entire seed value chain, which includes seed producers, suppliers, distributors and consumers. Apart from that, in order to influence the market dynamics, and the scenario of decentralized multiplication programmes in the state, inclusion of policy

makers (or influencers) are also critical. The stakeholders engaged can be categorized into five major categories, in keeping with their own interest and influence level in the entire process as well as in the technology (read variety).

The five categories of stakeholders actively participate through a major and essentially integrated event. They go through three different sessions during this event involving the principles of classroom learning, field visit and observation, and follow-up discussion in groups. The stakeholders are familiarized with the objective and criteria of evaluation, and various non-visible traits of new varieties, and the layout of the EH. Then follows a complete tour of the EH, allowing them to visit multiple replication plots to observe, evaluate and validate their findings as well as perceptions. The follow-up group discussion gives them an opportunity to have a critical discussion and arrive at ratings or priority ranking of varieties in a more participatory manner.

This generates not only scores/feedback for all the listed varieties and critical traits for each variety but also the overall rank of the preferred variety for a particular locality. The score sheets are validated,

acknowledged, and authorized by the District Director of Agriculture, who also participates as the key observer of the entire process and discussion and also gives his/her insights. These score sheets, collected from different districts or regional EHs, give the state functionary an overview of the localized demand and variations across districts. This also helps state functionaries to collate common varieties on demand or specific demands, and thereby prioritize the seasonal seed procurement or production based on resource and feasibility. Any non-released varieties evaluated as promising, also get an opportunity for policy intervention or dialogues that can then accelerate the release of the same in the state.

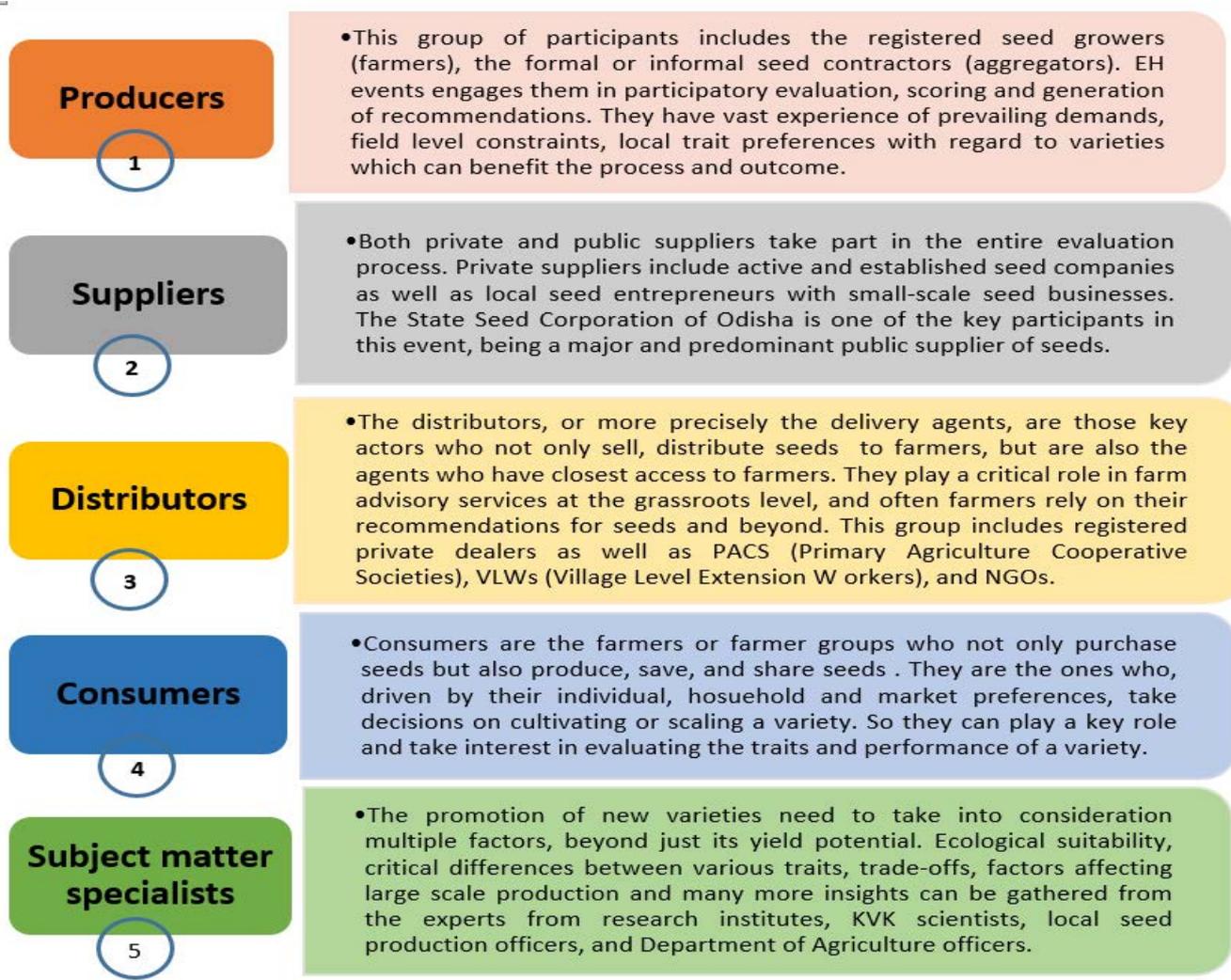


Fig. 1: The categories of stakeholders linked to the EH

The Process and Components of Evidence Hubs

A. Establishment of the Hub

Site Selection: To host an Evidence Hub, an ideal location is selected which could be strategic in terms of visibility and management. The ideal size of an EH should be one acre, making it an easily doable intervention at any suitable location. However, priority is given to departmental farms, which ensure a continuous engagement of local agriculture extension functionaries from the stage of lay out till plant establishment, along with basic infrastructure support and monitoring. Farms of private agencies or research institutions are other good options. At a few places, the community managed/farmer hosted EH has also been successful, and worth studying.

Varietal Selection: Newly released or lesser known climate resilient varieties are tested against several local checks which are popular (old or new). Each cafeteria hosts a total varietal portfolio ranging from 15-20. Ecological suitability is taken into consideration while selecting new varieties, e.g., drought resistant varieties for upland areas and submergence tolerant varieties for lowlands.

Crop Establishment: A staggered sowing practice is followed to coincide with the flowering and panicle initiation of all varieties for better comparison of visible traits. Three replication plots are allocated for each variety and each replication plot can be randomly positioned at any location of the site. This helps in generalizing the trait/performance of the variety by observing all three plots.

Scheduling of Cafeteria Event: The event is scheduled when the cafeteria is almost ready to harvest but not harvested yet. This gives stakeholders an opportunity to analyse multiple observable traits, and not just the yield. This also reduces the bias which stakeholders could have after measuring or knowing the exact yield. However, each plot is subjected to crop cuttings as to validate the findings and make state-level recommendations for final production planning.

B. Varietal Evaluation and Selection

A scorecard is designed for each cafeteria. This consists of a set of 15-20 varieties which are evaluated in the platform. Several key traits that can influence adoption as well as overall performance of the varieties are listed against the varieties. The traits are kept similar across all varieties for comparison.

Variety Name	Traits		Duration (in days)	Grain Type	Crop Height	Tilling Ability	Expected yield	Actual Yield	Disease occurrence	Pest occurrence?	Overall score(1-10)	Any comment
	Stress Tolerance type (Drought/Flood/Salinity/None)											
Var 1												
Var 2												
Var 3												
.												
.												
											Overall Comment	DDA Signature
Name of participants		Designation	Contact No.									

Fig. 2: A template of the evaluation sheet/scorecard used in an EH Event

Some of the traits remain as visible traits which can be evaluated on the field through observation whereas some traits are explained during orientation, e.g., duration of the varieties. For traits, participants give direct score or feedback (like/dislike; more or less, etc.). The scoring is done on a 1-10 scale. After observing each trait, they are asked to give overall score to the variety (1 being the lowest score and 10 being the highest). Individual participants or a small group of participants travel across all the replication plots guided by a layout map and evaluate each of the varieties based on traits.

After the field observation and simultaneous discussion is complete, they gather in a room for a group discussion. This discussion triggers many negotiations, trade-offs and insights – coming from multiple stakeholders trying to influence as well as inform each other. At the end of a participatory discussion session, the group arrives at a consensus on final ranking and these are presented before the DDA. When there is any lack of consensus, DDA or seed production officers try to facilitate further discussion in order to arrive at a final decision. Later, the scorecard is signed and acknowledged by the DDA for formal recommendation to the state.

C. The Stakeholder Influence and Interest Matrix

The cafeterias are hosted with the objective of strengthening the seed system and market and not for merely integrating the concept of participation. In that sense it is important that the stakeholder influence and interest is analysed not just in the perspective of varietal evaluation and selection, but in the larger perspective of varietal adoption, scaling, and production.

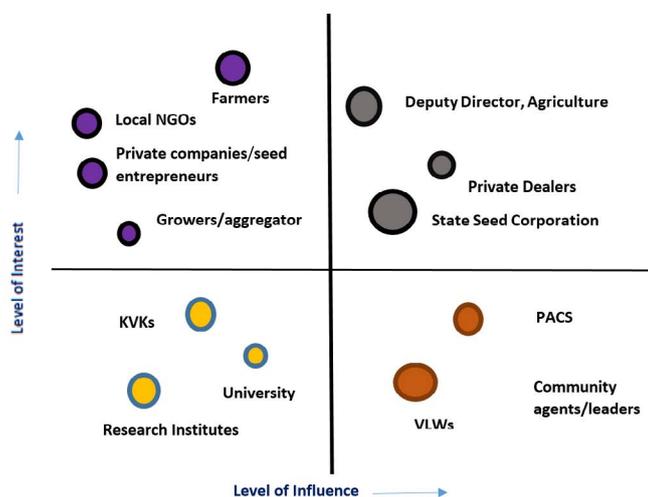


Fig. 3: The stakeholder matrix

Lessons

With more than 40 cafeterias hosted in Odisha State, focusing on micro-ecology and geographies over the last few years (2016 onwards), the interest and influence of each stakeholder seems to be varied. Even for the same stakeholder, it varies from district to district. Also it is not always the case that one group of stakeholders is more influential than another. Within the same group you may find individuals and institutions who have relatively higher influence or interest in the entire process.

For a crop cafeteria to reach its primary objectives, one of the most influential stakeholders was found to be the Deputy Director, Agriculture (DDA), the district nodal authority in the Department of Agriculture in Odisha. A DDA can influence the state’s functionaries, and then in turn the state seed corporations and local seed production officers, to accept the highly-ranked variety and incorporate it in to the seasonal production/procurement plan. He has the power to incorporate these varieties across various district level programmes as well as accelerate dissemination of the same.

In the case of Odisha, the state seed corporation being one of the dominant suppliers of seed it is also a key player who has both direct influence

and interest over production and scaling. It has the power to finalize seasonal production plans for districts and the state at large. Being engaged with this process of evaluation, they can get a deeper insight into varietal preferences and performance, which in turn would have direct incentives for sales volume and revenue. The other influential players are found to be local seed or agro input dealers. They have the direct motivation to promote a variety as demand can turn into revenue for them. Apart from that, traditionally, dealers have the farmers’ trust as they depend on the former for most farm advisories.

Primary Agricultural Co-operative Society (PACS), which are the public arm of input dealership for farmers, are also very popular institutions. However, with multiple parallel activities and limited support infrastructure, their interests are much broader and often not focused only on seed business or varietal promotion. However, they have a higher level of influence on farmer decision and spread of varieties in a region.

Farmers, farmer producer groups, local NGOs and many private seed entrepreneurs have also been observed to show immense interest in promoting such technology and accelerating the adoption and scaling of varieties. But in order to strengthen the seed system of a particular variety they have to rely on large scale production plans and supply chain through Odisha State Seeds Corporation (OSSC), their registered dealers, as well as the Department of Agriculture.

The inputs and technical insights from research institutes and subject matter specialists from KVK are important for evaluation and selection of varieties, but again their contributions towards strengthening local seed systems and large-scale scaling would be limited.

The Outcomes and Results

The varietal portfolio of the cafeterias vary based on the host district, number of released/notified/developed new resilient varieties in a given year, the local popular varieties, ecological conditions, and past evaluation experiences. Though the combinations may vary, the basic principles remain the same.

The cost of an evidence hub varies between INR 75,000 to 100,000. However, based on the available land at the suitable location and the number of varieties available for comparison, the size of the hub can vary. This can affect the layout cost. The ideal land size for hosting an evidence hub is one acre; and the total numbers of varieties to be compared are 20. The cost of organizing the event might vary slightly based

on the number of participants and location. This makes this intervention an approach which can be taken up by institutions who work for agriculture research for development and extension domain. This may be the Department of Agriculture, the National Agricultural Research and Extension System (NARES) institutions, private firms and their extension wings, and other public institutions.

Taking into account 2017's crop cafeterias– 23 in number and most of them hosted on departmental farms – on average 20-25 varieties were compared per cafeteria. The lowland ecologies dominating coastal Odisha saw a larger number of varieties available for comparison than in the upland districts. The portfolio of varieties already being cultivated by farmers was seen to be quite popular, large in number, and some of them are being considered as mega varieties, having been grown for more than 20 years (e.g., Swarna). The ecologies in the coastal area are also varied – across shallow lowland, medium land, lowland, etc.

The selection of new varieties to compare against the older ones took into account the factors for comparison (e.g., comparable duration/land type) for generating an effective varietal replacement strategy. The range of new varieties tested gave options for the stakeholders to pair with older ones, and compare and promote the most suitable ones for varietal replacement. For example, Swarna Sub 1, a flood tolerant variety can be a suitable replacement for the variety Swarna with similar duration and ecological suitability. However, promoting SwarnaSub1 to farmers who grow Lalat could be a wrong strategy. These strategic inputs were taken into consideration throughout the discussions that followed every evidence hub evaluation event.

The overall result (average scores) across the state of Odisha showed a preference for many new stress tolerant rice varieties (STRVs) over traditional or older varieties as evinced by the concerned stakeholder group.

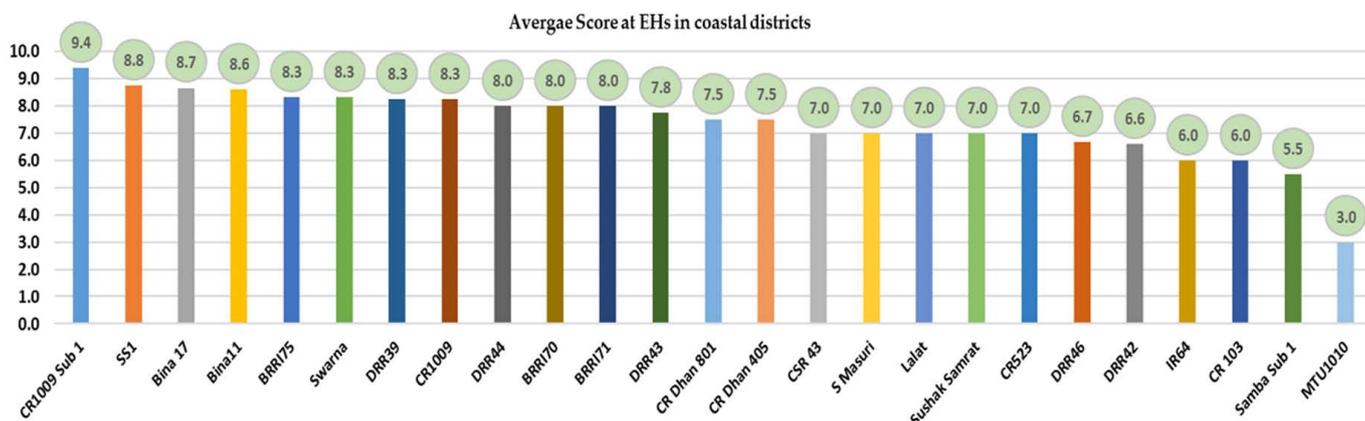


Fig. 4: The average scores/varietal ratings for coastal districts

The coastal areas witnessed the selection of varieties such as CR1009 Sub1, SwarnaSub1, BINA Dhan 11, and other climate resilient varieties over the older varieties like Swarna, Lalat, Samba Mashuri, and MTU 1010.

Swarna Sub 1 gave yield increase of 0.1 t/ha compared to Swarna under the same varietal duration category, thereby offering a great opportunity for varietal replacement in lowland areas. BINA Dhan11 gave better yield advantage as compared to the closest comparable old varieties like Lalat, MTU 1010, etc.

When validated with actual yield measurement through crop cuts, it was also observed that

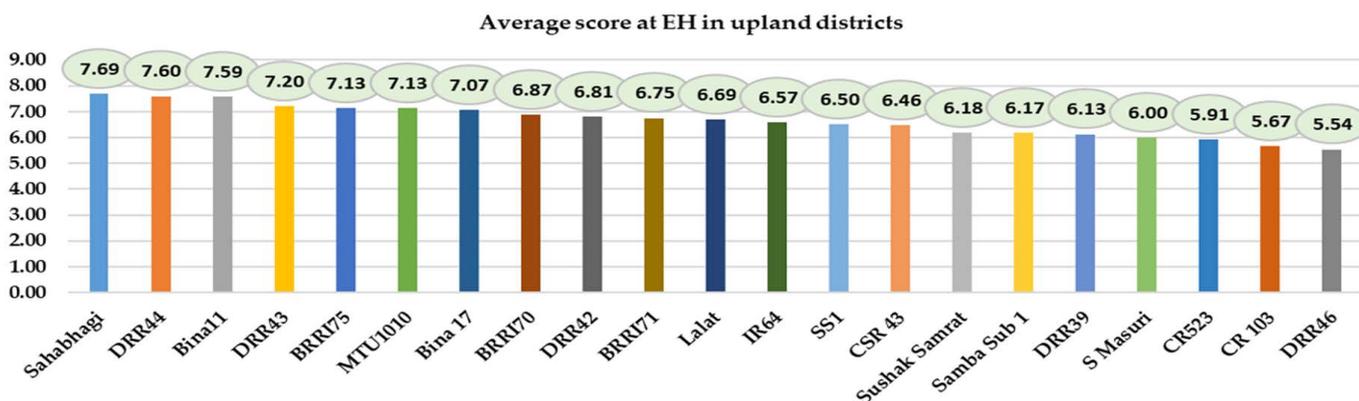


Fig. 5: The average scores/varietal ratings for coastal districts

For the upland (medium upland) areas, resilient varieties like Sahabhazi Dhan, DRR 44, as well as BINA Dhan11 emerged as stakeholder-preferred varieties as compared to older varieties like MTU1010, Lalat, and many other resilient varieties.

Even though the crop cut data demonstrated BINADhan 11 as the best performing variety in terms of yield, followed by DRR44, a variety like Sahabhazi was rated highest overall. This indicates various trade-offs and regional suitability by the stakeholders while rating and selecting a variety.

This also indicated that large scale seed production, supply and promotion of a new variety is dependent on different market dynamics and potential demand. Regional stakeholders are in the best position to discuss and decide what would be the most appropriate variety catering to the maximum market and therefore can plan the production and procurement of the same.

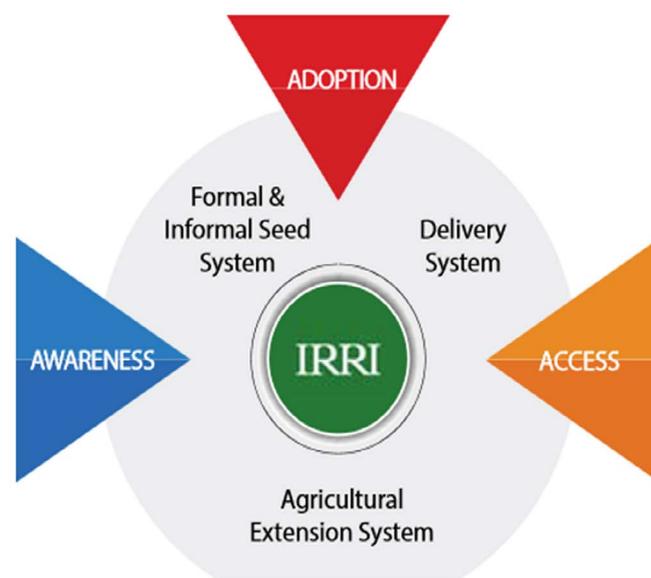
Apart from that there were many varieties which were rated high by the stakeholders, e.g., the BRRI 75 (a variety developed in Bangladesh), however, due to the fact that this variety is yet to be released in the state, it was difficult to promote it directly for production. Conversely, this definitely triggered meaningful dialogues among policy makers and key stakeholders on releasing this variety in Odisha.

BINA Dhan 11, with potential as it is high yielding and a preferred variety across all zones, was picked up as the one common variety that can help in replacing many older varieties. The government, state seed corporations, as well as many private seed entrepreneurs have now started taking up the production and distribution of this variety at a considerable scale. Remarkably, by the end of 2018 the Odisha State Seeds Corporation, facilitated by IRRI, has taken up a significant move to multiply nearly 10 quintals of BINA Dhan 11 variety procured from Narendra Deva University of Agriculture and Technology (NDUAT), Karnal. These strategic linkages have started to trigger the most significant changes in Odisha's seed market.

The Envisaged Impact

These platforms give an opportunity to create new linkages as well as strengthen existing ones. The experience combined with detailed insights, knowledge, and brainstorming coming from key stakeholders in the seed value chain makes it a more holistic approach. Primarily targeted to create demand and establish a market for new and potential resilient varieties, these tiny, localized cafeterias have been showing promising impact in the region. Actors – from delivery systems, formal as well as informal seed systems and agriculture

extension systems—are collectively using their own influence, infrastructure and capacity to streamline the supply and production chain. The steady increase in procurement of breeder seed and multiplication of many climate resilient varieties, such as Shahabhazi Dhan, BINA Dhan 11, DRR 44 by both public and private seed agencies of the region marks the significant and strategic success



that is the result of such efforts and consequential linkages.

Way Forward

An Evidence Hub can be seen as a fresh shift from traditional extension approaches. It is a participatory and interactive knowledge platform which specifically focuses on market stakeholders. The market stakeholders in the seed sector includes a lot of public sector players who have a greater holdover the policy arena of state. The state seed corporations work very closely with the Department of Agriculture. The district/ zonal level seed production officers representing seed corporations work very closely with public extension functionaries as well as private delivery agents like dealers. Together they can play a direct and decisive role in introducing, increasing or decreasing the production and circulation of specific seeds in the formal chain. These stakeholders, through their strong network of registered seed growers can also promote and incentivize the multiplication of new seeds. Institutions, like IRRI, ICAR-National Rice Research Institute (ICAR-NRRI) and other NARES bodies engaged in this process can strengthen the breeder seed linkage in the state – for multiplication and circulation of many new varieties. While being introduced to many new varieties, stakeholders are simultaneously evaluating and validating its performance and ecological suitability. In turn these stakeholders

can influence policy makers to expedite release and notification of several such varieties in the state. With so many research institutions, private seed firms, and district agriculture offices holding a mandate, there are many programmes dedicated towards testing, promoting new varieties, and

accelerating both varietal and seed replacement rate. Within this context such Evidence Hubs can be taken up as strategic interventions to promote, as well as create, demand for new high yielding varieties. Lastly, this approach can be replicated for other crops as well.



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PUBLIC-PRIVATE PARTNERSHIP EXTENSION MODEL FOR THE TEA SMALLHOLDING SECTOR IN SRI LANKA

Promotion of public-private partnerships for extension delivery is the only way to bridge the demand for, and supply of, extension services among small tea holdings in Sri Lanka, argues MKSLD Amarathunga.

Tea is one of the most important agricultural commodities in Sri Lanka that brings in a significant amount of export earning while generating employment opportunities for people in many districts. Even though its relative contribution has declined in recent years, the tea industry continues to occupy an important place in the economy of Sri Lanka. Productivity and the long term viability of tea smallholding lands have been declining due to many factors. One of the most significant lacuna in the tea sector has been the low level of adoption of proven technologies related to cultural practices arising from a lack of knowledge and non-availability of inputs at the correct time (Amarathunga and Wanigasundera 2018). The importance of an effective extension services in this regard cannot be over-emphasized (Samaraweera et al. 2013).



Box 1: Sri Lankan Tea

Tea consumes large quantities of resources and provides relatively high return to the country. The tea industry provides employment to about two million people, which is 9.8% of the total population. The tea industry plays a significant role by earning foreign exchange for the country. In 2017 the total tea production of the country was 307.08 million kg, of which 288.98 million kg (94% of production) was exported, earning Sri Lankan LKR 233.3 billion (Central Bank 2017). Tea export was mainly to 20 countries, such as Turkey, Iraq, Russia, Iran, UAE, etc. It was significant that the average price per kg of tea was LKR 620.18 across 2017, which was also the highest price ever fetched by Sri Lankan tea growers. The total tea production of the tea smallholders in 2017 was 231.96 million kg, which was 76% of the total production (Sri Lanka Tea Board 2017). Even though the smallholder sector is the dominant and most important sector in the country's tea production, the average productivity is around 1991 kg/ha/year (TSHDA Annual Report 2017), which is far below its potential level of over 3000 kg/ha/year (TRI 2002).

Extension Services in Tea

Technology dissemination in the tea smallholding sector is in the hands of public and private parties operating through various channels. However, the public extension system in the tea sector is not expanding at the required rate to meet the increasing demand mainly due to financial constraints and inadequate manpower availability. The field extension officer to farmer ratio is nearly 1:2700 when it should ideally be 1:1000. According to Obeysekera (2009), the extension coverage is extremely poor as the area under cultivation per extension worker is 814.85 ha. This shows the need for expansion of the TSHDA staff strength along with the need for more collaborative and partnership approaches to better serve the tea smallholders (Wanigasundera 2015).



The extension arms of private organizations, such as agro-input and service agencies often operating through bought leaf factories, provide information that promotes increased use of their products (Amarathunga and Wanigasundera 2018). There is no proper organizational mechanism for monitoring and evaluation of the expanding private sector extension channels so as to ensure that the recommended technologies are effectively disseminated and used by smallholders. In order to find a solution for these limitations of technology transfer for tea smallholders, I developed a public-private partnership (PPP) extension model. All major stakeholders attached to this PPP model could engage in technology transfer in an integrated and cost effective manner.

Application of Public-Private Partnership Extension Model for the Tea Smallholding Sector

PPPs are increasingly being emphasized as a mechanism for improving public service provision and for implementing development programs. Conceptually, the partnership is an extended form of group dynamics where two or more parties establish relationships and leverage resources to

work together with the expectation that each of the parties would achieve the greater goal than by working individually (Morse 1996) (Fig. 1).

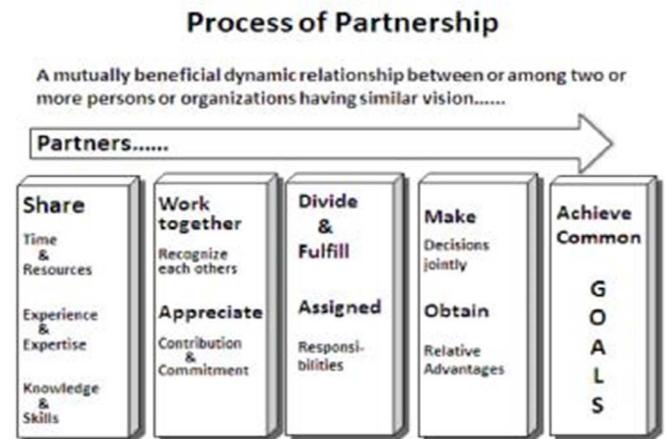


Fig. 1: Process of partnership

After applying the above concept to the technology dissemination process in the tea smallholdings sector, all key partners have to not only be working together and maintaining autonomy and independence, but also attaining their individual goals together with those of the other stakeholders in the sector. Partnership provides opportunities for all partners to learn new competence. The partnership also makes information available about the methods of accessing and using resources effectively.

Recommendations for the Establishment of an Effective Public-Private Partnership Model for the Tea Smallholding Sector

The PPP model (Fig. 2) consists of three main sub systems viz., Knowledge Generation, Dissemination, and Utilization, and each system should have a strong linking and feedback mechanism. The expectations from the proposed model were as follows:

- I. The Knowledge Generation System should initiate technology generation focusing on small holder-specific problems, and also conduct adaptive field trials on smallholding fields at different locations prior to releasing a recommendation.
- II. All partners belonging to private and public sector in the technology dissemination process in the tea small holdings sector, should have strong collaboration with each other and they would be willing to work together by sharing their experience.
- III. They will share resources while maintaining their autonomy and independence.
- IV. In addition to dissemination of technology the

PPP extension service should proactively work together for the distribution of inputs and services on time.

- V. Smallholders also should proactively participate in smallholder-specific technology generation by facilitating field-testing of new innovations on their lands, and record keeping.
- VI. The internally developed public and private monitoring mechanism with the representation of all partners will drive the system efficiently and effectively, and reach the set targets within the scheduled time frame.
- VII. With the active commitment and dedication of all the partners the developed mechanism is expected to facilitate the efficient and effective technology dissemination process to smallholders whilst addressing their field problems most appropriately.

However, since this model is practiced by only a handful of stakeholders and locations due to inadequate linkages among key partners viz., researchers, extensionists in public and private sectors, and tea growers result in systemic “bottlenecks” in technology dissemination systems and limit their effectiveness at contributing to development of the tea industry (Wanigasundera 2015). Hence, extension scientists should attempt to study and introduce different extension models and approaches for strengthening the existing extension system. Under such a mechanism, Public Private Partnership could be the most effective way to disseminate tea-related technologies to tea smallholders rather than the individual efforts of public institutions (TRI, TSHDA and Tea Commissioners’ division), market oriented (fertilizer or agrochemical agencies), or bought leaf factories (Amarathunga and Wanigasundera 2018). Apart from the author’s proven research findings and field experience derived by working together with all stakeholders, he emphasises that in order to achieve greater interaction among key stakeholders and their proactive participation in planning, implementation and monitoring of partnership programs, cooperation between the staff of partners, support from community leadership, mutual respect, appreciation of the contribution of partners, and effective communication, are of paramount importance in developing an effective partnership-based extension system. Hence it is recommended that the organizations responsible for developing management and fiscal procedures adopt this model and make sure that all smallholders are served through such models.

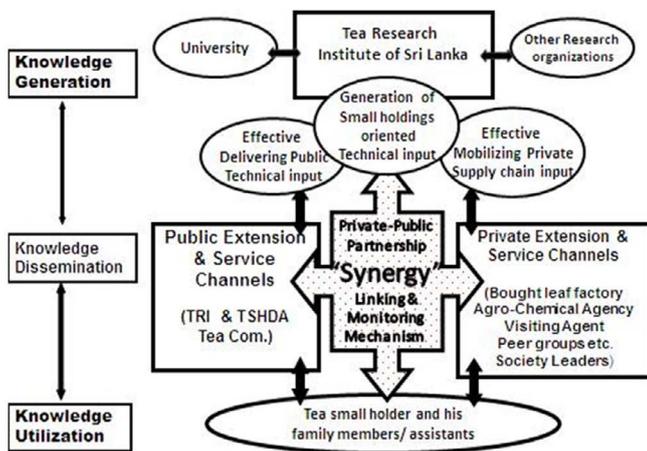


Fig. 2: Public-private partnership model for the tea smallholding sector

The model exhibited in Figure 2 on Public Private Partnership (PPP) extension was developed by me after conducting a comprehensive empirical study exploring existing collaborations among the key stakeholders of technology generation, dissemination and utilization systems. I also examined the factors affecting such linking mechanisms of extension and appraised the partners’ readiness for a public-private partnership (PPP) extension model for effective transfer of tea technologies to the tea smallholders.

The aforementioned empirical study clearly illustrates sufficient evidence to prove that the adoption of proven technologies strongly depend on degree of interaction between smallholders and extension agents working in partnership. Therefore, I strongly recommend that all extension agencies develop higher levels of partnership and closer interaction among themselves and smallholders.

Implications

With the realization that top-down models of extension were failing to meet the needs of farmers, bottom-up models of extension emerged from the view that farmers wanted to be involved in research, development and the extension process. New models of extension are characterized by participatory involvement of many stakeholders in program planning, development and implementation. The partnership concept arose from the recognition that relationships between researchers, extension, farmers and industry, should be more actively integrated to develop effective extension programs. The Public Private Partnership model is now emerging as a possible solution to the problems pertaining to effective technology transfer, and is increasingly being emphasized as a mechanism for improving public service provision and for implementing development programs (Amarathunga and Wanigasundera 2018). With the proven research findings derived from implementing the Public

Private Partnership Extension Model for effective dissemination of tea technologies to the tea smallholding sector, the author proposes to apply the PPP concept in the following areas to fulfill the targeted goals.

Productivity improvement of tea smallholder land by enhanced replanting programs through the tea factory-based Private Public Partnership extension channels.

Example 1: Most of the tea factories have a field extension service to maintain the relationship between tea factory management and tea smallholders and they assist in improving productivity, and thereby the development of the tea smallholder's livelihood. Example 2: Tea smallholder – Factory based partnership extension network of Tea Smallholder Factories Plc (private organization), has conducted a replanting project for productivity improvement of tea smallholding lands attached to the green leaf supply base of their factories since 2010. This project covers over 200 acres of tea lands under replanting with new cultivars and follows the standard good agricultural practices (GAP) recommended by the Tea Research Institute, and also with the collaboration of Tea Small Holder Development Authority (TSFL Annual Report 2017).

Introduction of appropriate mechanization techniques to field practices through PPP extension channels.

The tea industry faces an acute problem of labour shortage in field operations of the cultivation process. Most of the field operations, such as land preparation, harvesting, pruning, and weeding are labour intensive and manually done using the existing labour force at a higher cost. Given this scenario, in 2013 the Ministry of Plantations of Sri Lanka launched a project to popularize machinery in tea smallholdings. The total project budget is SLR 100 million and of this SLR 67.5 million has been allocated for awareness, training and supply of machines to selected smallholder societies and factories, while the remaining 32.5 million is earmarked for research and development of harvesting machines. The government has disbursed SLR 40 million and the Tea Research Institute (TRI) has launched a program to train tea smallholders in the use of new machinery under Phase I of the program. In the initial phase, 50 tea smallholder societies and 25 private tea factories have been selected for the project covering all tea growing regions. This project is being conducted in collaboration with both public sector (TRI, Tea commissioners division, Tea Smallholder Development Authority) and private sector (bought leaf tea factories, Tea societies, etc.).

Transforming conventional technology dissemination methods into modern IT Smart methods through the PPP extension channels.

The new models of extension proposed are characterized by participatory involvement of many stakeholders in program planning, development and implementation. It is encouraging to note that some advanced research and development studies have been recently undertaken to address the needs of extension services of the tea industry. The areas of study include: development of para-extension approaches and private-public partnerships to facilitate wider dissemination of technology, setting up of IT-based information and service delivery mechanism (Sidhakaran et al. 2014; Samansiri, Wanigasundera and Wijekoon 2014; Amarathunga 2015). IT-based mechanisms operate in both public and private organizations, tele communication channels, etc. These mechanisms will surely help in delivery of updated information to all relevant stakeholders – on forecasting of seasonal climate changes in tea growing areas, mitigation measures on pest and disease outbreaks, tea market updates etc. – and to get their feedback.

Availability of effective and efficient analytical services for tea fields and on the manufacturing process through PPP approaches.

Analytical services related to tea cultivation and the manufacturing process is presently undertaken only by public institutions such as TRI and Tea Board Labs. However, the currently available mechanism is not capable of meeting tea growers' demands due to limitations, chiefly of power, limited availability of new equipment, financial shortages, lack of coordination, etc. Availability of timely access to site-specific soil testing and nutrient management, coordination of inputs supply based on test reports, bio-chemical and residual analysis of different stages in the manufacturing process to ensure purity and cleanliness of the end product and so on – are all very important in providing efficient and effective services that meet the needs of stakeholders. Suitable private sector analytical service providers should be identified only after considering quality and standard of their services, timely availability, handling and capacity for wider coverage and capacity of analytical work, as well as their implementation of effective regulatory mechanisms through the involvement of relevant public organizations.

Establishment of an effective certification process for quality assurance of "Ceylon Tea" through the PPP extension channels

"Sustainability" has now emerged, along with ecological concerns such as global warming, the greenhouse effect, carbon credits, energy efficiency, alternative and renewable energy, and environmentally friendly resources. These

issues are now engaging the attention of the industry. Sensitive to these developments, it is actively addressing these issues – ranging from Good Agricultural and Manufacturing Practices, Technological Parameters and Social Responsibility to Logistics of the Value - 8 - Chain, Strategic Planning and Innovative Marketing Initiatives. However, the experiences and examples of the past stewards of the industry must not be trivialized in a misguided perception of progress. The dynamics of the future must be tempered by the morals, values, ethics and principles of the past. These values could be marketed in international business forums by the relevant public-private organizations through the establishment of effective certification processes (ISO 22000, Ethical partnership, Rainforest, GAPs and GMPs) that ensure the quality of “Ceylon Tea”.

Opening up new avenues for value addition and product development through the PPP tea-related market-oriented channels. Tea exporters have now realized the difference between trading a commodity (black tea in bulk) and marketing a consumer product (value added tea in branded packs). Commodities are products that consumers cannot differentiate, one from another, as they all seem to serve the same need and deliver the same value. Consumer brands, in contrast, are distinguished through their compelling features that make one better than another in the product category. Ceylon tea will remain vulnerable to downward demand-led price pressure as long as it is treated as just a commodity. Sri Lanka is conscious of the need to bring about vertical integration in its traditional tea exports and is now converting a major portion of tea exports into consumer packs and other forms of value added exports, thus meeting the requirements of more sophisticated markets. Considering the need for long term sustainability in the tea sector, the National Plantation Industry Policy Framework (NPIP Framework-2006) means to focus on implementation of value addition and product development through building public-private and private-private partnership (PPP) approaches. The Tea Research Institute of Sri Lanka has already identified new research areas and included these into their corporate research plan for the next five years. The focus is on development of value added tea products, such as improving the process for instant black tea production, optimizing the liquid tea-concentrate production process for commercialization, optimizing the alcoholic tea beverage production process for commercialization, optimizing polyphenol extraction from tea for commercialization, and extraction of protein from spent tea leaves.

Opening up new lobbies for promotion of brand name – “Pure Ceylon Tea” – by

marketing of health aspects via PPP tea-related market-oriented channels. Product differentiation, cost leadership, niche marketing, branding and customer focus were accepted as the strategies that need to be adopted by most of the firms. In addition, each firm had its own set of strategies, which differentiate it from others and offer competitive advantage over its competitors. Some of these specific strategies include fair trade, environment sustainability, strategic partnerships, outreach, market diversification and quick delivery. The firms have introduced new products into the market as well as extended the existing product range according to growing market demands. Opening up new markets abroad has been an important strategy that placed these firms among the market leaders. When the tea’s sales values are considered, it is apparent that the firms that have outperformed their competitors in sales have adopted customer focus as a common strategy.

For instance, the health tea segment was selected due to the strong demand predicted and triggered by a health trend that is an ongoing craze in Scandinavia. The product planned is a green tea containing Scandinavian herbs, as Danish people tend to prefer local products. The brand name is Healthé, the packaging shows a cartoon, and the tea is packaged as tea bags. Healthé is positioned within the lifestyle segment with ‘healthy lifestyle’ seen as its main driver. The key attributes of the product will embody the Scandinavian traits of being energetic, healthy and happy. To promote the product an integrated marketing communication plan will be implemented. The promotion of the product will be with Global warming potentials (GWP’s) and not discounts, as Healthé is a premium product. Health and wellness trends boost the total volume sales of green tea and other fruit/herbal teas in Denmark. Green tea is the best performing major category in tea in terms of retail volume and retail value growth – with growth of 3% and of 7%, respectively, for 2010 and 2011 (Euromonitor International 2013). Black tea suffered a decline due to the good performance of green tea and fruit/herbal tea (Euromonitor International 2012).

Opening up new avenues for development of tea culture and promotion of “Tea eco-tourism” locally and internationally through PPP tea-related market-oriented channels. Most tea plantations are located in the central mountains of the country. These areas are rich in biodiversity, and attracts tourists with its natural beauty, waterfalls, rivers, and architecture, etc. These locations have more potential to improve eco-tourism. Furthermore, there is great potential to promote Sri Lanka’s tea culture by highlighting historic events, tradition, cultural values, along with a tea story that follows each step in the cultivation

and manufacturing process, value addition, and product development and diversification, etc. Therefore, effective mechanisms must be established by linking relevant public–private organizations to explore all potential avenues for improving tea-related eco-tourism. These must transcend politics and personalities and be formalized as much as possible by using proven mechanisms within, and between, each level of government and between the public and private sectors.

Way Forward

The Public-Private Partnership model in tea has significantly improved the adoption of important field practices in tea production, which is

directly leading to enhanced productivity of tea smallholding land and its long-term sustainability. In order to achieve greater interaction among key stakeholders it is necessary to engage their proactive participation in planning, implementation and monitoring of the partnership programs. Cooperation between the staff of partners, support from community leadership, mutual respect, appreciation of the contribution of all partners, and effective communication are of paramount importance in maintaining an effective partnership extension system. Organizations involved in the tea sector should now develop appropriate mechanisms and fiscal procedures to adopt this model and thus make sure that all smallholders are served effectively.

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**PROMOTING
AGRIPRENEURSHIP
AND TECHNOLOGY
COMMERCIALISATION**

05

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INSTITUTIONAL SHIFT: FROM EXTENSION TO ENTREPRENEURSHIP

Unless the entrepreneurship competencies are added to the extension capabilities, the application of extension may not bear expected results, argues
S Ramkumar

Agri-“culture” is increasingly changing to Agri-“business” in rural India. Though youth are generally apathetic to get themselves involved in agriculture, many are keen to pursue agribusiness as an enterprise. They consider agribusiness as a profession which bestows reputation in the society (amidst the competing IT and related sectors). It also offers better income. Such a change calls for an extension approach beyond the conventional thinking on “crop and livestock production” or “technology”. Entrepreneurship development gains momentum in this emerging context. Hence approaches on developing entrepreneurship needs to be discovered and appropriately synthesized with extension so as to have a meaningful and relevant extension system that suits to the entrepreneurs who are engaged in agriculture, livestock and related activities. It is this realization that led the Kerala Veterinary and Animal Science University (www.kvasu.ac.in) to establish a Directorate of Entrepreneurship under it.

Box 1: Time, Technology and Territory

Extension is a product of time, technology and territory. The concepts and practice of extension has evolved through different contexts overtime. Approaches such as Transfer of Technology, Lab to Land, Land to Lab, Agricultural Knowledge and Information Systems etc have evolved to improve the contribution of extension at different points in time. We are currently in a period of time which is characterized by accelerated knowledge generation and dissemination aided by advances in information and communication technologies. Better technology design & delivery systems have opened up new possibilities to improve technical efficiencies and new territories to market farm produce. It is time now for extension to find new approaches that are relevant to these three “T”s. This calls for a paradigm shift in thinking and practice of extension.

Probably KVASU is the first university within the agricultural university system of India, which has an exclusive Directorate of Entrepreneurship, without a Directorate of Extension. All the activities associated to extension like farmer/stakeholder outreach programmes, capacity building, publications, e-learning are all implemented under the Directorate of Entrepreneurship. But there is a special focus on institutional innovations aimed at promoting entrepreneurship within all these activities. For instance, in Wayanad district, KVASU developed partnerships with Panchayat administration; initiated technology enabled learning courses; and enhanced capacity of resource persons on commercial dairy farming.

To improve milk production from crossbreed dairy cows (which are predominant in cattle population of Kerala), the conventional extension systems (through grass root level extension workers of animal husbandry department, Dairy development department, milk cooperative society etc) focus on improving production in terms of unit cost involved in feeding, breeding and management. But in the changing situation, the commercial dairy farmers (whose numbers are increasing) are more keen to know about project formulation, licensing, climate change, pollution control, budgeting, sources of funds, market rates, dairy machineries, value addition etc which are beyond the conventional thoughts of extension like increased milk production through feeding, breeding & management.

Essentially this means that the information, advice, technologies, ideas, practices being promoted by extension have to consider the market. Extension agents should also have a clear understanding of the risks and opportunities (including value addition and marketing) while promoting or advising an enterprise. Unless the entrepreneurship competencies are added to the extension capabilities, application of extension in such situations may not bear expected results.

One way of improving this capability would be through identifying topics of commercial agriculture and developing Industry-University partnerships. This will help in identifying areas of relevance, on which the knowledge and skills could be developed. Another approach is to develop a resource pool of veterinary professionals who are competent to advise on commercial dairy enterprises. KVASU is currently engaged in this activity. Initiating a Community of Practice (CoP) in Entrepreneurial Extension concepts is yet another approach worth considering.

Way Forward

- It is not the technologies per se that are going to make changes, but the innovativeness in applying these technologies among farmers with participation and support from different stakeholders. Extension workers have to build this capacity, rather than evading such a challenge.
- Extension has a large role to understand markets and analyse market trends as the present day agriculture is increasingly turning out to be a business proposition.
- Entrepreneurial extension is an essential area for capacity development among extension staff.



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TRANSFORMING AGRICULTURE INTO AN ENTERPRISE: LEARNING FROM ENTREPRENEURSHIP AND INCUBATING AGRI-ENTERPRISES

The proposed transformation of agriculture into an enterprise needs two significant shifts. Firstly, a conceptual shift in thinking on the role of the state and the market in agricultural transformation; and secondly, a critical rethink by the agricultural research and education systems towards learning, facilitation, and as co-creators of change, argues C Shambu Prasad.

The recent bold pronouncement by the Government of India in its Doubling Farm Income Report (GoI 2018) suggests a paradigm shift in the way we look at agriculture. Agriculture, the report suggests, needs to be seen as an enterprise and the farmer as an entrepreneur – necessitating adoption of business principles for positive net returns. The National Agricultural Research System (NARS), the report suggests, should take urgent steps to reorient and adopt a systems approach so as to include post-harvest management and monetisation, and furthermore, support farming as an enterprise and farmers as entrepreneurs. How prepared are our agricultural education systems for such a transformation and what would this mean for agricultural extension in India today? Are existing institutional arrangements in agriculture designed for productivity enhancement in any position? And, who could lead this change, given that their own experience in promoting entrepreneurship has been negligible? What should agricultural universities learn from ongoing experiments in entrepreneurial incubation and education? How should they customize this learning for the very unique contexts in agriculture today?

Just by sheer number, Indian farmers would constitute the largest community of private entrepreneurs in the world. They cope with vulnerabilities and practice their occupation with significant risks. These risks have multiplied with a drop in global commodity prices in recent years. It is not helpful that conventional agricultural economics treats farmers as risk-averse and facile policy recommendations that simple aggregation into a global value chain of agricultural commodity trade can enhance farm incomes and make farmers more entrepreneurial will not bring about the necessary change.

In this blog, I suggest that the proposed transformation of agriculture as an enterprise needs two significant shifts. First, a conceptual shift in thinking that goes beyond suggesting the state as the benevolent provider of sops and subsidies that can improve farm incomes, or the belief that the ubiquitous market can solve state failure. On the contrary, there is a need to reinstate the agency of the farmer and ensure that the farmer's ability to experiment, not just technically but institutionally, is valued and forms the basis of any structural transformation. Second, there is need for a critical rethink by the agricultural research and education systems to transform themselves into learning organisations so as to rework themselves as facilitators and co-creators of change, rather than just continuing with their erstwhile role as the sole source of agricultural innovation.

Entrepreneurship is closely linked to innovation, and while it is heartening to note that many agricultural universities today are setting up incubation centres and the curriculum in agricultural education is veering towards entrepreneurship, we need to also remind ourselves that most Indian agricultural universities have not been at the forefront of entrepreneurship in the past.

A change in the name of a scheme, a new Agriculture Grand Challenge alone without a change of institutions and mindsets is unlikely to lead to the desired transformation. It is here that agricultural extension can play an important role. This article argues that the NARS needs to do three things:

1. Map and understand the evolving entrepreneurial ecosystem and learn to avoid some of the common misconceptions about entrepreneurship;
2. Learn from some of the dynamic, but rich, insights on entrepreneurship from contemporary entrepreneurship education;
3. Create an ecosystem of learning, experimentation, and innovation – from

what not to learn and what to learn – by working with farmers and other intermediate organisations to build innovative business models. In short, co-create a future where they are equal partners with farmers and other actors in the ecosystem.

These ideas have been elaborated upon below.

Entrepreneurship is Beyond Start-Ups and Technology

There is indeed a lot to learn from the dynamic changes in India's entrepreneurial ecosystem. The Flipkart-Walmart deal has been seen as a validation of India's start-up ecosystem and a recent report (over!) estimates the number of start-ups as 40,000 (Yourstory, 2018). The recent thrust by the Government of India has seen India shoot up in the Ease of Doing Business, and India prides itself as having one of the largest numbers of incubators in the world. The regular updates on the Startup India website indicate progress on diverse fronts, such as establishing tinkering labs, registering start-ups, Atal Incubation Centres, etc. Details of state-wise incubators in India is given below in Fig. 1.

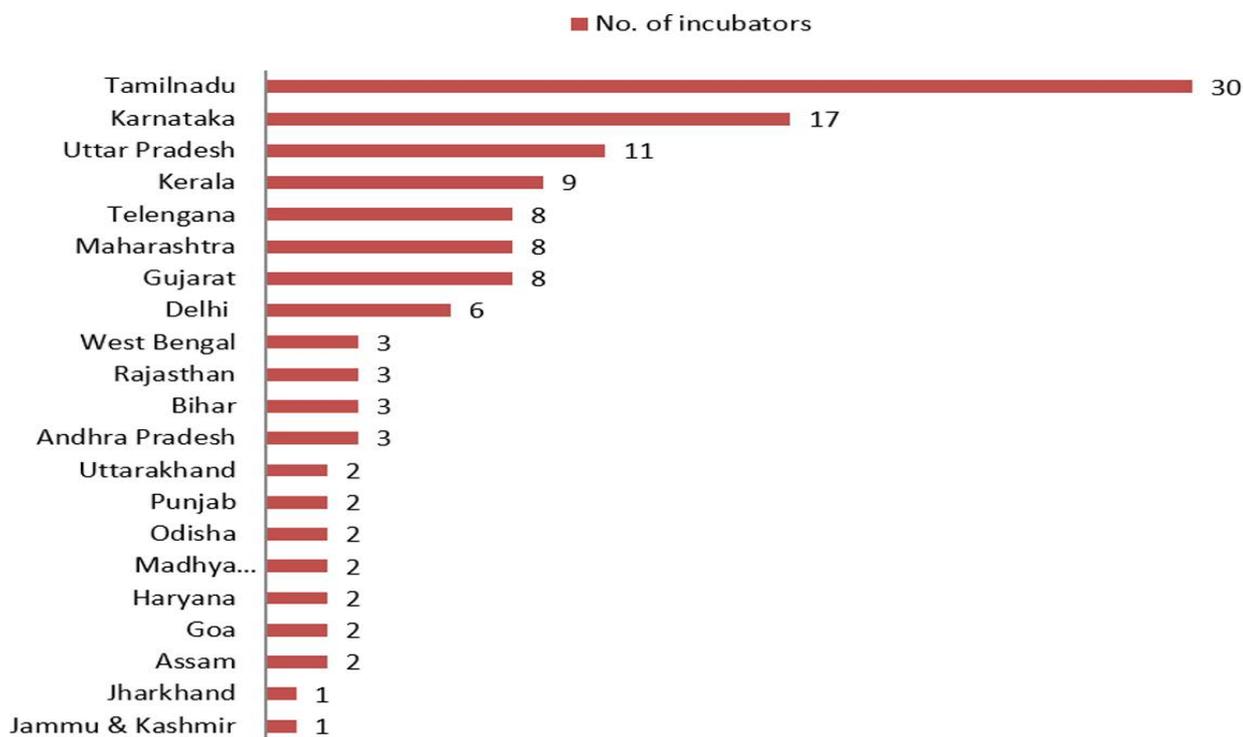


Fig. 1: State-wise incubators in India

Source: Collated from Startup India website, October 2018 (<https://www.startupindia.gov.in/>)

However, a closer look at these numbers reveals significant biases too. Rural, social and collective enterprises are rarely mentioned in these reports and much of the entrepreneurial buzz reveals a significant spatial bias that favours both capital cities and a disciplinary bias towards engineering

colleges. The need for significant built-up space to house start-ups in incubation support schemes favours engineering and technical institutes with large laboratory facilities. This fails to recognise that incubation is more about intangible services, such as networking and mentoring, than tangible

support such as space or funds. Further, it is important to realise that the need for incubation and entrepreneurship requires to be more inclusive in order to tap into the entrepreneurial spirit in rural and tribal India, as well as a recognition that not all entrepreneurship is about technology. While technology plays an important role in e-commerce or in those start-ups that have been invested in based on technological innovation, we do need to recognise that many innovations may not require significant technological change and investments. In fact, even in well-established set-ups in the US most investments by entrepreneurs are less than 50,000 US dollars and not many entrepreneurs prefer the venture capital route.

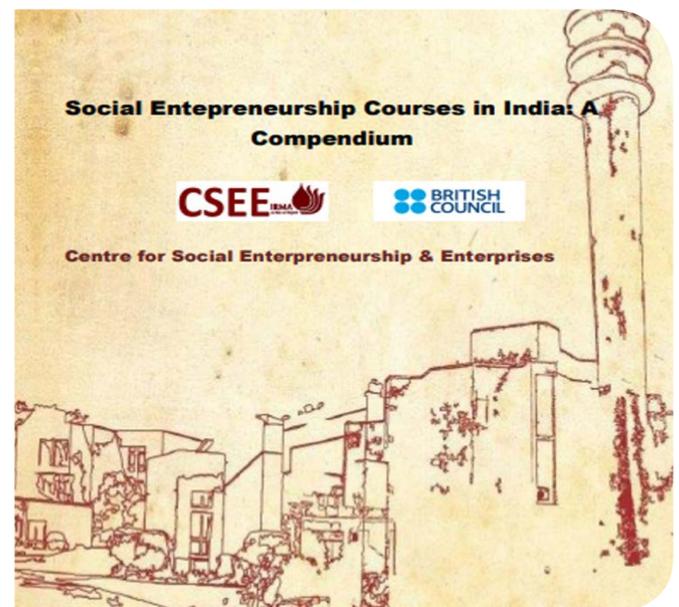
This is particularly important as we discuss entrepreneurship in agriculture. An ongoing study of sixteen social enterprises by the Vikas Anvesh Foundation (VAF) and the Institute of Rural Management Anand (IRMA) indicates that not all entrepreneurs in the agriculture space choose venture capital funding as the main source. Incubators need to promote entrepreneurship more broadly rather than favour and mentor only those that are scalable and venture-funded. In fact, a significant drawback in the Indian entrepreneurship space is the mistaken notion that the time from an idea to a scalable enterprise is small (3-5 years) and can be predicted. A bigger role for incubators (we are now realising at our own incubator), is in helping and supporting enterprises experiment so as to discover their business models. This alone can take a minimum of three years and involves significant experimentation and failure. How then should academic institutions look and learn in terms of teaching entrepreneurship? What useful lessons are to be had from existing entrepreneurship education?

On being Entrepreneurial about Teaching Entrepreneurship

There has been increased interest in entrepreneurship teaching and research in the last decade. It is important for agricultural extension professionals to keep abreast with these developments that have happened largely within management institutes. The change in the concept of entrepreneurship and strategy – from motivational training of potential entrepreneurs to providing a more systemic understanding and application of the entrepreneurial spirit to larger social change – lies at the heart of the emerging field of social entrepreneurship and entrepreneurship on the whole.

As traditional lines blur between non-profit enterprises, government, and business, it is critical that students and researchers of agricultural

extension see and equip themselves to contribute to the fast-emerging social entrepreneurial ecosystem. My own experiences of teaching and innovating on pedagogy in social entrepreneurship for over a decade has pointed to the need for constant innovation in pedagogy and engagement with the external world and ecosystem. In short, academics need to be entrepreneurial as well. A big challenge often lies in trying to bring the exciting entrepreneurial world to the classroom and getting students to meet and engage with entrepreneurs through long conversations and learn first-hand from their experiments and failures. Significant learning consists in trying to link entrepreneurship with other fields of design, sociology, development, etc. For instance, the idea that start-ups are not smaller versions of larger companies and that they are often involved in the process of search and not execution. These insights have emerged in recent thinking by Steve Blank on what has been known as the 'lean start-up'.



Incorporating these insights and moving away from the conventional focus on the Business Plan to experimenting and reiterating with Business Model Canvases can open up greater possibilities for entrepreneurs who otherwise get put off by too many financial planning exercises. Our learning through four rounds of a customized Entrepreneurship Development Programme (EDP) on Building and Managing Social Enterprises (BMSE) in the last two years has been more important than entrepreneurial hard skills. It is creating a nurturing and empathetic environment for individuals to tap into and explore their entrepreneurial selves. A better focus on attitude can be acquired through peer learning and support and need not be competitive alone. Establishing this collaborative environment is often the key to entrepreneurial strategy and more effort needs to be put in that direction.

Co-Creating an Entrepreneurial Ecosystem

Entrepreneurship is new to most actors. It can be learnt and is better learnt together. It involves failures and hence one needs to have the attitude of an experimenter, having the ability to learn rapidly from failures and mistakes. Design thinking is an emerging discipline that is often an important first step for entrepreneurship. It is important that entrepreneur educators learn to root empathy for the customer, farmer, and other actors in the system. Design thinking helps reorient ourselves towards this key behavioural change.

Further, it is also important to recognise that while some broad ideas on design thinking, lean start-ups, etc., can help start our journey in entrepreneurship it is important that educators and extensionists create spaces for sharing and collaborative learning.

One of the important elements of IRMA's foray into entrepreneurship is in creating an ecosystem for social enterprises and entrepreneurship. Learning from other experiments in India, we have found that it is important to have spaces where academicians and practitioners think and brainstorm together, where we break the walls and boundaries of learning, and accept that we need to learn from each other. A significant design element of XLRI's National Conference on Social Entrepreneurship (NCSE) is a deliberate attempt to exclude academia from the platform. This strategic pause before action emphasises the need for educators to listen, unlearn, and reflect. Learning is critical to creating a different ecosystem. During the launch of IRMA's

incubator, we brought out a compendium of course offerings on social entrepreneurship that put together how the subject is taught across Indian higher education institutions. The idea was not to standardise offerings but to initiate a dialogue on what we could learn from each other, even as we retain our own individual academic orientations and recognise institutional constraints. Agricultural universities need to have more dialogues with management and other institutions and create networks for learning. The National Entrepreneurship Network (NEN) has by-passed most of the agricultural universities, and it might be useful to rework these conversations.

An incubator at an academic institution becomes a laboratory of ideas. This does not call for a large infrastructure, but ideas for change are imperative. In fact, the incubator can be an expression of newer thinking in entrepreneurial education and practice. An incubator needs to be seen as an innovation platform that combines education, training, research, and action on innovation. The first year or two of an incubator should be focused on active experimentation – especially to figure out one's own unique strengths and weaknesses. We at ISEED, (Incubator for Social Enterprises and Entrepreneurs for Development) and IRMA we, have found that we need to stick to what is unique, namely our focus on rural, social and collective enterprises rather than on following a 'metoo' process. With this conviction in place we know we have more value to add to this ecosystem than by just becoming another technology business incubator or TBI. We have found, through experimentation and trial and error, that not being able to invest in enterprises or claim as take enables us to have a different conversation with



our incubatees, or as we now call them 'social enterprise partners'. We have documented some of the learning of our ISEED journey. We have also found and reiterate our learning, saying that we should not own our incubatees, but actively work towards co-incubation. We are, in fact, glad to see them work with other incubators, for we do realise that entrepreneurs need several support structures and no single incubator can provide all of these. Some are good at funding; some are better in some domains and have a sectoral focus. Together, these incubators can help build an ecosystem but it is important to value the agency of the enterprise.

We have not shied away from technology but believe that this needs to be embedded suitably. One of the innovations we are proud of is a recent development, a multi-purpose grader with our partner Earth 360, an enterprise that works across the millet value chain. They had done most of the groundwork in identifying a problem from the field– the need for a grader that can enable community-level processing. This could lead to enhanced farm income. We supported the development of the grader through the incubator, and importantly, did this with other actors that included an engineering simulation partner, Altair, and a design partner, Big Stamp. We enabled the enterprise to work on their idea and helped them network with other opportunities. The innovation was a finalist at Startup India's agriculture Grand Challenge and won special recognition at the

Vibrant Gujarat Summit 201. While we did not create the innovation, we added value through other ways and continue to support their new start-up, Millet Machine Tools, as they seek to transform the millet value chain through a bouquet of machines.

Finally, an entrepreneurial mindset is one that is also one that raises uncomfortable questions. We have been doing this in the Farmer Producer Organisations (FPO) space. For instance, we believe that an FPO needs the same, if not more, of a supportive environment as a start-up. They too could fail and they too need investments, mentoring, and support even if their institutional design does not allow for venture capital and other support. We thus would like to work with FPOs too and see how they could be incubated, or how resource institutions working with a few FPOs could benefit from these entrepreneurial insights.



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AGRIPRENEURS: WHO THEY ARE AND WHY THEY ARE IMPORTANT?

While entrepreneurship has been talked about since many years, agriprenurship is something which we started discussing only recently. Mahesh Chander explores the characteristics of Agripreneurs in this blog and he argues the need to encourage, support and promote agriprenurship by extension and advisory service providers.

Traditionally, agriculture is seen as a way of life especially in non-industrialized countries of Asia and Africa, where farmers are mostly focused on doing things better rather than doing new things. However, the situation is changing rapidly mainly because of the following reasons:

- Rising levels of literacy and education
- Economic liberalization and commercialization
- Deregulating or opening of agricultural markets
- Better means of communication and transportation.

With the changing market dynamics, many choices are available to the consumers. The agricultural producers and especially the Agricultural companies have to adapt increasingly to the market demand, changing consumer habits, enhanced environmental regulations, new requirements for product quality, chain management, food safety, sustainability, and so on (Lans et al 2011).

These changes have cleared the way for new entrants, innovation, and portfolio entrepreneurship (<http://ir.canterbury.ac.nz/handle/10092/878>). Politicians, practitioners as well as scientists have recognised that farmers and growers increasingly require entrepreneurship, besides sound management and craftsmanship, to be sustainable in the future (McElwee 2008; Pyysiäinen et al. 2005). Recent studies show that agricultural entrepreneurship is not only wishful thinking or a new hype: it has a profound impact on business growth and survival (Lans et al. 2011; Verhees et al. 2011).

Box 1: Entrepreneur

Entrepreneur is a French word, first used in 1723, to describe a person who organizes and operates a business by taking a financial risk. Entrepreneurship has traditionally been defined as the process of designing, launching and running a new business, which typically begins as a small business, such as a start-up company, offering a product, process or service for sale (Yetisen et al. 2015). It has also been defined as the "...capacity and willingness to develop, organize, and manage a business venture along with any of its risks in order to make a profit.

Entrepreneurship is a concept that encompasses transforming an idea or vision into a new business or new venture creation, or the expansion of an existing business, by an individual, a team of individuals, or an established business (Reynolds et al. 1999, cited by Global Entrepreneurship Monitor). By and large, today it implies qualities of leadership, initiative, and innovation in new venture design. But entrepreneurship, as opposed to self-employment, is also defined by the spirit of the entrepreneurs.

The entrepreneur either creates new combinations of production factors such as new methods of production, new products, new markets, finds new sources of supply and new organizational forms; or as a person who is willing to take risks; or a person who, by exploiting market opportunities, eliminates disequilibrium between aggregate

supply and aggregate demand, or as one who owns and operates a business (Tyson et al, 1994). There is not one but in several ways entrepreneurship has been defined by many different professionals, yet all these definitions have some common elements (Box 2).

Box 2: Characteristics of entrepreneurs

The literature on entrepreneurship has described entrepreneurs having a number of characteristics viz Initiative, risk taking, leadership, business and profit orientation, unconventional or out of the box thinking, never say die attitude, willingness and ability to follow the new technology. The entrepreneurs have capability to turn their ideas into business. Many of them are daring enough to take a break from traditional jobs and venture into wholly new fields and make a success of it through their own ingenuity or with some institutional or state help. Entrepreneurs tend to be good at perceiving new business opportunities and they often exhibit positive biases in their perception (i.e., a bias towards finding new possibilities and seeing unmet market needs) and a pro-risk-taking attitude that makes them more likely to exploit the opportunity (Zhang and Cueto, 2015).

The entrepreneur is commonly seen as an innovator — a designer of new ideas and business processes. Entrepreneurs are usually creative, take opportunities and accept risks, and can quickly change business strategies to adapt to changing environments. They are often innovators (Kahan, 2012). As per Butler (2006), an entrepreneur is a complex combination of some interacting factors. For instance,

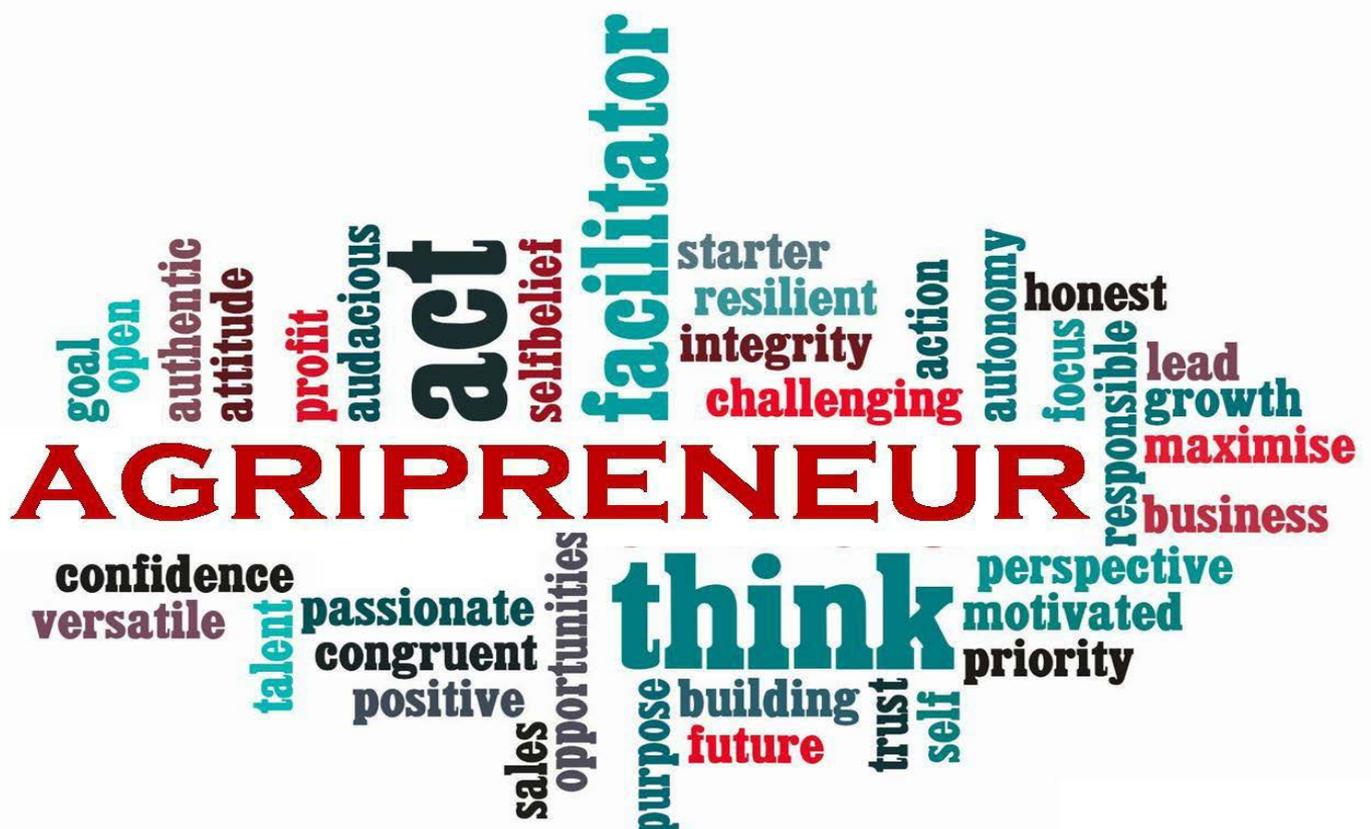
Personality: In terms of possessing resilience, tenacity, opportunity spotting, and risk taking;

Attitude: Having awareness of the importance of customer focus, the application of creativity and imagination, defined personal standards and values, the perception of enterprise as a positive activity;

Skills: such as the ability to network, to think strategically, to gain access to resources, business knowledge and acumen, interpersonal skills and people management capabilities;

Motivation: personal drive and ambition, the desire to make an impact, the need for achievement or self-satisfaction, a desire for status, to create and accumulate wealth, and social responsibility.

The presence, combination and interaction of these factors determine both the way in which an entrepreneur engages in enterprising activities, and ultimately the degree of success that is achieved, concluded Butler (2006).



Agripreneurship

When talking about entrepreneurship in agriculture, it is termed as Agriculture Entrepreneurship or Agripreneurship. Agripreneurs, thus, do not differ from entrepreneurs in their basic traits. While profiling some of the agripreneurs (Chander, 2016, 2016a, b and c), I found them very articulate in personal, interpersonal and process skills. It is their pro-risk-taking attitude that makes them more likely to cash upon the opportunity available in new agricultural ventures compared to conventional farmers. They not only believe in new venture new gains, but also work consistently to prove themselves true. They are the trend setting farmers.

Recently I interacted with five such agripreneurs in India to understand what they do and why they are different.

1. Traditionally many farmers are growing cereal crops since generations in Upper Gangetic Plain Zone, often with declining profit margins. But breaking away from this trend, a farmer switched to vegetable cultivation and marketing and since then has been earning huge profits. He could not only recognize the business opportunity in vegetable growing, but also turned his idea into action by dint of his hard work and disregarding possible risk in new venture.
2. Raising pigs is considered dirty vocation and taboo, not considered good by many castes and communities in India. A young man in family dares to establish pig farm against this taboo and paves the way for improved earning to family enabling them to better standard of living from the extra income generated from this new enterprise in the locality. Looking at good profit prospects due to least competition, he got motivated and dared to defy and challenge the conventional thinking.
3. Instead of growing food crops with little earning, a farmer opts for growing fodder crops and selling it to peri-urban dairies for better profit margins.
4. A farmer chooses to diversify in farm-based tourism by making certain changes in his house to accommodate tourists and create some infrastructure for their relaxed stay and living at the farm. This change brings in better net returns compared to any other farming activity.
5. One retired Air Force officer set up an Organic

Dairying Unit of indigenous cows, highlighting A2 milk properties (A2 type of beta-casein protein rather than the more common A1 protein commonly found in regular milk) and free from antibiotics, selling it as labelled and branded milk, at market premium. He is ahead of his counterparts in the region who continue with conventional milk production.

In all of the cases mentioned above, they were not at ease with their existing situation, so wanted to pursue the dream of making a difference in their life through change in their existing practice with chances of risk or failures. Since every case is unique in itself with the individual circumstances, there is no common formula for entrepreneurship for everyone. Each entrepreneur has to follow his own dream in his own unique way making it a unique case in a class of its own to be seen as a distinct story-mostly successful one!

Why Agripreneurship needs to be Promoted?

The need for an entrepreneurial culture in the agricultural sector has been recognized in recent decades (Bergevoet *et al.*, 2004; McElwee & Bosworth, 2010). By developing entrepreneurial and organizational competency, farmers are expected to be able to work in an organized manner and develop sustainable competitive advantages in order to compete successfully in regional, national and international markets. Sustainable development of the agricultural land requires the development of entrepreneurial and organizational competency in farmers.

However, the educational processes involved in such development have been insufficiently studied, especially in emerging economies (Díaz-Pichardo, 2011).

Even when farmers are innovative and creative, they often lack experiences, access to services, people, or markets, and skills to have realistic chances to succeed as entrepreneurs (Wongtschowski *et al.* 2013). In addition, agripreneurs are influenced by external, systemic factors, such as economic and social barriers, policies, and regulations (Kahan 2012). While these constraints affect all farmers and especially smallholders, women and youth are affected more. Farmers, thus, need support to

- Face multiple existing and emerging challenges in their farming activities
- Improve their livelihoods including turning themselves possibly into successful agripreneurs.

Promoting Agripreneurship: Current Initiatives in India

On February 26, 2010, Shri Sharad Pawar, the then Union Agriculture Minister honoured 101 enterprising men and women farmers from remote parts of the country, who by sheer dint of their innovation and hard work were more than inspirational for others. The Department of Agriculture and Cooperation, GOI has documented their success stories in shape of a Coffee Table Book titled "Harvest of Hope", with the sponsorship of NABARD (MoA, 2010). Referring to the success stories included in the book, Shri Pawar said that the basic thread underlying all the stories is the dedication, the zeal and the hope to harness resources, skills and enterprises. The path-breaking interventions covered by the true life stories in this book are not limited merely to crops, but cover the entire gamut of rural vocations as diverse as poultry, sheep and fish farming, floriculture and fruit orchards, oilseeds and pulses, and cotton and ayurvedic herb cultivation etc.

The entrepreneurial farmers are being felicitated and honoured by agricultural universities and research institutions and agricultural development agencies on different occasions like farmers' fairs (<http://www.icar.org.in/en/node/10275>). Almost all the SAUs, ICAR institutes and KVKs in India have list of enterprising farmers whom these institutions not only have awarded but a few of them utilize their services as resources persons too. The ICAR honours innovative farmers including agripreneurs under different categories every year on its Foundation Day on July 16. The farm magazines, radio, TV and YouTube videos profiling enterprising farmers have become very common in recent times (<https://www.youtube.com/watch?v=7MmdNNfON0Y&spfreload=5>).

The Director General, ICAR recently emphasized that the experience of successful entrepreneurs should be documented and disseminated in the form of success stories so that other budding entrepreneurs could be benefitted (<http://www.icar.org.in/en/node/10875>). An important challenge, however, is facilitating farmers' development of entrepreneurial and organizational capacities and attitudes. This requires economic support, beyond awarding and recognizing the successful farmers including a greater emphasis on their education, training and using their services proactively in RAS possibly with suitable remuneration. Research on the development of entrepreneurial and organizational competency in farmers is scarce, especially in context of the developing countries.

The government schemes must focus on attracting youth to the agriculture sector by transforming it into a business and offering them new avenues and opportunities to engage along the agriculture value chain. The Govt. of India has a large number of entrepreneurship development schemes for development in agricultural sector of which one is the Agri-clinics and Agribusiness Centres Scheme (AC&ABC). This is implemented by MANAGE in association of NABARD and it is an appreciable effort to take better methods of farming to farmer across the country (<http://www.agriclinics.net/scheme-home.htm>). Likewise, ICAR- National Academy of Agricultural Research Management (NAARM) has established a Centre for Agri-innovation a-IDEA to give incubation support services to the agri-entrepreneurs. This helps in developing their businesses and to provide access to knowledge and networking support services in innovation and entrepreneurship in agriculture towards fostering innovation and entrepreneurship in agriculture (http://www.naarm.ernet.in/index.php?option=com_content&view=article&id=117:a-idea&catid=2&Itemid=435&lang=en).

Attracting and Retaining Youth in Agriculture (ARYA) Scheme of ICAR aims to empower youth in rural areas to take up agriculture, allied and service sector enterprises for sustainable income and gainful employment. It enables youth to establish network groups to take up resource and capital intensive activities like processing, value addition and marketing. Rural and Entrepreneurship Awareness Development Yojana (STUDENT READY) is yet another scheme of ICAR. This is a skill development initiative to strengthen students with skills to take up global challenges and also to improve both their employability as well as ability to set up a venture. (http://www.gktoday.in/blog/2016-agriculture-schemes-terms-and-updates/#Attracting_and_Retaining_Youth_in_Agriculture_ARYA_Scheme)

Many similar schemes are under implementation by various Ministries including a range of schemes being implemented by Ministry of Agriculture and Farmers' Welfare (GoI, 2015).

Agripreneurs and Rural Advisory Services

Agripreneurs often look towards Extension and Advisory Services/Rural Advisory Services (RAS) for support as they can provide useful information and training to the farmers on the required skills. RAS generally link farmers to technical knowledge. Increasingly they are also linking farmers to market information. But generally their ability to link potential agripreneurs to other

agripreneurs, financial services and value chain actors is limited. Rural Advisory Services need to considerably enhance their capacities to support agripreneurs. The RAS should also attain capacities to influence policies and regulations to create an agriprenship friendly environment, reduce barriers, or change prevailing values in societies. Thankfully, in response to the multiple changes that are impacting on farming, extension services are recognizing the importance of business, management and marketing support to farmers. There is now a wide range of public and private organizations viz, extension services, input dealers and manufacturers, traders, financial and farmer organizations, and NGOs, which are taking interest in improving the efficiency of the farm business.

Considering the growing role and importance of agriprenship in changing agricultural scenario, the Global Forum for Rural Advisory services (GFRAS) has chosen the topic, "The Role of Rural Advisory Services for Inclusive Agriprenship" for its 7th Annual Meeting, Cameroon during 3-6 October 2016. This meeting will be an opportunity to discuss, learn, exchange, and formulate recommendations on the roles and required capacities of RAS for supporting inclusive agriprenship as important element of sustainable rural development (<http://www.g-fras.org/en/annual-meeting-2016.html>).

The progressive farmers, innovative farmers, lead farmers and agripreneurs though differ fundamentally but all of them could be potential resource to motivate other farmers. Many extension services choose farmers to work with them in implementing their programs. For example, the Malawi Ministry of Agriculture works with more than 12,000 lead farmers (Franzel et al, 2014). In Malawi, a survey of 37 extension services found that 78 percent used some form of farmer-to-farmer extension (Masangano and Mthinda, 2012).

Entrepreneurship and links to the private sector are essential for the rejuvenation of agriculture, making it more attractive, profitable and moving away from the perception of agriculture as a low prestige career (Box 3). Educational institutions must include business skills and entrepreneurship into the agricultural curriculum and forge stronger links with the private sector. Educational institutions should stimulate potential entrepreneurs through networking opportunities, internship opportunities and business incubators (YPARD, 2012). The research institutes and agricultural universities in India are now increasingly paying attention to entrepreneurship development in rural areas. For instance, ICAR-Indian Veterinary Research Institute has been organizing entrepreneurship development meetings with prospective entrepreneurs on regular basis (<https://drive.google.com/file/d/0B0TX5SvS4IMRV0RsQmsyTzFzN28/view?usp=sharing>).

The approaches on developing entrepreneurship needs to be discovered and appropriately synthesized with extension so as to have a meaningful and relevant extension system that suits to the entrepreneurs who are engaged in agriculture, livestock and related activities. It is this realization that led the Kerala Veterinary and Animal Science University (KVASU) to establish a Directorate of Entrepreneurship under it. Unless the entrepreneurship competencies are added to the extension capabilities, the application of extension may not bear expected results. Thus, entrepreneurial extension must be an essential area for capacity development among extension staff (Ramkumar, 2013). KVASU has recently trained 100 field veterinarians to serve as a resource pool on "Entrepreneurial Advisory Resources on Livestock Farming in Kerala" (Murugan, 2016).

Box 3: Agripreneurs and private sector

Agriculture is business like any other ventures, it should be treated the same way we treat other businesses. One way to treat agriculture like a business is to get the private sector more involved in it, since government can't create agricultural transformation; it can only enable it by making more room for businesses to intervene. The government on its part can do best by putting right policies and regulations in place, by creating strong institutions, and by building sufficient infrastructure. Agricultural transformation has to be led by the private sector since farmers need access to finance, inputs, information, or markets, where government can't do much (Adesina, 2016). The private sector can do much by making available good quality seeds, agro-chemicals, processing facilities and developing markets and value chains for farm products. The Agripreneurs have been found to keep well in touch with these agencies in private sector, while having good liaison with public sector agencies too.

Way Forward

1. The extension services wings of agricultural universities, research institutions and

development departments should organize meetings/workshops regularly to listen to experiences and problems of agripreneurs. In such meetings, line department officials, banks,

agro-input companies and farm machinery manufacturers should also be invited to facilitate meaningful discussions. The scientific and agricultural development agencies must consider benefiting from their experiences.

2. The experiences of agripreneurs can be utilized by RAS in framing extension and rural development strategies. The RAS may consider hiring services of these agripreneurs as consultants so that they feel motivated to contribute in agricultural development process.
3. The Agripreneurs may be trained by the RAS on communication and training skills so that they can effectively complement the efforts of RAS.
4. The educational processes involved in entrepreneurial and organizational competency in farmers towards sustainable agricultural development may be studied including by the student researches in agricultural social science disciplines like Extension Education

and Agricultural economics.

5. Agriculture is going to be even more market oriented in future, where agripreneurship would matter more. Thus, the policies must be framed to facilitate market-oriented agricultural practices. The Rural Advisory Services should develop strategies to support farmers to become successful agripreneurs, at individual, organisational and system level.
6. The government schemes must focus on attracting youth to the agriculture sector by transforming it into a business and offering them new avenues and opportunities to engage along the agriculture value chain.
7. Agripreneurs can effectively complement the efforts of Extension and Rural Advisory Services. The EAS, thus, should identify agripreneurs, facilitate the business development processes including arranging for funding, while enhancing their capacities on communication skills and training towards enabling them to train farmers.



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FOSTERING ENTREPRENEURSHIP THROUGH AGRIBUSINESS INCUBATION: ROLE OF EXTENSION PROFESSIONALS

Development of competitive agribusiness enterprises is critical for creation of new jobs and promotion of farm livelihood diversification. Though extension professionals could play a very useful role in this endeavor, the field of agribusiness incubation hasn't yet got into the education and training curricula of extension professionals. P Sethuraman Sivakumar and I Sivaraman discuss the importance of agribusiness incubators and how extension professionals can support the incubation process in this blog.

India, being one of world's fastest growing and most populous economies of the World, is emerging as a potentially large market for global agricultural trade and investment. With the growth in Indian economy and liberalisation of investment regimes, India's Agribusiness is booming (Box 1). As "Venture Capital" and "Private Equity Funds" are the primary drivers for the growth of new Agribusiness ventures, there is an urgent need to develop start-ups i.e. early stage technology ventures to utilise the emerging opportunities.

Box 1: Indian Agribusiness

The major sectors of Indian agribusiness, namely, Biotechnology, seeds, organic fertilizers and pesticides, farm machinery and food processing are major sectors of Agribusiness witnessed significant growth in the recent years. Currently, India's Agribusiness market size is estimated Rs. 17.44 trillion and it is growing at 9% per annum driven by captive domestic demand and export opportunities. Indian Food Industry is the largest growing category in India, accounting for 31% share of the consumer wallet; approximately twice as high as any other category (Srinivas, 2011). The private equity investments in Agribusiness as a percentage of total investments have grown to 3.8 per cent in 2012 from 0.2 per cent in 2008. During the same period, venture capital investments in agribusinesses grew from 0.2 per cent to 1.6 per cent of total investments (KPMG-FICCI, 2013).

Many countries are promoting business incubators to create new technology based business start-ups. In the agricultural sector, agribusiness incubators are promoted to encourage enthusiastic entrepreneurs to initiate business start-ups. Promoting agribusiness and entrepreneurship is increasingly considered as a priority area for extension and there is a lot of interest in promoting agribusiness initiatives in developed countries. While many developed countries have rich experience of promoting agribusiness incubation, in India it is a recent phenomenon. Though ABIs are developed through National Agricultural Innovation Project of ICAR with the help of International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT), Hyderabad, there is a need to expand this network to the grass root level to maximise its benefit to farmers. Extension professionals can play a major role in bringing the benefits of ABIs to farmers.

Promoting Agri-Technology Ventures

In general, technology based ventures are considered as key growth sectors that foster economic development through income

generation and job creation. Business Incubators (Box 2) are popular ways of creating new technology ventures and commercializing R&D outputs to foster socio-economic development. In the developed countries like USA, UK and other European countries, new technology ventures

have created two-thirds of the net new jobs and 95% of the radical innovations in the last 25 years (Timmons and Spinelli, 2003). The business incubators vary in their objective and structure. Various types of business incubators are described in Annexure 1.

Box 2: Business Incubators

Business Incubators are organisations which create a supportive environment that is conducive to the "hatching" and development of new technology ventures (Chan and Lau, 2005). They eliminate the risk of business instability, especially among the start-ups by providing lab space, equipments and other business development support to budding entrepreneurs to help them to grow. Once a fledgling business is financially viable and the individual entrepreneur has developed the necessary survival skills, the technology venture is hatched into the open market, to stand on its own. Business incubators are originated in the United States of America in 1959 and proliferated rapidly during 1990s (National Business Incubator Association, 2009). Among the developing countries, China initiated the first business incubator at Wuhan in 1987 and India started its programme only during 2000s. Currently, there are over 8000 incubators in the World of which India has only 120 (Ryzonkov, 2013).

However, in India, technology based ventures are a rare phenomena. Though India has a vast pool of S&T infrastructure with over 800 technical institutions including around 200 universities, 400 national laboratories, over 1,300 in-house R&D units in the corporate and other sectors, there is a significant gap in commercialising the significant technological outputs into new technology ventures.

In the agricultural sector, the situation is still worse. Despite enormous scope for commercialising agricultural technologies, especially in the emerging areas of biotechnology and food processing, there are very few initiatives from the potential agri-preneurs. The main reason is that new technology based start-ups face greater problems at the initial stages due to technology volatility and they take longer time to commercialize as compared to other start-ups especially those focused on services. Other problems like inadequate product development experience, inability to map the markets, poor managerial skills, inadequate networking, as well as shortage of financial resources also prevent birth of new ventures.

Agribusiness Incubators

InfoDev (2013) defines agribusiness incubation as *a process which focuses on nurturing innovative start-ups that have high growth potential to become competitive agribusinesses by serving, adding value or linking to farm producers*. Agribusiness incubator is a specialised form of mixed-portfolio business incubators focusing exclusively on the agricultural sector. Like other business incubators, the agribusiness business incubators provide shared facilities and equipment, business development, market access,

and technology assessment services, financial services; as well as mentoring and networking (Box 3).

Agribusiness incubation has generally been conducted in the same way that general business incubation has, although the conditions for business success are substantially different. Agribusiness takes place in a complex environment, involving farmers, intermediaries, government policy and markets and follows a value chain approach, rather than improving individual businesses. The agribusiness incubator helps in the identification and commercialization of significant technologies and services from public and private agricultural research institutions and universities to improve productivity in farmers' fields and increase the impact of research conducted in these organisations.

ABI Programme of ICRISAT

The Agribusiness Incubation (ABI) program of ICARISAT, Hyderabad is the most successful business incubator in India. Started in 2003, the ABI has over 140 clients, commercialised 113 technologies and supported over 180 business ventures. The ABI is also working with 22 Business Process Development (BPD) – an Agribusiness incubator, units of NAIP-ICAR under Network of Indian Agribusiness Incubators (NIABI) to promote start-ups in various parts of India (Karuppanchetty, 2012). The network of ABIs promoted by ICRISAT along with NAIP is displayed in Fig. 1. Award-winning BPD units in Tamil Nadu Agricultural University (TNAU), Coimbatore and Central Institute of Fisheries Technology (CIFT), Cochin are commercialising the agri-technologies at a faster rate and creating viable agriculture-based technology ventures.

Box 3: Structure and function of Agribusiness incubators

In general, the Agribusiness incubators will host about 20 or more technology start-ups in a centrally located business complex. They are like single window service providers, which offer the techno-business services like lab space, equipment and library facilities, technical collaboration with host Institution scientists, business development services and training, professional networking etc at a cheaper rate (Ayers, 2012). Any budding entrepreneur with a sound technology/idea with a high market potential can apply for a space in a business incubator. A high profile committee comprising of scientists, administrators and business managers will screen the applications and select the ideas based on (i) their market potential, (ii) ability of the entrepreneur to develop the idea into a viable business.

After selection, the companies will be invited to occupy an allotted space in the building. The rent for the space varies with the host organisation. The companies can set-up their laboratory and office inside the allotted space and utilize the centralised lab, equipments, INTERNET and other facilities; consult scientists and business experts; attend scientific, business development and client meetings organised by the incubators etc. to develop their technology product. A technology incubator will have large area under laboratory space while the Agribusiness and other incubators utilise more space for business development, demonstration units and training.

At a minimum, staffing should include a manager with business experience who has been trained in incubator operation, possibly an administrative assistant, secretary/receptionist, and at least one business counsellor who provides technical services directly to tenants. The start-ups will graduate from the incubators once they are acquiring an assured market for their products/services; develop sound business management skills and ability to sustain in the competitive market. The graduation time varies from 4 years (in case of software companies) to 8-10 years (for biotech products). Successful completion of a business incubation program increases the likelihood that a start-up company will stay in business for the long term: older studies found 87% of incubator graduates stayed in business (Molnar *et al.*, 1997).

Table 1: Specific roles of extension professionals in Agribusiness incubators

Mission	Level	Activity	In collaboration with	Specific extension method
1. Identifying and adopting technologies appropriate for specific agribusiness enterprises	National, Regional, State level	Technology prioritization; Demand – supply gap analysis; Value chain mapping	Policy makers, business Managers, scientists and agricultural Economists	Market survey; Field survey; Brainstorming; Delphi technique; Focus groups; Ex-ante assessment; Personal interviews; focus groups
	District and village level	-do-	Scientists and agricultural economists	Market survey; PRA; Personal interviews; focus groups
2. Identifying and motivating entrepreneurs in agribusiness enterprises, frequently in rural areas	National, State, District and village levels	Creating public awareness about incubator; Mobilising farmers and youth to develop business ideas; Selecting potential incubatees	Business Managers, scientists and agricultural economists	Field level and mass media campaigns; Mobilising farmers associations and training them to develop sound business proposals; Equipping farmers with necessary entrepreneurial skills through field and residential training
3. Building commercial conduits in the form of value chains which integrate new value creating activities in rural and urban spaces	National, State, District and village levels	Developing farmers associations; value chain mapping and analysis; Developing linkages with credit, input and marketing agencies; Developing market intelligence system	Policy makers, business Managers, scientists and agricultural economists	Team building activities; PRA; Focus groups; coordinating technical, financial and managerial training of incubatees and farmers; Training field staff to collect market data, conducting field work

The agri-entrepreneurship is developed through vertical strategy (service strategy) and a horizontal strategy (an outreach strategy based on partnerships in collaborative business incubation) (Sharma *et al.*, 2012). The service strategy focuses development on strategic areas related to the mandates of host organisation and its partners. For example, the ABI at the ICRISAT promotes (i) seed ventures, (ii) bio-fuel ventures, (iii) Innovative ventures on propriety products, (iv) farm ventures, (v) Agribusiness ventures and (vi) agri-biotech ventures. The outreach strategy of ABI is to collaborate with organizations locally and globally in business incubation (co-business incubation).

Role of Extension Professionals

In general, the Agribusiness incubators focus on viable technologies to develop agribusiness enterprises at the primary (e.g. farmer), secondary (e.g. processing) or tertiary (e.g. support service) level. It provides greater opportunities for extension professionals to perform multiple roles with a variety of stakeholders. As Agribusiness incubators are multi-disciplinary entities comprising of business managers, scientists, policy makers, input and marketing agencies, farmers and general public, the extension professionals can work in a collaborative environment to create viable start-ups. The extension professionals can play a major role in performing the outreach function of the Agribusiness incubators. Specific roles of extension professionals in Agribusiness incubation are given in Table 1.

Way Forward

Business incubators are vital catalysts for developing new agricultural technology enterprises. In the developing countries, the incubators have contributed significantly in transforming potential start-ups into viable technology ventures. In India, the Agribusiness business incubators are relatively new entrants into the technology business, but their numbers are increasing at a significant rate. Few successful agribusiness incubators like Agribusiness Incubator of ICRISAT and Business Planning & Development Units of TNAU and CIFT have contributed significantly to agro-enterprise development in India. Extension professionals can play a larger role in executing the service function of the Agribusiness incubators by creating awareness, recruiting, mobilising and training potential entrepreneurs, networking with credit, input and marketing agencies and provide market intelligence services. Extension professionals can contribute to improving the efficiency of

Agribusiness incubators in the following ways:

Identifying potential entrepreneurs

In India, the agri-entrepreneurship extension programmes are traditionally focused on developing entrepreneurial abilities of the farmers, with the aim to maximise “producers’ share” in the consumers’ price of the product. As entrepreneurship requires specialised skills and attitude especially in the area of business idea development, financial management and marketing, we can’t expect the small and marginal farmers (who are already faced with several struggles to manage their farms) to be a successful agripreneur. The value chain approach has demonstrated that the producer’s share can be maximised by manipulating other processes. Agribusiness incubators provide a new platform and “state-of-art” methods to identify potential agri-preneurs, who can create new and efficient value chains to help farmers maximise their share in consumer price.

Revising extension entrepreneurship curricula

Most of the extension entrepreneurship training programs organised by premier extension Institutes provide very little or no information about Agribusiness incubation. There is also an inadequate understanding about the role of extension professionals in the Agribusiness incubation process and the skills required to maximise their role and efficiency. In this context, there is a pressing need to revise the extension & entrepreneurship training and education curricula by incorporating information and tools of Agribusiness incubation

Extension research on Agribusiness incubation

In India, Agribusiness incubation and value chains are often researched by agricultural economics and business management professionals. Extension entrepreneurship research is outdated and focused more on traditional extension topics like training need identification, assessing management/financial management skills, market skills and entrepreneurial abilities of farmers, etc. There is a need to strengthen research on value chain modelling-mapping and analysis, business opportunity identification, financial management tools and techniques, logistics and branding to maximise our role in the agri-incubation process.

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Annexure 1: Types of Business Incubators

Incubators vary in the manner they deliver their services, in their organizational structure and in the types of clients they serve. There are a variety of incubators, which are described in the following table.

Type	Aim	Objectives	Target sectors	Example
Mixed Portfolio Business Incubation	To reduce the business gap in environments where there is little entrepreneurial activity	Create start-up companies and Employment generation	Targets high-growth firms in the sectors that align with the overall regional or national competitiveness strategy	Foundation Chile and Technoserve of Mozambique
Technology Business Incubation	To reduce entrepreneurial gap in the areas where this infrastructure and human capital are weak	Create entrepreneurship, stimulate innovation, technology start-ups and graduates	Targets high-growth technology firms – IT and biotechnology	TBI, IIT-Delhi , India and Sid Martin Biotechnology Incubator, USA
Business incubation with university relationships	To bridge the gap between research and commercialization or technology transfer	Create entrepreneurship for university based technologies	Typically targets technology firm, but may work with other sectors	Rice Alliance for Technology and Entrepreneurship, Rice University, USA.
Agribusiness Incubation	To improve the livelihood of farming communities through agri-preunership	Commercialise potential agricultural technologies and create competitive Agribusiness SMEs	Targets Agribusiness SMEs that have potential to improve the value chains	Agribusiness Incubator@ ICRISAT, India and Rutgers Food Innovation Center, New Jersey, USA
Social Business Incubation	To bridge the social gap by increasing employment possibilities for people with low employment capacities	To integrate social categories; To create employment opportunities for people with low employment capacities	Creating socially valuable products and services in the non-profit sector	Social Incubator North, UK.
Basic research incubators	To reduce the discovery gap in a specialised area of study	To conduct blue sky research	High tech research sectors	DIBS Research Incubator, Durham, USA
Technology Parks	To accelerate growth of relatively mature businesses	For product advancement and innovation and to attract talent, ideas and financial resources and future clients	Focus on range of technology firms, but may target specific industries	Software Technology Parks of India

(Source: Ruby, 2004; Ayers, 2012)

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BUILDING ENTREPRENEURSHIP THROUGH AGRICULTURAL UNIVERSITIES AND RESEARCH INSTITUTES

Over the years, extension professionals have employed non-profit approaches for entrepreneurship development with non-IPR technologies for transforming farmers into agripreneurs. However, the true benefits of agricultural research will be realised only when the focus is shifted to creating technology-based start-ups with people having the essential entrepreneurial attributes. Extension professionals need to understand and master the process of technology commercialisation and entrepreneurship development in a systematic way, to support research in this endeavour, argues, P Sethuraman Sivakumar.

Since their inception in the 1960s, Agricultural Universities have developed significant technologies, which have gone on to enhance livelihood security of farmers and other stakeholders. Currently, India has 60 Agricultural Universities, four central and four deemed-to-be universities, and 98 ICAR research Institutes. The Agricultural Universities and research institutes are traditionally engaged in (i) creating competent and professionally qualified agricultural manpower; (ii) developing location-specific agricultural technologies; and (iii) applying viable agricultural technologies to promote farmers welfare. In recent years, there has been a significant structural change in agriculture, with increasing focus on enhancing the entrepreneurial advantage of this traditional profession. In line with this trend, there is growing interest among universities in pursuing commercial applications of the research products they have developed, including new venture creation.

Why Agricultural Entrepreneurship?

An Instrument of Poverty Reduction

Agricultural entrepreneurship through value addition has been promoted as an instrument for securing food security and reducing poverty. A World Bank study (Ravallion and Datt 1996) has estimated that a one per cent rise in agricultural value added per hectare results in a 0.4 per cent and 1.9 per cent reduction in poverty in the short- and long-run, respectively.

Rising Share of High Value Agriculture

High value products, such as fruits and vegetable crops, on average generate Rs. 3.30 lakh worth of output per hectare compared with Rs. 37.5 thousand in the case of cereals, and Rs. 29 thousand and Rs. 48.7 thousand in the cases of pulses and oilseeds, respectively (NITI Aayog 2015). These variations in value productivity indicate a very large scope for raising the value of agricultural output through a shift from cereals, pulses and oilseeds into commercial cultivation of fruits and vegetables.

Shift in Household Dietary Consumption Patterns

The nature of eating and composition of foods consumed has changed drastically over the years. India's gross national income (per capita), increased by about 2.3 times in the last decade (2000-10), leaving surplus money in the hands of Indian consumers. A National Sample Survey Organisation's study (NSSO 2014) indicates that cereal consumption has declined – by 16.3% in rural and 12.4% in urban areas – during the

1993-2012 periods. Pooled data indicate that per capita consumption rose by 21 per cent in the case of fruits, 14 per cent in the case of vegetables, 11

per cent in the case of milk, and 23 per cent in the case of meat, eggs and fish during the same period.

Box 1: What is Agricultural Entrepreneurship?

Entrepreneurship is the process of creating something new with value by devoting time and effort, assuming the accompanying financial, psychic and social risks and uncertainties and receiving the resulting rewards of monetary and personal satisfaction (Hisrich et al. 2005). Agricultural entrepreneurship deals with the entrepreneurial activities performed within and across agricultural value chains. The purposes of agricultural entrepreneurship are: (i) stabilising market prices of agricultural commodities; (ii) generating assured income from farm produce; (iii) creating opportunities to get additional income by utilising farm produce; (iv) utilising the additional revenue or surplus money to develop a viable business; and (v) generating adequate income to sustain farmers' livelihoods.

Changes in Demographic Composition of the Indian Population

Age-related factors play a crucial role in agricultural commercialisation because food consumption by an individual changes over his/her lifetime. A recent survey indicates that India has the world's highest number of 10-24-year-olds, at 242 million, making it the largest youth population in the world (Swissnex India 2015). Considering the creativity, innovativeness and enthusiasm of youth, a National Policy for Skill Development and Entrepreneurship (2015) has been formulated, and several programmes were initiated to motivate them to create new ventures (Ministry of Skill Development and Entrepreneurship, Government of India 2015).

Growth in Export Opportunities for High-Value Agricultural Commodities

In the last few decades, India has mastered its export competitiveness in agricultural commodities, especially in high value products, making it the world's 14th largest agricultural, fishery, and forestry produce exporter. A report prepared by a not-for-profit organisation, the Centre for Environment and Agriculture (Centegro) indicates that Indian agricultural commodities

exports are likely to grow to Rs 6507 billion by 2022 from the present Rs 2342.7 billion (The Economic Times, 23 August 2017).

Emerging Agri-Food Retail Chains

Retail industry in India is expected to grow to Rs 23400 billion by 2020 from the current level of Rs 21613 billion, registering a Compound Annual Growth Rate (CAGR) of over 10% (Euromonitor International, February 2017). Grocery and food account for more than 50 percent of fast moving consumer goods (FMCG) sales, and together form the biggest retail channel in India.

Increase in the Foreign Direct Investment Inflow for Agri-Businesses

The FDI in agriculture is held in three sectors –food processing, agricultural services, and agricultural machinery. The food processing industry is one of the largest industries in India and ranks fifth in terms of production, consumption, and exports and contributes 14 percent of the Gross Domestic product of India. Food processing is a hallmark sector attracting FDI at an increasing level. FDI in the food processing sector rose from Rs. 3357 crore in 2014-15, to 4732.28crore in 2016-17 (Press Information Bureau, July 2017).

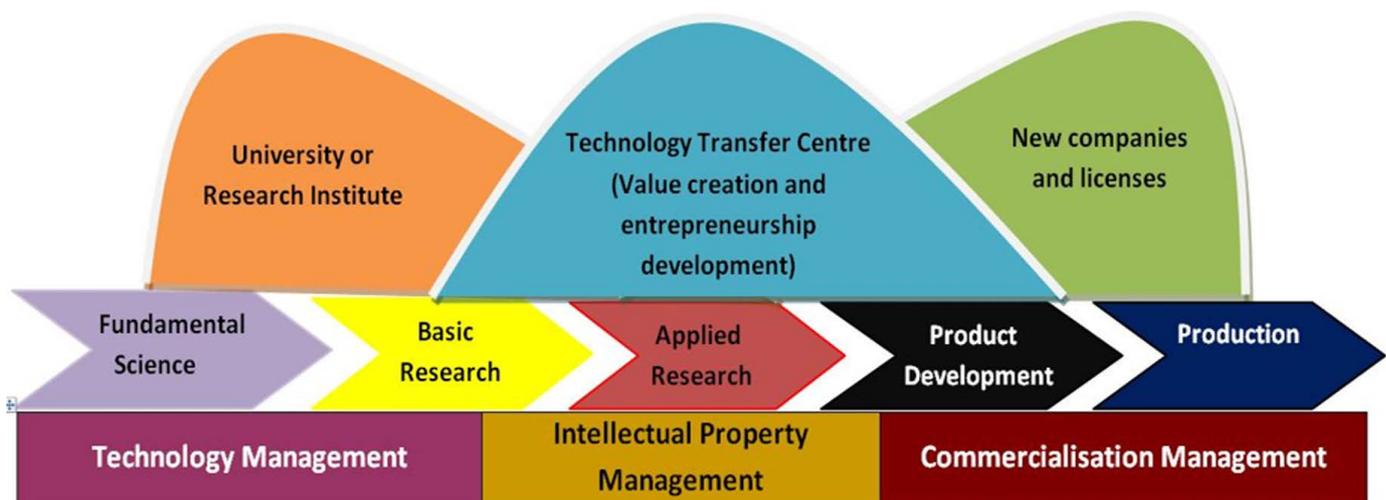


Fig. 1: Level of achievement in terms of adoption and constraints in adoption of checks

Entrepreneurship Development in Universities and Research Institutes

Traditionally, Universities and research Institutes are engaged in three primary functions of teaching, research and extension, which are now incorporating entrepreneurship development as their fourth function. The entrepreneurial development activities of universities and research institutes are channelized in three ways. The interrelationships among these core functions are displayed in Fig. 1. An overview of the entrepreneurship development process is displayed in Fig. 2.

- (i) Technology management involves planning and executing stakeholder-oriented technology development strategies and programmes;
- (ii) Intellectual Property (IP) management deals with protecting the intellectual property rights (IPR) of the viable technologies; and
- (iii) Commercialisation management translates the products of research/technologies, including IP protected technologies, into commercial products and services.

Technology Management

Technology management refers to the planning

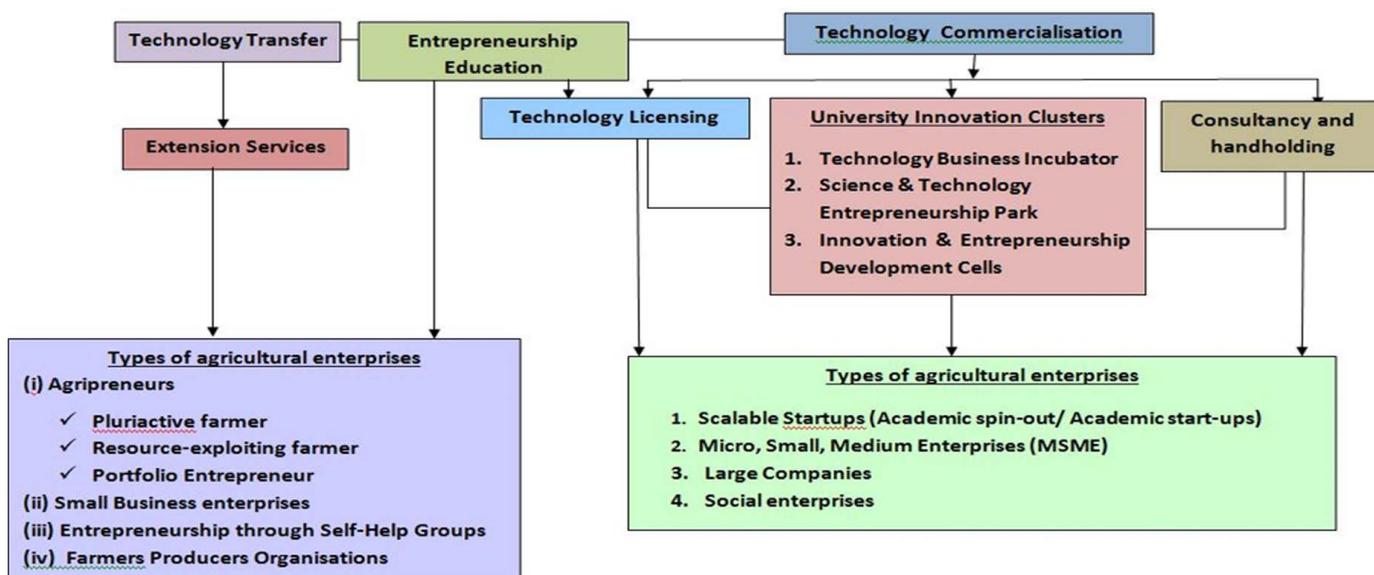


Fig. 2: Entrepreneurship Development in Universities and Research Institutes

IP management has three components:

Technology or invention disclosure

The inventor explains the details of the technology to a commercialisation committee in a confidential meeting. All the members provide an undertaking of non-disclosure of the technology details. During the meeting, the inventor(s) provide details of name of the invention, technical details, the inventors, source of funding for creating the invention, advantages of the technology over prior art, potential drawbacks, its scope of use,

and execution of stakeholder-oriented technology development strategies for generating high impact technological products and services. Strategies are formed by critically analysing the external drivers of technology and the existing infrastructure available in the organisation. Technology management is done by the Directorate of Research and Planning in Agricultural Universities, and the Planning, Monitoring and Evaluation (PME) Unit in ICAR Institutes.

Intellectual Property Management

IP management at the universities and research institutes is undertaken by an IPR Cell (Agricultural Universities) or Intellectual Property and Technology Management Unit (ICAR Institutes). In ICAR Institutes, the Intellectual Property and Technology Management Unit manages Intellectual Property and Technology Commercialisation at the institute level with guidance from the Intellectual Property and Technology Management Committee. The Zonal Technology Management Unit (ZTMU) at the regional level and the Intellectual Property and Technology Management Unit (IPTM) at ICAR HQ are the coordinating agencies at higher levels.

publication records related to the invention, proposed price, market potential and prospective buyers. After a critical discussion, the committee decides on whether to proceed for IPR protection. The technology non-disclosure clause is binding for protecting IPR of the technologies.

Intellectual Property Rights Protection

Intellectual Property Protection involves identification of potential technologies for IP protection through critical assessment of their market viability, selecting a suitable IPR protection

method, preparing and filing an IPR application, and managing the entire process until the IPR is granted. The purpose of IP protection is to safeguard the intellectual property rights of the technologies developed at the universities and research institutes from possible misuse by other parties. There are four common types of IPR: patents, copyrights, trademarks and Geographical Indications (Box 2).

Intellectual Property Portfolio Management

IP Portfolio management is the processes and

tools that enable acquisition, analysis, and organization of IP information, available both inside and outside the universities and research institutes. The IP Portfolio managers analyse the current IP scenario of specific technological products and develop future IP management strategies. The IP Portfolio is a key function which determines the choice of technologies for protecting IP, guides decision-making on mode and extent of commercialization of technologies, and type of entrepreneurs created by the universities and research institutes.

Box 2: Common forms of Intellectual Property Rights

1. **Copyrights** protect original works of authorship, such as original literary, dramatic, musical or artistic work, cinematograph films, sound recordings, and computer programmes (treated as literary work). With copyright protection, the holder has exclusive rights to modify, distribute, perform, create, display, and copy the work. In general, the protection is valid for 60 years for most types.
2. **Patent** is a document, issued, upon application, by a government office, which describes an invention and creates a legal situation in which the patented invention can normally only be exploited - manufactured, used, sold, imported, with the authorization of the owner of the patent. "Invention" means a solution to a specific problem in the field of technology. An invention may relate to a product or a process. The protection conferred by the patent is valid for 20 years.
3. **Trademark** is a word, phrase, symbol, or design that distinguishes the source of products (trademarks) or services (service marks) of one business from its competitors. In order to qualify for patent protection, the mark must be distinctive. The registration for trademark is valid for 10 years and renewable for every 10 years. In addition to trademarks, the Certification marks (granted to anyone who can certify that the products involved meet certain established standards like ISO and ASTM), and Collective marks (owned by associations and the members allowed to use it to identify themselves with a level of quality and other requirements and standards set by the association) can also be protected.
4. **Geographical Indications (GI)** identify a good as "originating in a place" where a given quality, reputation, or other characteristic of the good is essentially attributable to its geographical origin. For example, Darjeeling tea and Mysore Silks are unique products protected by GI.

Source: Nishith Desai and Associates (July 2015)

The specific functions of IP Portfolio management (Burdon 2007) include technology scan, IP surveillance, licensing/business development IP support, patent development/patentability, patent landscape and managing infringement claims.

Commercialisation Management

The commercialisation management of technologies is the process of turning IP assets into value for both stakeholders and the university and research institute. Commercialisation management has two components: Technology Transfer, and Technology Commercialisation.

Technology Transfer

Technology transfer is a generic term which indicates the formal and informal movement of know-how, skills, technical knowledge, procedures, methods, expertise or technology from one organizational setting to another (Roessner 2000). It includes both 'for profit' and "non-profit" forms and is used as a mechanism to apply the technological products to derive impacts

which enhance the welfare of the stakeholders. While the 'for profit' forms represent technology commercialisation, the 'non-profit' forms are implemented through 'extension outreach' programmes. The differences between 'for profit' and 'non-profit' forms of technology transfer are displayed in Table 1.

The entrepreneurship development activities of extension services focus on the farmer's welfare. The technological products and services are provided at a reasonable cost or free, to help the stakeholders including farmers to maximise returns.

The types of entrepreneurs created through extension services are as follows:

a. Agripreneurs: Agripreneurs are primarily the farmers who are engaged in entrepreneurial activities associated with their farm. Agripreneurship development focuses on creating a new breed of farmers with core business skills in undertaking farm-based businesses for maximising their income.

Table 1: Differences between 'for profit' and 'non-profit' forms of technology transfer

Aspect	'For profit' technology transfer (Commercialisation)	'Non-profit' technology transfer (Extension and Outreach Services)
Purpose	To recover costs incurred in developing the technology and realize the value for the innovation	To enhance stakeholder welfare by applying technological products and services
Type of technologies	With or without IP protection	Only technologies which are not IP protected
Target group	Existing and new enterprises, individual entrepreneurs, public and private sector agencies which are interested in using the technologies for generating revenue	Non-profit public and private sector agencies like KVKs, state extension agencies, NGOs and other stakeholder groups
Mechanism of technology transfer	Technology licensing, contract research, direct and online sale of technologies	Extension outreach programmes

b. Small Business Enterprises: Small-scale enterprises focus only on a few commodities or services. They are created by agripreneurs or rural youth to sustain their livelihoods.

This business doesn't require specialised skills and can run with farmers' own capital. Examples include: agri-clinics and horticultural nurseries.

Box 3: Types of Agripreneurs

According to Alsos et al. (2003), there are three types of agripreneurs: Pluriactive farmer, Resource-exploiting, and the Portfolio Entrepreneur.

Pluriactive Farmer: They derive a reasonable proportion of income from the off-farm income generating activities. The purpose of engaging in off-farm economic activities is to sustain their farming and/or to expand their farms to provide employment to their family members. This approach is used as a coping mechanism to sustain in adverse climatic conditions and other shocks which affect their livelihoods (Shucksmith et al. 1989). In the pluriactive approach, the farm business is owned by the family and is less capital intensive.

Resource Exploiting Entrepreneur: They are farmers who utilize the unique resources available in their farm to develop a new farm-based business. For example, livestock farmers can prepare compost from cow dung; or the farm can be used as an agri-tourism venue to generate additional income. The capital requirement for the business activity varies with the nature of the business.

The Portfolio Entrepreneur: They are progressive farmers who wish to exploit a novel but risky business idea. They develop teams to implement their ideas and are ready to invest large capital for translating these into a viable business. Though the ideas originate from farm, the new business is registered as a separate entity from the farm. For example, when a group of farmers create a mango pulp processing factory using their own produce at the initial stages, and then go on to procure from others when expanding production.

c. Entrepreneurship through Self-Help Groups (SHGs):

An SHG is a village-based financial intermediary usually composed of 10–20 local women or men. The SHGs are formed by NGOs and financed by banks to undertake a specific entrepreneurial activity. SHGs mostly work on traditional agri-businesses and the profits earned are utilised in a collective way.

d. Farmers Producers Organisations (FPOs):

The FPO is a collective of producers, especially small and marginal farmers, who have formed an effective alliance to collectively address many challenges of agriculture, such as improved access to investment, technology, inputs and markets. This collective can be registered as a company under the Company's Act and undertake farm-based business.

Technology Commercialisation

Technology commercialisation is a systematic attempt to translate technological advancements into commercial products or services targeted to satisfy the felt/unfelt needs of consumers. As indicated in Table 1, it is a special form of technology transfer, which occurs when the party transferring technology receives money in exchange for giving up some or all the usage rights to the technology (Speser, 2008). Technology commercialisation involves selling, licensing, or contracting of technology services, intellectual assets, and related-knowledge to potential users, i.e., independent entrepreneurs, companies or other public/private sector organisations.

Technology commercialisation management involves the following activities:

- a. **Technology valuation:** It involves estimating the value of the technologies from both buyers and sellers perspectives for deciding the licensing fee. In the case of non-IP technologies, the technology price is determined through negotiation between the buyer and seller.
- b. **Developing technology commercialisation strategies:** Technology commercialisation strategies are a series of options that a university or research institute can employ to move its technologies from concept to the marketplace. The purpose of devising commercialisation strategies is to realize the value of Intellectual Property developed by the university or research institute and also to recover the costs incurred in developing those technologies. Various technology commercialisation strategies employed by Universities and Research Institutes are – (i) Technology licensing; (ii) Venture creation; and (iii) Consultancy and handholding.

(i) Technology Licensing

Technology licensing involves transferring rights of IP-protected technologies, technological knowhow (confidential information), copyrights, and registered or unregistered designs developed by the university or research institute to entrepreneurs. It is basically an agreement whereby an owner of a technological intellectual property (University/Research Institute) allows

another party (Entrepreneur) by granting exclusive or non-exclusive rights to use, modify, and/or resell that IP in a particular market for a specific purpose in exchange for suitable compensation. The compensation may take the form of a (1) lump sum license fee; and (2) royalty, based on volume of sales. Such agreements are legally binding commitments by one or both parties to not use or disclose to others the confidential information that they have come to know during the negotiations. The period of licensing varies with the stage of technology development (Box 3) and its market potential.

Among the technology development stages, the technologies at the 'prototyping, formulation and compound' stage are directly licensed to interested entrepreneurs for large scale commercialisation. The stage 3 technologies need scaling up for making them 'market-ready'. Both stage 1 and 2 technologies require extensive research before they can be turned into a suitable commercial form.

Technology licensing and contract research with universities and research institutes may help agricultural enterprises to acquire valuable technology from them for improving existing businesses or to develop a new one.

In addition to technology licensing, universities and research institutions are also undertaking contract research with public sector or private agencies for developing a new technology/ assessing the existing technology for its viability and efficiency/upgrading these technologies in stages 1-3 for making them 'market-ready'.

Box 4: Stages of Agricultural Technology

Stage 1 - Early stage: An early-stage technology is an idea which is expected to work and solve an existing problem, or create a new need. For example, a plant extract known to have a pesticidal property, but the components and modalities are unknown.

Stage 2 - Proof of concept: Then this early stage idea could be researched and a new technology developed to the point that it shows signs of having the proposed effect. In this stage, a few components of the plant extract which cause insect mortality would have been identified, but the mechanism by which they act is still unknown.

Stage 3 - Reduction to practice: In this stage, several experiments on the specific idea have been completed and the projected results have been reliably and repeatedly reproduced. The pesticidal properties of specific components of the plant extract have been identified, and a mode of action documented and validated.

Stage 4 - Prototyping, formulation and compound: The technology is now standardised and found reliable and valid and ready for commercialisation. In the previous stage, the components having pesticidal properties are extracted using a specific method and reformulated into a pesticide with target-specific claims.

(ii) Venture Creation

The entrepreneurship developed by universities and research institutes are largely technology-based with the aim of translating various technological products and services into sustainable businesses. Various institutional mechanisms for creating enterprises include:

University Innovation Clusters containing Technology Business Incubators, Science & Technology Parks, and Innovation and Entrepreneurship Development Centre (IEDC) along with consultancy and handholding services. The types of agricultural enterprises created by university and research institutes are given in Box 5 and Fig. 2.

Mechanisms of Venture Creation

- University Innovation Clusters and its constituents

University Innovation Clusters are macro-interventions aimed to create an innovation network with multiple stakeholders, such as Industry, other Universities, R&D Labs, and others. The focus is on developing an innovation culture for developing novel products, processes, services, and delivery which will in turn enable growth and development (Office of Adviser to the Prime Minister on Public Information Infrastructure and Innovations 2011). Within each cluster, project teams made up of researchers, students, entrepreneurs, policy makers, extension agencies and funding agencies co-design new strategies for addressing a specific unmet need within a population.

The University here acts as the focal point of such a cluster and will be able to leverage the following (Office of Adviser to the Prime Minister on Public Information Infrastructure and Innovations 2011):

- Technology R&D and problem solving strengths of the University;

- The entrepreneurial spirit of the students and faculty;
- Collaboration with local industry, NGOs and others;
- The teaching and training capabilities of the University;
- Infrastructure and capital available locally;
- Government policy initiatives, more efficiently.

Several govt. agencies, including National Science Technology & Entrepreneurship Development Board (NSTEDB) - DST, Biotechnology Industry Research Assistance Council (BIRAC), and NAIF- National Agricultural Innovation Fund of Indian Council of Agricultural Research (ICAR), have created University Innovation Clusters on specific focal areas. Typically, a University Innovation Cluster is comprised of a Technology Business Incubator/Agri-Business Incubator, a Science & Technology Entrepreneurship Park (STEP), and Innovation & Entrepreneurship Development Cells (IEDC), which are linked to its stakeholders.

- Technology Business Incubator (TBI)

A Business Incubator is an organization designed to create, accelerate the growth and success of

Box 5: Technology Commercialisation - Types of agricultural enterprises created (Blank, 2010)

1. Scalable Startups

- Baby companies, which are developing innovative products or services based on a marketable idea, but yet to establish a concrete business model;
- Often registered as a Private Limited Company;
- Up to seven years from the date of its incorporation/registration;
- Annual turnover – maximum of Rs. 25 crores.

Types of start-ups

- Academic spin-out - A commercial entity that derives a significant portion of its commercial activities from the application or use of a technology and/or know-how developed by, or during, a research program of a university or non-profit, usually public, research organization.
- Academic start-ups – Technology-based enterprises created by the persons who have studied at a university or research Institutions. They are built upon technological knowledge derived from academic research.

2. Micro, Small, Medium Enterprises (MSME)

- A MSME is a permanent and structured business unit that focuses on the delivery of value to its already-known customers.
- As per Govt. of India guidelines, the MSME is classified based on investment. Micro: up to Rs 5 crore; Small: up to Rs 75 crore; and Medium: up to Rs 250 crore.

3. Large Companies

- Universities can help large companies to develop new ideas and business opportunities, leading to new business ventures and the improvement of organizational profitability, thus enhancing the competitive position of the existing firm.

4. Social enterprises

- A social enterprise is an organization that applies commercial strategies to maximize improvements in financial, social and environmental well-being of people, and maximizing social impact alongside profits for external shareholders.
- Social enterprises are not volunteer organizations in that they operate as an enterprise by selling in a market (profit or non-profit enterprises).

entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common lab facilities and services, and networking connections. A TBI is a special type of business incubator, where the focus group consists of innovative, mostly technology-oriented, or knowledge-intensive service sector enterprises which constantly interact with the academic sector

to bring innovative technology-based solutions to solve persistent problems of society. The impact of TBIs is assessed by the number of companies that have been founded and developed there, the number of created jobs, commercialised technologies or patents obtained. A few of the technology incubators maintained at Agricultural Universities and ICAR Institutes are listed in Table 2.

Table 2: Technology Business Incubators at Agricultural Universities and research institutes

Name of the TBI	Host Organisation	Contact details
Association for Innovation Development of Entrepreneurship in Agriculture (A-IDEA)	National Academy of Agricultural Research Management (NAARM) (ICAR), Rajendranagar, Hyderabad-500030, Telangana	Tel: +91-40-24581427 Email: coo.aidea@naarm.in
Society for Innovation and Entrepreneurship in Dairying (SINED)	National Dairy Research Institute Campus, Karnal – 132001, Haryana	Tel:+91-184-2259329 Email : tbi@ndri.res.in
Agri Business Incubation Society – TBI	Tamil Nadu Agricultural University (TNAU), Coimbatore- 641003, TN	Tel: +91-422-6611310 Email: business@tnau.ac.in
NIELAN –Technology Business Incubator (TBI)	Indian Institute of Millets Research, Rajendranagar, Hyderabad-500030, Telangana	Tel: +91- 8499895407 Email: nielan-tbi@millets.res.in

- Science & Technology Entrepreneurship Park (STEP)

A Science Park is an organization managed by specialized professionals whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions (International Association of Science Parks and Areas of Innovation 2017). The main task of STEPs is to create the scientific research infrastructure available for creating new companies. Further, technology parks are to provide students and university staff with the opportunity to do scientific-research cooperation with enterprises. STEPs are offering services like technology transfer, incubation, business support, and link with academics.

- The Innovation and Entrepreneurship Development Centre (IEDC)

IEDCs are promoted in educational institutions to develop institutional mechanisms to create an entrepreneurial culture in Science & Technology academic institutions and to foster techno-entrepreneurship. The IEDC programme is focused directly on entrepreneurship development in academic institutions by maintaining close relations with existing businesses and R&D practice.

- (iii) Consultancy and handholding

Apart from licensing technologies to enterprises, Universities and Research Institutes also offer consultancy and handholding services for commencing commercial production of technologies. Consultancy services are offered on individual and institutional basis to help entrepreneurs solve specific problems. Handholding is the provision of careful support or guidance to budding entrepreneurs for establishing agricultural technology-based ventures. It involves technology transfer or licensing, extending farm advisory services, linking with funding agencies, establishing the industry, product planning and development, business mentoring, linking with marketing agencies and others.

Entrepreneurship Education

Entrepreneurship education in agriculture is offered by most of the Agricultural Universities, Private Universities and Institutes, and a few ICAR Institutes. This education and capacity development on entrepreneurial skills is: (i) a regular course in UG, PG and PhD level; (ii) a specialised course at Masters level; and (iii) continuous education programmes in technology commercialisation and entrepreneurship development.

Regular courses: Considering the importance of agricultural entrepreneurship, Entrepreneurship Development course is introduced in all agricultural and animal husbandry disciplines. The purpose of these courses is to sensitize UG students on the importance and techniques of entrepreneurship and equip them with critical skills in creating and managing enterprises.

In general, there are two components in teaching entrepreneurship. First aspect is to develop a fundamental understanding of entrepreneurship and business management by providing concepts, principles, structures and processes associated with entrepreneurship. The second aspect focuses more on creating entrepreneurship and managing the business where students are equipped to apply their fundamental understanding along with critical skills to create and manage enterprises. For example, teaching agricultural marketing develops a fundamental understanding of the concept, principles, channels, and structures associated with marketing of agricultural produce. However, the actual practice of marketing requires critical skills in understanding consumers, devising marketing strategies and managing market intelligence through proven strategies and methods/techniques. The current curriculum of entrepreneurship at the undergraduate level focuses more on creating a fundamental understanding of entrepreneurship and business management, but lacks in their application. Though post-graduate curriculum in extension covers both aspects in a general way, there is a need to enrich it with state-of-the-art approaches and tools with adequate hands-on experience for creating and managing successful agri-businesses.

Specialised course: A specialised MBA in Rural and Agri-business Management is offered in many universities to develop adequate business manpower to meet emerging demands. These specialised courses are well-designed so as to make the students competent in creating and managing agri-businesses. Apart from Agricultural Universities, the Deemed Universities under ICAR system are also offering MBA courses in agriculture.

Continuous education: The continuous education programmes on entrepreneurship are offered to equip professionals on critical skills in business planning, technology management, marketing,

etc. The Indian Institute of Management (IIM) at Ahmedabad and Lucknow; Institute of Rural Management (IRMA), Anand; National Academy of Agricultural Research Management (NAARM) and National Institute of Agricultural Extension Management (MANAGE), Hyderabad; Indian Institute of Plantation Management, Bengaluru; CCS National Institute of Agricultural Marketing (NIAM), Jaipur, along with many public sector and private universities and colleges are offering specialised short term courses in business management.

Way Forward

Universities and Research Institutes have expanded their traditional roles of knowledge generation by teaching agricultural technology development and thereby producing quality human resources that can accommodate the fourth function of entrepreneurship development. Though entrepreneurship development is an essential component of both technology transfer and commercialisation, their objectives, reach, and impact are technically different. Over the years, extension professionals have employed non-profit approaches for entrepreneurship development with non-IPR technologies for transforming farmers into agripreneurs. Though this strategy has paid rich dividends, the true benefits of agricultural research will be realised only when the focus is shifted to creating technology-based start-ups with people having the essential entrepreneurial attributes. As creating technology-based entrepreneurship is a very complex process, it is essential for extension professionals to understand and master the process of technology commercialisation and entrepreneurship development in a systematic way prior to developing sustainable entrepreneurships.



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COMMERCIALIZATION OF AGRICULTURAL TECHNOLOGIES: INNOVATIONS IN BUSINESS INCUBATION AND START-UPS

Though the Indian National Agricultural Research System has initiated several measures to support commercialisation of agricultural technologies, a lot more needs to be done to strengthen these efforts. In this blog, Manoj Samuel, George Ninan and CN Ravishanker argue for a new framework to encourage start-up companies in agriculture.

Mrs. Omana Muralidharan was a homemaker at Ernakulam district of Kerala. One of the extension programs conducted by the ICAR-Central Institute of Fisheries Technology (CIFT), Kochi, changed her destiny. Many new fish processing and packaging technologies were discussed during the program. Her attention developed into interest and furthered her desire to start up a small business enterprise with CIFT technologies.

Box 1: Prawnoes – The Extruded Snack Products

ICAR-CIFT's technology for extruded snack food from fish was taken by a woman entrepreneur, Mrs. Omana Muraleedharan, Charis Food Products, Aroor, Kerala.

Before registering as an Incubatee at ZTM-BPD Unit of ICAR-Central Institute of Fisheries Technology (CIFT), Mrs Omana Muraleedharan was running a small-scale metal industry named Amruta Metal Works. She approached ICAR-CIFT with the idea to develop the extruded snack food flavoured with prawn. A brand named 'Prawnoes' was created and registered for trademark protection by ZTM-BPD Unit.

CIFT developed and standardized three varieties of Fish Kure for the Incubatee, 'Spicy Shrimp', 'Shrimp n Onion' and 'Prawn Seasoning'. The BPD Unit also helped the entrepreneur to carry out feasibility studies, prepare Business plan and DPR (Detailed Project Report) and helped her in mobilising seed funding from Canara Bank to start her own production facility in the Industrial area at Aroor, Kerala. The production facility was designed and machines were sourced through the BPD Unit. Some of the machines were indigenously designed and manufactured as per the suggestions from ICAR-CIFT. CIFT gave her technical guidance in developing the product, standardization of process parameters, testing, packaging solutions, ideas for branding, assistance in trademark filing and setting up their own production unit at Aroor.

The unit was inaugurated on 28 June 2014. Presently Prawnoes (www.prawnoes.com) is marketed in seven flavours and the produce is sold in four districts in Kerala. Mrs Omana Muraleedharan received the best woman entrepreneur award from the Government of Kerala State Prawnoes received excellent product reviews during its test marketing period and Mrs. Omana is planning to add more snack foods to her product range. With the support of all government institutions like the District Industries Centre (DIC), Ministry of Microm Small and Medium Enterprises (MSME), Banks and CIFT, she is now promoting a healthy snack food brand with a campaign "Save Children, Eat healthy snack".

However, the challenges were (a) no finances, (b) competition from big firms, (c) no infrastructure, (d) no machineries, (e) no skilled manpower, and (f) no trainings. At that juncture, the Agri-Business Incubator (ABI) attached to the CIFT has come to her rescue. Presently, she is one of the most successful women entrepreneurs of Kerala with the brand of "PRAWANOES" -- the extruded snack products in different flavours (Box 1).

Business Incubation in Agriculture

Agri-Business Incubators (ABI) open new entry points in the agricultural value chains, which in turn keep in accessing new markets (Box 2). There is no single "right way" to perform agribusiness incubation. Rather the work of agribusiness incubation depends on the state of development of the agribusiness ecosystem and changes over time as that ecosystem matures and develops. In its earliest phases, incubators demonstrate the viability of new business models and look to

create and capture additional value from primary agricultural products.

In underdeveloped agricultural economies, incubators help by strengthening and facilitating linkages between enterprises and new commercial opportunities. They open new windows on technologies appropriate to agribusiness enterprises and help agricultural enterprises discover new, potentially more competitive ways of doing business. In subsequent phases of development, incubators operate as network facilitators by:

- Linking specialized service providers to agribusinesses and
- Linking separate agribusinesses to one another

Finally, in a more advanced state of business development, incubators operate as conduits for the exchange of technology, products, inputs and management methods across national borders.

Box 2: Agri-Business Incubation

The mission of agri-business incubation is improving the well-being of the poor through creation of competitive agri-business enterprises by technology development and commercialization. Agri-Business incubation is defined as a process which focuses on nurturing innovative early-stage enterprises. These enterprises have high growth potential to become competitive agribusinesses by serving, adding value or linking to farm producers.

The major objectives of agri-business incubation initiatives are as follows:

- Foster the innovation through creation, development of agri-businesses to benefit the farming community
- Facilitate agro-technology commercialization by promoting and supporting agribusiness ventures.
- Promote successful agribusiness ventures in order to benefit the farmers through new markets, products and services

The commercialization including dissemination, transfer and marketing of technology has been evolving as a major pillar that supports the R&D systems. The commercialization process is linked to various activities in the technology management pipeline like protection, valuation, incubation, test marketing, technical and economic feasibility studies, showcasing, licensing and marketing of the technology. Incubation process helps nascent technology to fully evolve into a business product or service which can compete in real world environment. In a globalized economy, technology licensing and transfer of technology are important factors in strategic alliances and international joint ventures in order to maintain a competitive edge in a market economy.

Agri-Business Incubation and Tech Transfer in NARS

The National Agricultural Research System (NARS) in India employs about 4000 researchers in Indian Council of Agricultural Research (ICAR) and almost 15,000 academic faculty members in various State Agricultural Universities (SAUs). In view of changing circumstances and policies, the NARS has initiated steps to strengthen its IP portfolio management and encourage its researchers and academicians to develop and commercialize their innovations for the benefit of farming community. A more pragmatic system for business incubation and promoting start-up companies with respect

to agricultural technologies have evolved in recent times within the National Agricultural Research System (NARS). Generally agricultural technologies are low-cost technologies and entrepreneurs are not much enthusiastic about it, considering the less purchasing power of the target market.

Since the implementation of the Eleventh Five Year Plan (2007-12) of Government of India, the three-tier IP management mechanism has been established in Indian Council of Agricultural Research (ICAR) towards developing an institutional setup for commercialization of agriculture research products/technologies generated from public research institutions.

Accordingly, Institute Technology Management Units (ITMUs) were established in its 95 institutes as a single-window mechanism to showcase the intellectual assets of the institute and pursue matters related to IP management and transfer/commercialization. Five Zonal Technology Management and Business Planning and Development (ZTM&BPD) units were established at the middle-tier, in synergy with the ITMUs, in their respective zones. Twelve new BPD units have been initiated in 2013-14 to promote business incubation and technology commercialization. Subsequently the National Agricultural Innovation Fund (NAIF) has been schematized for the 12th Plan period (2012-17) by the Government of India and establishment Agri-Business Incubation (ABI) Units in 27 Agricultural research institutes and promotion of Grass-roots Innovations are the highlights of the scheme. Under the new initiative, sector wise Zonal Technology Management Centres (ZTMC) coordinate the technology incubation, protection, commercialization

activities. Apart from these, Department of Science & Technology (DST) supported Technology Business Incubators (TBI) are set up in three NARS institutions and incubation and innovation centres are established at different State Agricultural Universities.

Support and services needed by bigger firms and investors for technology transfer as well as for incubation and funding can be addressed through the new flexible business innovation-incubation centres like "Agrinnovate India" and Technology Business Incubator under the NARS itself (Fig. 1). The requirement of incubation support by the bigger firms may also be met by these institutional innovations. Provisions were also made to protect the interest of farming community. The established mechanism helps to answer the questions, which may arise from the society on the righteousness and ethical issues of commercializing the public funded research outputs.

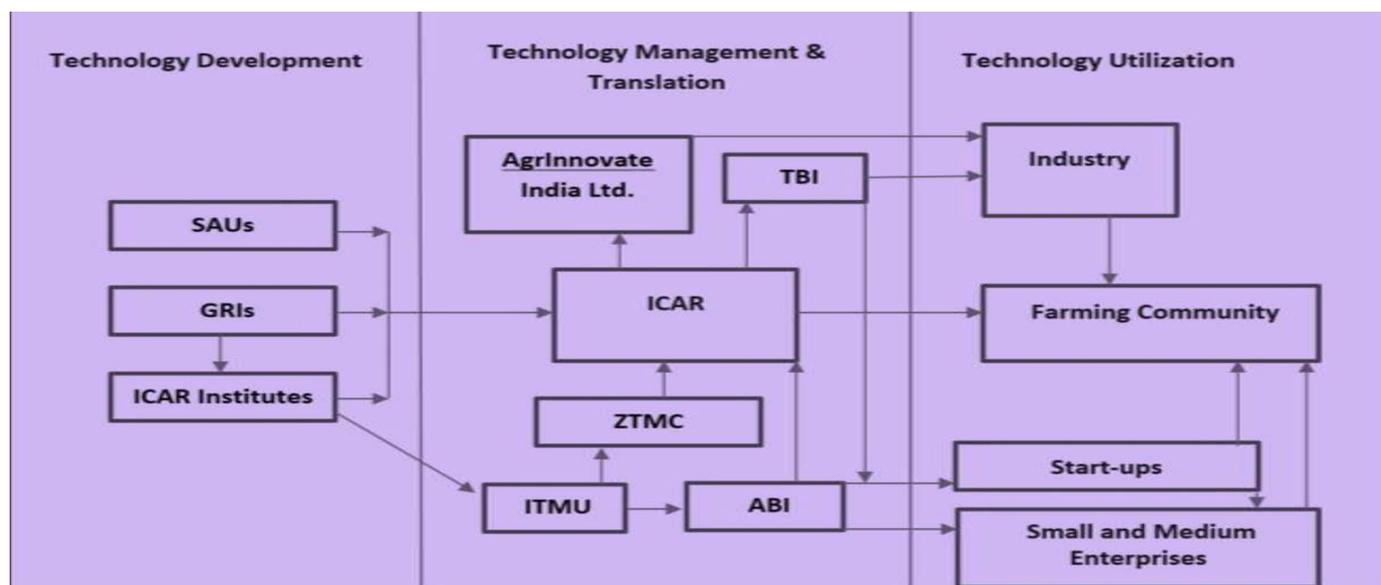


Fig. 1: Institutional framework for Tech transfer and commercialization

The Agribusiness Incubator Program under NARS seeks to provide business consulting services to agriculture-related businesses and helps to develop a strategic business plan. The new initiatives by the Govt. of India as well as ICAR have encouraged start-up companies in agriculture, especially by attracting rural youth to agri-entrepreneurship. Apart from guidance and consultancy services, the new initiatives also assist in making venture capital funds available to the start-ups. The local communities can also be involved in developing business ideas and entities with respect to agriculture.

Need for a New Framework

Though the existing framework works fairly well,

more innovations are required for strengthening agri-Incubation and commercialization capacity of NARS in India in view of rapidly changing market dynamics- both nationally and globally, positively oriented government policies and expanding agri-business avenues. Though there are many agencies, schemes and government departments in the country to act as support mechanisms for IP protection and subsequent commercialization, the benefits are not extended to the needy entrepreneurs, especially in case of small and medium scale agri-businesses. See AESA Blogs: Sivakumar S and Sivaraman I (2014). Fostering entrepreneurship through Agribusiness Incubation: Role of extension professionals. Blog 33. Agricultural Extension in South Asia (<http://www.aesanetwork.org/fostering-entrepreneurship->

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Though agribusiness incubators are important to promote entrepreneurship and commercialization of new technologies in agriculture, the incubators are yet to receive sufficient attention and funding in India. Lack of a positive ecosystem to nurture start-ups affects the functioning of agribusiness incubators (Srinivas, 2016).

Hence, an effective umbrella structure should be conceived as a nodal unit at the ICAR level. ICAR coordinated the technology commercialization activities under NARS. The nodal unit ensures the deliverance of governmental schemes and financial grants to the appropriate agri-enterprises and start-ups.

The new institutional and process innovations should focus on the speed and ease of commercializing developed technology and further doing business without much bureaucratic delays. The envisaged system should facilitate open communication and exchange of ideas among academia, research institutions, industry and farmers.

A novel approach is envisaged to encourage

start-up companies in agriculture, especially by attracting rural youth to agri-entrepreneurship. Apart from guidance and consultancy services, the new initiative should also assist in making venture capital funds available to the start-ups. The local communities can also be involved in developing business ideas and entities with respect to agriculture.

The development processes in the suggestive framework (Fig.2) for the Agriculture Business Incubation (ABI) involve scouting of the technology, assessment and the valuation. The technology management services focus on the protection of the developed technologies having a commercial value. The technology generation cycle is the phase where product prototype developed out of the technology innovation undergoes continuous transformation leading into the final product development. The process such as innovation process; technology generation process; and agriculture business incubation are individual entities but complete a cycle of a business. Combining all these processes in a framework, a holistic approach for fostering innovation and incubation eco-system has been envisaged. Through this framework, the role of the individuals or public and private players at various levels and at various places are defined in the process of innovation of various technologies and products.

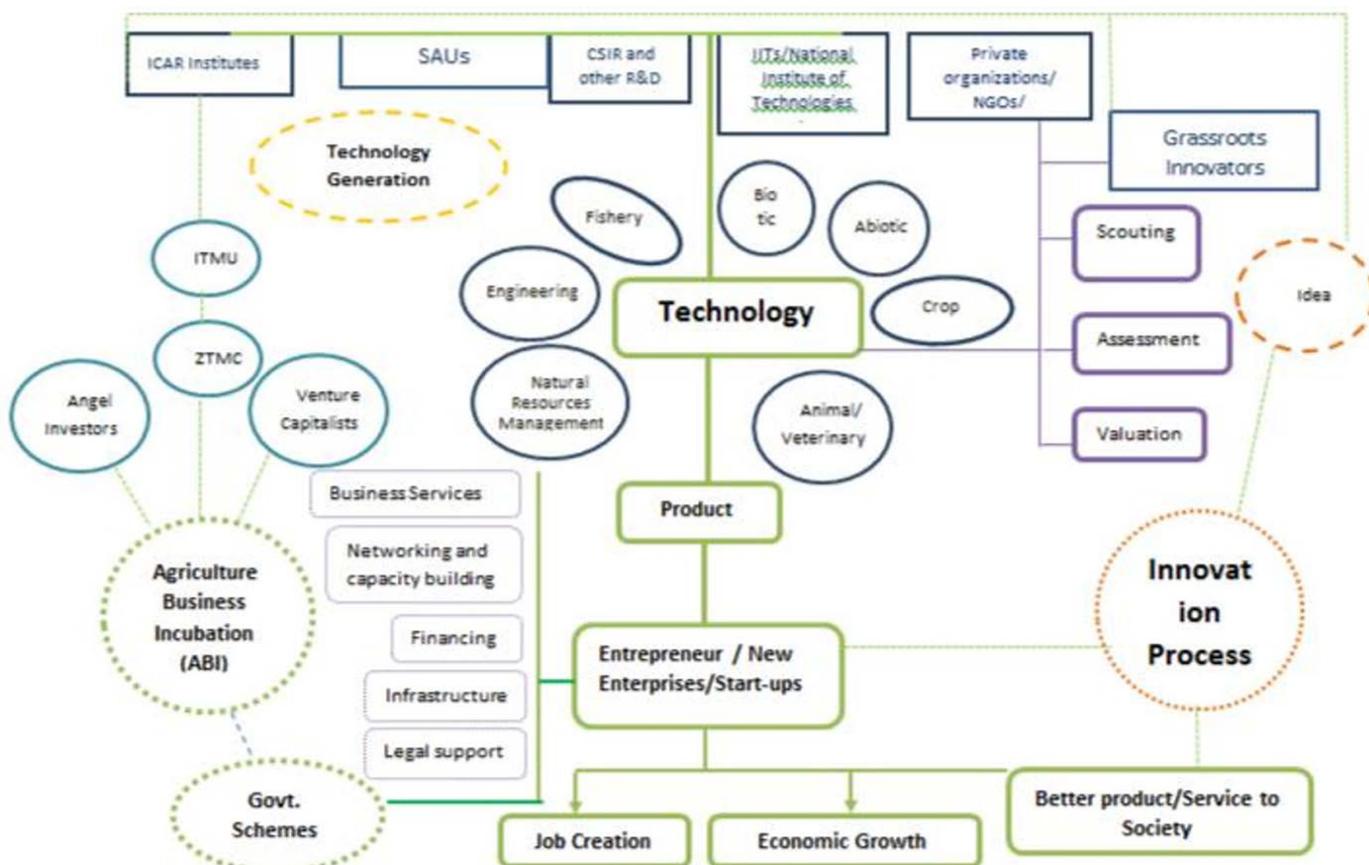


Fig. 2: Conceptualized framework for agri-innovation-incubation process

The nodal centre, which can act as a networking platform of technology managers in SAUs and ICAR institutes in line of a registered society will be helpful in networking relations and exchange of ideas and information related to IP management in agriculture. Further it can be extended by incorporating other areas of scientific organizations, institute of technologies, engineering colleges, law and business schools and traditional universities. Such a platform can be linked to similar organizations in other countries like Association of University Technology Managers (AUTM) in USA in order to explore the possibility of global technology transfer and commercialization. This initiative will also aid in updating with recent trends in IP regime, new changes in IP laws in a national and international perspective. The platform can also be extended to private companies to foster public-private partnerships.

The nodal centre can bridge the gap between research institutes, industry society, and the Government. It can play a proactive role in framing technology transfer and commercialization policy in coordination with Central and State agencies, government, business houses and other players in the industry. Nodal centres can be mooted in all research councils/organizations like CSIR, ICAR, ICMR etc. and which all can be pooled together to form a National level umbrella consortium under Government of India. The Consortia is envisaged to facilitate the convergence and effective deliverance of all schemes with respect to innovation, incubation and commercialization.

Way Forward

Translating research into technologies and then to product and services requires a coordinated and concerted effort by all stakeholders. An effective national-level umbrella structure should be conceived and established which ensures the deliverance of governmental schemes and

financial grants to the appropriate agri-enterprises and start-ups.

A technology transfer protocol for forward integration with the Government machinery, policy makers and other clients and the backward integration with the framers, research institutes, NGOs and other organizations such as IIMs, IITs and business houses, has to be designed with clearly defined channels of communication and data flow.

Partnerships should be developed among the research producers, users, and funders both at the nodal centre and consortia levels. The scope of public-private partnerships in agriculture and biotechnology in the areas of technology development, protection, transfer and commercialization has to be explored.

Though extension professionals could play a very useful role in this endeavour, the field of agribusiness incubation hasn't yet got into the education and training curricula of extension professionals. There is a need to strengthen research on value chain modelling-mapping and analysis, business opportunity identification, financial management tools and techniques, logistics and branding to maximise the role of extension in the agri-incubation process (Sivakumar and Sivaraman, 2014).

Public institutions under various platforms in India such as Department of Science & Technology (DST), Council for Scientific and Industrial Research (CSIR), Department of Bio-technology (DBT), ICAR, Ministry of Micro, Small and Medium Enterprises etc. should make sure effective flow of information, timely consultancy services and speedy delivery mechanisms to the grass-root level agripreneurs. Effective communication, coordination and cooperation among the various nodal centres, umbrella consortium and the industry are inevitable for the successful implementation of the schemes.



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AGRIBUSINESS INCUBATION IN INDIA: WAYS FORWARD

Though agribusiness incubators are important to promote entrepreneurship and commercialization of new technologies in agriculture, the incubators are yet to receive sufficient attention and funding in India. Lack of a positive ecosystem to nurture start-ups affects the functioning of agribusiness incubators, argues K Srinivas.

Agribusiness incubation is a process which focuses on nurturing innovative start-ups that have high growth potential to become competitive agribusinesses by serving, adding value or linking to farm producers (InfoDev, 2013). Agribusiness incubation entails directly working with early stage enterprises and facilitation of their growth through a number of services (shared facilities and equipment, business development, technology, finance, mentoring and networking). The incubation ecosystem for agriculture is in the nascent stages of development when compared to the incubation ecosystem in other sectors such as Information Technology, CleanTech and HealthCare. The start-ups in agriculture need sector-specific incubation support including access to the knowledge, resources and agribusiness networks. Many of the start-ups also need to reach out to a large number of stakeholders in the agriculture value chains. Many start-ups working in the agriculture incubation ecosystem lack agricultural background and hence need technical support including mentoring and technology validation.

Agribusiness Incubators (ABIs)

Like other business incubators, the agribusiness incubators (ABIs) provide shared facilities and equipment, business development, market access, technology assessment services, financial services; as well as mentoring and networking (Sivakumar and Sivaraman, 2014).

ABIs play a major role in many ways:

- Entrepreneurship development
- Development of ecosystem in the area of agriculture technologies
- Commercialization of technologies (developed by various stakeholders in agriculture including scientists, students, and entrepreneurs) from lab to land
- Early stage support to the technology start-ups emerging in the area of agriculture.

ABIs evolve with changing agenda for enterprise development determined by changes in their business ecosystem and corresponding changes in incubator strategy. The figure below depicts three stages of "early stage development" and five alternative pathways for more advanced development and scale-up of agribusiness incubation (Fig 1).

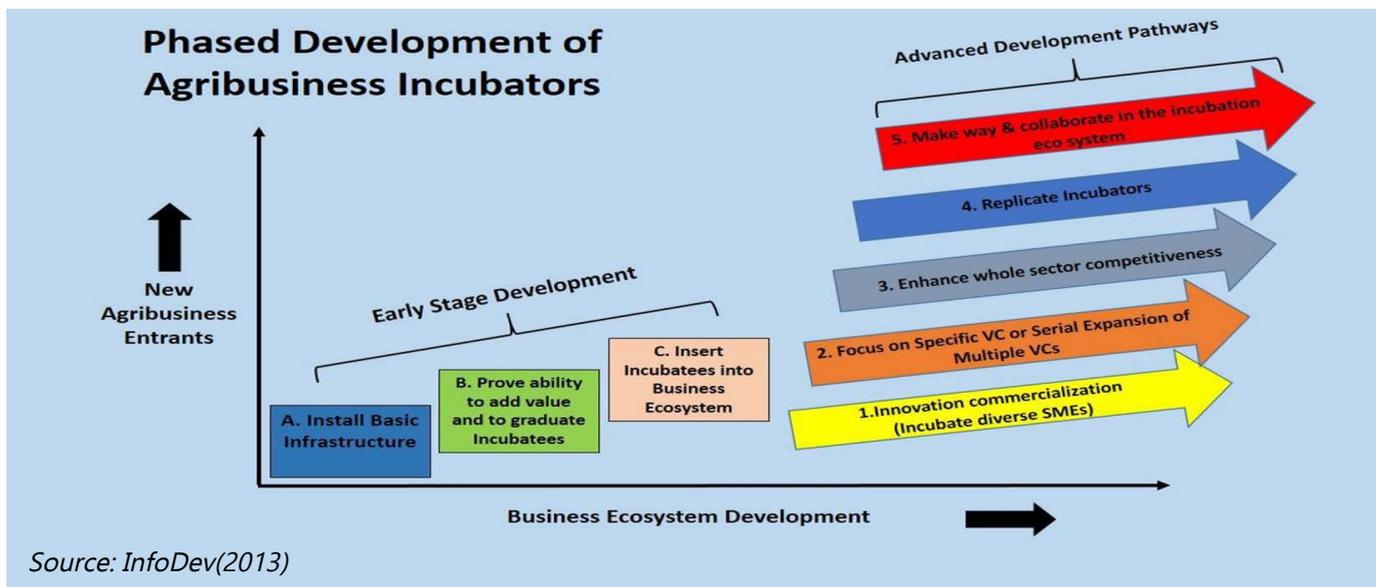


Fig. 1: Phased development of Agribusiness incubators

ABIs need the following capacities:

- Large Networks: a large network of agricultural stakeholders across the value chain with a pool of mentors, investors and other knowledge partners.
- Technological support for validation of

technologies: A strong technological support drawn from the network of people/institutions for validation of technologies.

- Business support for scaling of start-ups: Access to wide networks of agribusiness support for scaling the start-ups (Box 1).

Box 1: Start-up?

A start-up is a young company that is just beginning to develop. Start-ups are usually small and initially financed and operated by a handful of founders or one individual. These companies offer a product or service that is not currently being offered elsewhere in the market, or that the founders believe is being offered in an inferior manner. In the early stages, start-up companies' expenses tend to exceed their revenues as they work on developing, testing and marketing their idea. As such, they often require financing. Incubators can provide start-ups with both the capital and the advice. A start-up that can prove its potential may be able to attract venture capital financing in exchange for giving up some control and a percentage of company ownership

(<http://www.investopedia.com/ask/answers/12/what-is-a-startup.asp>)

Challenges in Promoting ABIs

Many stakeholders spread across the value chains of agriculture makes it more challenging for the agriculture start-ups to test their technologies and products. Although many have knowledge of agriculture and agri-business, very few mentors have specific knowledge of agribusiness incubation.. Most of the promoters who are keen to invest in start-ups are yielding high rates of return (ROI) in a short span of time. However, in the case of agriculture start-ups more timeframe is required and the ROI may not be competitive enough.

ABIs in India

Over the past five years, several ABIs have emerged in India. The Agribusiness Incubation (ABI) program of ICRISAT, Hyderabad, is the most successful business incubator in India. Started

in 2003, the ABI at ICRISAT has incubated over 200 agribusiness ventures so far, and facilitated funding to 23 ventures worth \$18 million, trained more than 2300 entrepreneurs and assisted in the commercialisation of 194 agro-technologies (<http://www.aipicrisat.org/agri-business-incubation-abi-program/abi-impact/>)

In May 2015, the Indian Institute of Management, Ahmedabad (IIM-A) technology business incubator – Centre for Innovation Incubation and Entrepreneurship (<http://www.ciie.co/>) CIIE) – launched its first food and agri-business accelerator in partnership with a-IDEA – the business incubator at Indian Council of Agricultural Research's (ICAR) National Academy of Agricultural Research Management (<http://www.naarm.ernet.in/>). More than a dozen ABIs in the name of Business Planning and Development (BPD) units exist in select ICAR institute and Agricultural Universities in India.

a-IDEA, Technology Business Incubator of NAARM

a-IDEA (Association for Innovation Development of Entrepreneurship in Agriculture) is an initiative by ICAR-National Academy of Agricultural Research Management (ICAR-NAARM, GOI) with the support of Department of Science & Technology (DST,GOI) for fostering innovation and entrepreneurship in agriculture in India. a-IDEA operates under this initiative of Centre for Agriculture Innovation (CAI) and its objectives are as follows:

- Give incubation support services to the agri-entrepreneurs for developing their businesses.
- Scout and catalyse the commercial utilization of viable technologies developed at various

research institutions in National Agricultural Research Systems (NARS).

- Build and accelerate the agri-business cluster across the ecosystem.
- Provide access to knowledge and networking support services in innovation and entrepreneurship in agriculture.

a-IDEA hand-holds entrepreneurs who come up with agri-startup ideas, mentor them and provide them research, managerial and technology support. They even guide entrepreneurs on financial aspects and link them to banks and other institutes for funds. Different services offered by a-IDEA are illustrated in Fig 2. The processes adopted by a-IDEA in identifying and supporting start-ups are indicated in Box 2.

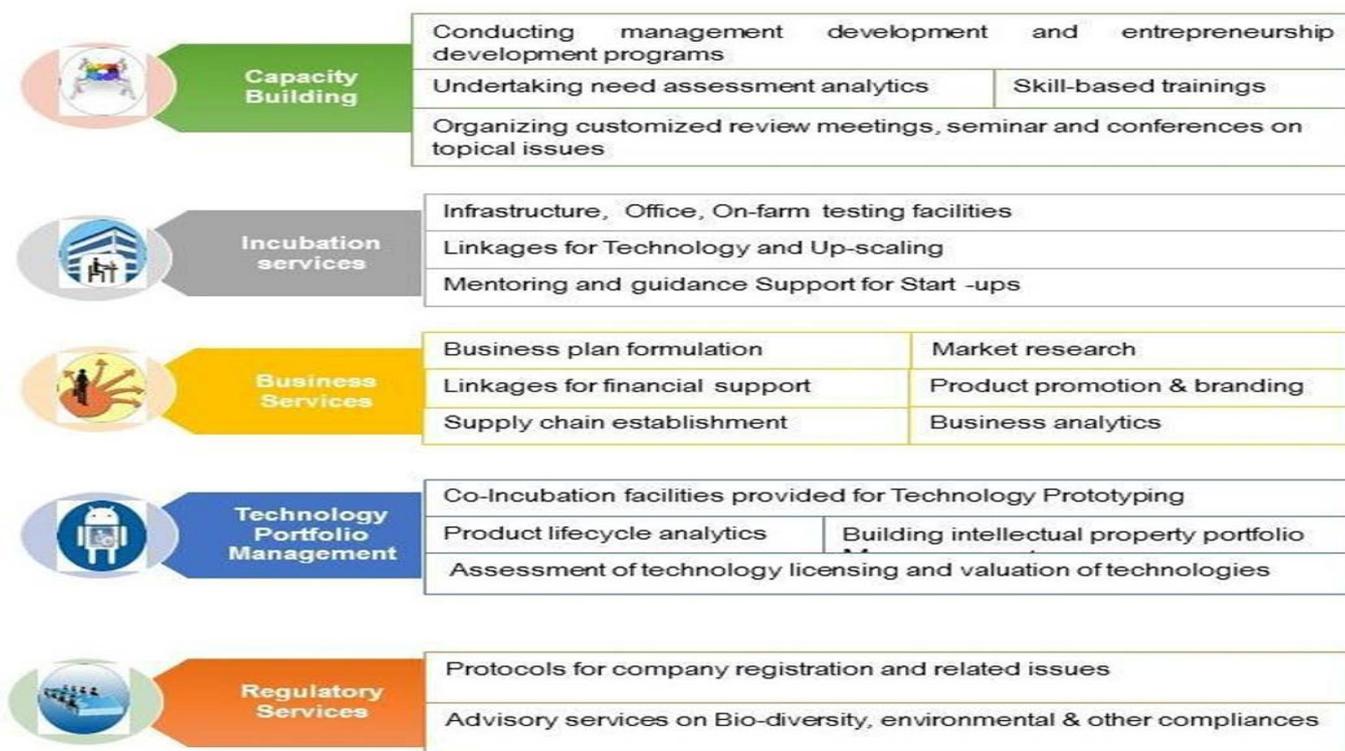


Fig. 2: Services offered by a-IDEA

Box 2: a-IDEA: Identification and support of start-ups

The start-ups approach a-IDEA either through a network, referrals of agricultural institutions/ incubators/start-ups or by accessing information available in print media or online/social media. a-IDEA provides Incubation and Accelerator programs for start-ups in agriculture.

The Accelerator program is a PAN India competition which is held yearly once, and the start-ups applications are reviewed and evaluated by the experts in the screening committee. The committee shortlists a cohort of the start-ups who are trained virtually for a period of four months. During this intense training period, the start-ups are provided access to training, handholding support through access to mentors, technology support, technology validation, business model development, product launch, networking, capacity building, pitching, access to funding resources followed by a Demo day which is an investor meet, where the start-ups happen to present before a group of empanelled investors ranging from High Network Individuals (HNI's), Angel Investors, Venture Capitalists etc. As a part of the accelerator a-IDEA also provides a seed fund to the start-up which emerges as the best of the start-ups in the accelerator program at the end of the program. The accelerator program is primarily held to support start-ups in agriculture that are in the stage of scaling up.

The incubation program is an ongoing program, wherein the early stage start-ups approach for the incubation support from us. As a part of incubation program, the start-ups which are keen to be a part of this program approaches a-IDEA followed by a general meeting/ telephonic discussion/ Skype call, followed by an Incubation template which is shared by the incubator to the start-up. Further the start-up needs to fill the form and submit to the a-IDEA. Once the filled-in application form of the startup is received, the application is sent for evaluation to the experts representing the industry, scientists, academicians etc. Based on the feedback of the experts, start-ups are supported in the incubation program through a MOU for a period of 18 months. As part of the incubation program, a range of services to the start-ups are offered. The services offered by a-IDEA to the incubates ranges from protocols for company formation, training, capacity building, office and shared spaces, research space for conducting trials, technology mentoring, access to institutional databases and resources, technology validation, business model development, product launch, channel management, planning of sales and distribution, marketing plan and any other needs chalked mutually by the startup, incubator team and mentors. Nominal incubation fee is charged per annum towards the infrastructure, support and services provided to the start-ups.

Since May 2015, a-IDEA is supporting closely 12 start-ups in agriculture.

The following is a snapshot of the start-ups a-IDEA is working with (Fig 3).



Fig. 3: Start-ups at a-IDEA

The agricultural start-ups of a-IDEA are working at the grassroots level. For instance, Inner Being Wellness, promoted by an entrepreneur Mr. Jadhav and his team, are promoting quinoa and other millets. As the demand for readily acceptable products at the customers end is growing, they are able to transfer the benefits to the farmers at the grassroots level. The disposable income of farmers is increasing through the sale of high value quinoa. At customers end, making quinoa available to them at an affordable cost due to establishment of good supply chain is beneficial as consumption of quinoa is considered to be a good substitute for Rice, especially for patients suffering from diabetes. InnerBeing Wellness is currently working on establishment of quinoa supply chain in the districts of Telangana state, which at a macro level could provide impetus to the dry land farming

situations having scarce irrigation resources and fragmented land holdings.

Another incubate, Agrowbook provides an ICT platform with features such as Agri-on-mobile and AgrowTube for dissemination of agricultural related information to the farmers (Lode 2016). They are also offering marketplace for connecting farmers, dealers, distributors, agri-input companies, so that agri-input supply chain is streamlined with access to the availability and prices of the agri-inputs i.e., seeds, fertilizers, pesticides through this ICT platform using their smartphones. Agrowbook is working on the marketplace in Tallasingaram Taluka of Nalgonda district of Telangana state. Through this initiative, the farmers are likely to get effective information on availability and prices of agri-inputs.

Constraints impacting Agribusiness incubation in India

Very few ABIs in the country are present to support agriculture start-ups. ABIs in general have a limited funding support from the supporting organizations and largely work as not for profit organizations, limiting their own sustainability and scalability. Most of the ABI's in the country are relying on the debt format to support start-ups and equity based funding support to start-ups is largely not available in the ABI's in the country.

Overcoming the Challenges

There is a need to establish more ABIs to promote agricultural start-ups in the country. But at the same time, the existing ABIs need to be strengthened. Some of the following measure can go a long way in strengthening the existing ABIs:

- The funding support to agriculture focused

ABI's be increased so that the limited number of ABI's in the country are capacitated better to support more Agri start-ups.

- Host institutions of the ABI's should complement a positive ecosystem to encourage the ABI's to support the start-ups financially through debt, equity as well as royalty formats.
- Agricultural colleges should sensitize their students on agricultural start-ups and agriculture incubation services by developing suitable courses and modules in this area. This could also encourage students to initiate agricultural start-ups.
- Organisations such as NAARM, ICRISAT, IIM-A etc having experience with ABIs should organize more capacity development programmes on Agribusiness incubation to enhance capacities of research agencies who are venturing to establish ABIs in the country.

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**INFORMATION
AND
COMMUNICATION
TECHNOLOGY FOR
EXTENSION**

06

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EXTENSION, ICTS AND KNOWLEDGE MANAGEMENT: THE 10 DIFFICULT QUESTIONS

ICT enabled extension offers new opportunities for bridging the knowledge gap in Indian agriculture. But several critical challenges still remain. Instead of asking "what ICTs can do for extension", it is time to ask how "how extension can harness ICTs in existing contexts, argues Shaik N Meera.

Agricultural Extension Services do play an important role in delivering information, knowledge and advice to farmers. However to remain relevant in these changing times, it has to specialise in "effectively managing and transferring knowledge or information packages". Information and Communication Technologies (ICTs) can play an important role in supporting extension in this regard. Over the past two decades, Governments all around the world have invested heavily in strengthening the national ICT infrastructure. ICT applications (Box 1) are supposed to bring new information services to rural areas on which, farmers, as users, will have much greater control than ever over current information channels.

Box 1: Information and Communications Technology (ICT)

ICT is an umbrella term that includes computer hardware and software; digital broadcast and telecommunications technologies as well as electronic information repositories such as the World Wide Web or those found on CD-ROMs. It represents a broad and continually evolving range of elements that further includes television (TV), radio, mobile phones, and the policies and laws that govern these media and devices. ICTs are often used in plural sense (ICTs) to mean a range of technologies instead of a single technology.

ICTs in Extension Initiatives

In spite of the tremendous potential of ICTs in improving extension delivery, the developing countries have not adapted a sound strategy to utilise the ICT enabled extension effectively. Though several case studies on ICTs in agriculture exist in India, there hasn't been any comprehensive study that tried to analyse ICTs in relation to extension. Very few studies focussed on the impacts of the ICT initiatives on the stakeholder community. Though the available literature on "ICTs for Agricultural Extension" brought out issues related to ICTs, the extension context was less discussed and this remains as a major limitation of these studies.

As there is no single optimal or best model for providing need specific, purpose-specific and target-specific extension services, there is no one-size best fit approach for ICTs in Extension. The ultimate choice of the ICT enabled agricultural extension approach depends on:

- The ICT policy environment,
- The capacity of ICT service providers,
- The type of stakeholders and the ICT approach adopted, and

- The nature of the local communities, including their ability to access and apply the knowledge and various e-readiness parameters.

ICTs being employed in extension could be broadly classified as follows:

Table 1: Categorisation of ICT extension efforts (based on tools, process and integration)

Category	Types	Examples
ICT in Extension - Tools		Earliest / Popular efforts
	Computer Networks	Gyandoot (Madhya Pradesh), Warana Wired Village Project Information Village Project e-choupal models
	Audio- Video Conferencing	MANAGE's video conference facility
	Community Radio	Deccan Development Society, Sauras Crane of Kutch (Gujarat based NGO – name translated), UAS- Dharwad, so many SAUs
	Mobile Telephony	IFFCO's Kisan Sanchar Limited, RML (Reuters Market Light)
	Landline Phones	Kisan Call Centres
	Automated Tools	Automated Milk Collection Centres (tools) of AMUL
ICT in Extension - Processes	Blended	Agrisnet of State Departments
	Hub & Spokes Model	e-Sagu of IIT Hyderabad, Kissan project of IITM, Kerala
	Kiosk Model	Common Information Centres/ Common Service Centres, ATIC
	Knowledge Management Process	Rice Knowledge Management Portal, Agropedia, Digital Green
ICT in Extension - Integration	Open and Distance Learning (ODL) process	TN Agritech Portal, IGNOU
	Integrating ICTs into existing extension systems	ICT efforts of KVK's such as Baramathi
	Optimizing with minimum change in existing extension systems	ICT-ATMA Integration RKMP into existing AICRIP-extension
	Maximizing with maximum change in the extension systems	Yet to be developed (not sure yet about the feasibility)

ICTs in Agricultural Knowledge Management

The mammoth task of driving the knowledge sharing process in agriculture necessitates extension to adapt to ICT mediated Knowledge Management (KM). Of late, organisations in agriculture realised the importance of managing the knowledge (implicit & explicit; internal & external) for effective targeting and dissemination. The new face of 'digital divide' is "digital information/ knowledge divide". Knowledge management can play a pivotal role in enhancing agricultural productivity by enabling appropriate knowledge and information to reach knowledge intermediaries and farmers in a timely manner. Agricultural Knowledge Management strategies are built on huge agricultural content (Data-information-Knowledge).

In most developing countries, agricultural institutions have not moved to a level where new and consistent information services to farmers and other stakeholders are offered based on quality and contexts. For adopting KM strategies in extension, we need to pay more attention to (1) codifying and sharing tacit (i.e. implicit) knowledge, (2) creating new knowledge and (3)

having everyone in the organization involved in the process. Only then can the organisation be viewed as a living organism capable of creating continuous innovation in a self-organising manner."

The Ten Difficult Questions?

ICT enabled extension offers new opportunities for bridging the knowledge gap in Indian agriculture. But several critical challenges still remain. Most of the on-going initiatives are work in progress and there is a lot to learn from these.

As an extension scientist closely working on ICT initiatives in extension, I would like to raise 10 questions that we need to answer if we are serious in promoting ICT enabled extension.

1. Have we understood the context well?

Agricultural extension, whether public or private, operates in a context that influences the organization, form, and content of transfer activities. The dominant characteristic of that context is change. As the changing context affects all aspects of extension, the context should be examined and understood so that extension can be better managed. The history and

recent developments in Asia illustrate that ICT "prescriptions" are doomed to fail if they are not based on `farmers needs`. And it must be driven by learning about what works and what does not and by the nature of local

circumstances and context. As extensionists (with a comprehension on functional and structural components of our institutes/ organisations), are we in a position to envision opportunities for ICT interventions?

Box 2: ICAR and Knowledge Management

Explicit knowledge documented in the form of bulletins, text books and other publications will not be sufficient for addressing knowledge needs of various stakeholders. Though agricultural research organisations produce large amounts of scientifically validated knowledge, very little of it is transformed to action to solve real problems in the field. This realisation led ICAR (Indian Council of Agricultural Research) to strengthen its initiatives on knowledge management.

As a first step towards achieving this objective, an exclusive portal on rice viz., Rice Knowledge Management Portal (RKMP) was developed. The RKMP has several global firsts in terms of comprehensiveness and utility (<http://www.rkmp.co.in>). Built on web 2.0 standards, this portal caters to location specific information needs of many stakeholders (policy makers, farmers, extension professionals, researchers, traders, NGOs etc.) on 24x7 basis. This portal is an example of harnessing the enormous potential of ICT mediated KM strategies into existing ICAR (especially All India Coordinated Rice Improvement Project - AICRIP) set up.

2. Do we have clarity on what is our role in ICTs / KM enabled extension?

Most of the ICT4D reports end up stating "what ICTs can do for extension". Seldom have they addressed the issue of "how Extension can harness ICTs in existing contexts". What would be the role of extension scientists in addressing such issues? If extension scientists have to take a lead in this, they require to know how farmers and extension workers access knowledge; how communities at the village level perceive the value of ICT enabled services; and how they could be linked to organizational knowledge flows. Of course, there are other well known issues such as availability of relevant content, trust on the source of information the role of infomediaries, sustainability of ICT interventions etc that also needs to be considered. However, I would expect extensionists to focus on the most practical ways of content development (who, how, processes, scale and depth) and developing the capacities of infomediaries. Can we address relevant issues such as what makes public extension workers to become infomediaries? What about their job chart? Is there a scope for incentives for efficient performance using ICTs? What indicators should be in place before NGOs/ private sectors integrate their work with that of other ICT service providers?

3. Are we practical enough while thinking ICTs strategies?

ICT applications alone will not be readily available, accessible and applicable in farmers' conditions. It requires higher commitments from field extensionists (There is myth that ICT extension experts are not engaged in field extension activities). How to build farmers communities (such as radio rural fora) so that ICT services/ content

are applied in the field conditions? Is there a scope for `zooming in zooming out` farmers learning/ experiences using ICTs. [For instance, take the case of "Digital Green". It starts with local communities' practices, their innovations and the words they use in relation to the chosen topic (zooming-in). Key learning needs are defined and videos are produced in close consultation with the end-users. Consequently, while showing the draft videos to more villages (zooming-out), more insights are gathered about the innovations and their socio-cultural context, and further adjustments made.] While doing so what are the validation/ credibility issues? - How to overcome them?

4. Is 'access' the only issue that makes ICTs relevant?

ICTs are not a panacea for all the problems of extension. How many of the key challenges in extension could be addressed by ICTs? Whether use of ICTs will assure (*ceteris paribus*) efficient and effective extension delivery? For instance, can ICTs address the issue of weak linkages between research & extension? What other enabling factors should we consider? Similarly, considering ICAR as a major "reliable source of research outputs", what constrain its scientists and organisations in sharing information? Can ICTs help in this regard? If storing/ retrieval/ re-writing/ sharing / re-packaging/ uploading are the problems, then what activities have to be planned to strengthening this? As extension scientists, is this a priority area for us?

If SDA (State Department of Agriculture) is a major extension body - then what constraints are there for grass root extension worker in accessing (ICT enabled services/ content)? What enabling factors should we consider? If `access` alone is the problem - then rural ICT centers can help. But are

we sure that `access` is the real problem or are there other problems which we don't (want to) see.

If we want to bring all Research -Extension organizations onto a common platform, what adjustments need to be made? What is the `level playing field for each of them"? Whether their mandates allow them to do so? What incentives are required? For instance, researchers would be inclined to publish research articles rather than contributing the content to ICT – extension initiative.

5. Are ICTs only for teaching or are they meant for learning too?

The main focus of reforms in extension currently is towards learning rather than teaching. This learning emphasis would require new methodologies and approaches that are demand-driven and increase the real, interactive participation of all stakeholders at all levels of decision making in an extension delivery network. Can we integrate ICTs for doing this? If yes, how? Looking at ICT initiatives in the past, I see lot of them as 'prescriptive' (teaching) initiatives rather than as 'learning' initiatives. For example, most of the initiatives do not adopt web 2.0 standards (enabling users to contribute their experiences, locally developed knowledge). Can we convince Agri R&D managers to have platforms that share this kind of initiatives on a problem solving mode? If yes, validation and contextualising the content (making information in to knowledge) can be done without much effort.

6. How can ICTs complement other extension approaches?

While focusing ICTs, we tend do completely ignore basic extension work/ methods that an extension worker uses. For example, if field demonstrations are conducted by extension workers - how ICTs would contribute to maximizing its impact. Whether `field days` can be captured in video format and then these video are shown in neighbouring villages? There are `n` number of basic extension tools that could be blended effectively with ICTs. Can we list out such experiences to formulate a strategy?

7. How to make knowledge available, accessible and applicable? Can we move from managing ICTs to managing knowledge/ services using ICTs

"Issue of content/ knowledge" is perhaps the most neglected of all. (Even though we know the importance of it - we seldom know how to do?). We are yet to grow from addressing connectivity divide (establishing 'ICT kiosks') to knowledge divide (Managing the knowledge).

Over the years, ICT experts have over simplified the issue of agricultural content/ knowledge - they report when the entire ICT infrastructure is available - within no time `knowledge can be generated/ digitized/ uploaded). It's high time; we focus on this as well. Our recent initiative of Rice Knowledge Management Portal (www.rkmp.co.in) tried to build, validate, and contextualise the rice knowledge (running in more than 14,000 pages with 18 platforms) in a short span of 2.5 years. But for Indian agriculture as a whole, the effort required is huge. In the absence of such validated knowledge on the web, the junk is being fed to agricultural stakeholders. Are we, as extension scientists, willing to lead these ICT mediated knowledge management initiatives?

8. How to enable knowledge with time critical services?

I do not know how feasible to integrate `knowledge` with `time critical services` (the services that are critical for decision making and are required in timely manner) in the whole chain of ICT actors. The "*e-choupal*" from ITC is a good case for this. The *e-choupal* links knowledge and technology transfer for creation of economic and social capacity and provide an end to end solution with the farmers. But when we think of modernising extension in pluralistic environment - what strategies should be in place? The lead extension centres in India are yet to try these possibilities.

9. How do we measure the impact of ICT interventions?

Impact of extension activities has been questioned always because attributing 'change' to extension interventions was never taken seriously by extension researchers. Same is the case with ICT interventions. Benchmarking and establishing causality is a fundamental part of result measurement, as we want to see what impact a particular intervention has on the target population. In other words, is there a causal link between the ICT activity that we undertake, and the result we see?

10. Can we develop our own indicators for ICTs, KM extension interventions?

We should have evidences of use, pattern, purpose, users etc., for ICT / KM activities. Without this evidence, ICT experts will promote over simplified success factors such as number of hits (say from google analytics). For example they derive success for `online repositories` based on the number of hits directed for every key word on google. But as extension professionals, we know for sure that this doesn't mean anything. Now the

question is how to develop and use appropriate methodologies for better impact assessments for 'soft extension interventions' such as knowledge based advisories? Do we have sufficient indicators to establish evidence of use of ICTs in extension such as:

- Access - Relative easiness in access due to ICTs,
- Availability - Quality of knowledge provided through ICTs
- Appropriateness - comprehensiveness (there is a paradox- while focusing on comprehensiveness, we may lose appropriateness to a specific location)
- Complimentary of knowledge with the

existing services/ infrastructure of extension organizations

- Presence of pre-requisite conditions and multiple deliveries and opportunity costs
- Willingness of partners to uptake (ability of content to value add to their services)
- Attributing the `knowledge` to productivity/ income/ other gains

Understanding the above issues related to use of ICTs is critical for extension scientists and field extensionists to fully harvest the potential of ICTs. Instead of "ICT centric approach of extension", it is time that we move towards "extension centric approach for ICTs".



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COMMUNITY RADIO IN SOUTH ASIA— POTENTIAL FOR SHARING COMMUNITY INFORMATION AND CONNECTING PEOPLE

Community radio (CR) is a remarkable mass media that could give voice to the voiceless in rural and urban societies. In this blog WADP Wanigasundera and MC Rasmin explore the current status of CR and its contribution to the development of the rural economy, largely based on their recent visits to several CR stations in India, Bangladesh, and Nepal.

If a radio promotes public participation and people's interest, informs the community, facilitates people in getting solutions to problems in their daily life, respects cultural diversity, includes women as key players, provides a voice against dictatorship, then it can be called a Community Radio (Vigil 1997). CR, as a local medium for community communication, can play multiple roles in driving social change. Its ability to produce programmes in local languages and its structural flexibility that allows the use of audience members as a key part of station management, programming and production, enables it to drive this change.

Development of Community Radio in South Asia

CR in the South Asian region evolved as a third sector to cater to the people who were widely excluded by the mainstream media and the people who were going through development challenges (Pavarala and Malik 2007; Girard 2001).

Nepal was the first country in South Asia to open its airwaves in 1997 for community and commercial broadcasters (Dahal and Aram 2011). Radio Sagarmatha was eventually licensed on 18 May 1997 and it began broadcasting on 22 May 1997. It is the very first community radio in South Asia (Banjade 2007). Radio Sagarmatha set the standard for independent, public-interest radio in that country.

In India, the agenda of CR was mostly led by civil society organizations (CSO) and individual activists. There, the need for CR was realized in the absence of a space for community voices and fair representation for marginalized sections in the mainstream and state-owned media (Frederick, 2003). Though news and current affairs have been restricted by official policy, CR has been legally recognized as the third sector (Kapoor et al. 2017; Pavarala et al. 2011). In India, until late 2006, only educational institutions were allowed to set up campus radio stations having a transmission range of 10-15 km. The scope was only recently expanded to also include non-profit agencies, agricultural research institutes, and schools— these were allowed to set up community radio stations that would involve local communities in the content production process.

With regard to Bangladesh, Ganilo et al. (2016), believed that the advocacy for CR in Bangladesh was initiated in early 1998, but it took 10 years for CR to be legally recognized. At present, 17 CR stations are functioning in Bangladesh. In 2016, this number was 17 and the listenership was estimated to be 6.18 million (BNNRC 2016).

Closely looking at the broader CR agenda, it mainly acts as catalyst to facilitate inclusive development and free flow of information. Bazlur Rahman, CEO of Bangladesh NGO Network for Radio and Communication (BNNRC), claims CR, is trying to contribute to the achievement of the Five-Year Development Plan (2016-2020) of the Government of Bangladesh (GoB).

There's a long-existing debate among CR scholars in Sri Lanka and South Asia on the existence of Community Radio in Sri Lanka. A large volume of literature discusses this subject (Jayaratne et al. 2005; Rasmin 2011). In the very first decade (1979-1989) 'the famous' Mahaweli

Community Radio (MCR) was initiated under the state broadcaster – Sri Lanka Broadcasting Corporation (SLBC) (Rasmin 2011). MCR was set up to facilitate socio-economic development of the people who became the settlers when Mahaweli Development Project implementation started in Sri Lanka. MCR during the 10 years of its operation played a significant role in empowering farmers by: providing timely agricultural information, offering a knowledge base, sharing local knowledge, bridging local farmers and agri-service delivery entities, shaping agricultural behaviors, providing knowledge and information about new technologies, and acting as an effective extension tool.

Box 1: Community Radio

Various scholars have tried to define CR in different ways. According to AMARC–Europe (1994) CR is a non-profit entity, which offers participatory opportunities and services to the community in which it is formed. CR provides accessibility to, and enhance, the participation of citizens in the community medium (Barlow 1988). CR is fundamentally differentiated bits: 'of the people, for the people, and by the people' format (Mtimde 2000; Tabing 2002). Jallof (2012) defined key aspects of community broadcasting as for, by, and of the community. It is the voice of the voiceless and a space for alternative political and socio-cultural thinking and action. Yet another feature that distinguishes CR from other kinds of media is its democratic nature. Barlow (1988) was of the view that it is different from commercial radio. Community involvement, non-profit nature and the democratic structure makes CR unique. It serves specific section of society known as a community (Kasoma 2002) and does not treat the audience as commercial objects, but as an integral part of the radio (Fraser and Estrada 2001). According to Howley (2005), Community Radio emerged as a response to the encroachment of global forces upon local cultural identities and socio-political autonomy.

Based on the location and service provided it is known by various names (Wilkins et al. 2014). In Latin America it is known as community, educational, and grassroots or civic radio. In Africa it is known as rural or bush radio. In some parts of Europe, it is called free radio (Jankowski 2002). In Australia it is known as public radio, and in the United States of America and many other countries it is known as community radio (Offer 2002). This indicates that CR is often conceptualized and perceived differently by different people in different parts of the world.

Role of Community Radio in social change

Community radio stations operate to provide social benefits, and they provide an open process for participation. CRs also make available a range of educational programmes, thus pushing for collective change. CRs serve as an expression of the community and it offers a voice for everyone in that society, including the marginalized. It offers a channel for the unheard to speak (Jallof 2012). It also enables action-oriented relationships and change (Mainali 2008). The communication process offered by the CR can lead to social change. It capacitates marginalized people to challenge poverty, includes multiple voices, promotes democratization, covers politically and socially important events, and helps to understand the community well. Being a transparent media, its benefits are accessible to various segments of communities (Box 2).

Mainali et al. (2009) noted that CR can be a key factor in fighting exclusion and marginalization,

and this can be done by energizing community radio both in terms of content and access to radio management and technology use. Community radio is all about generating and sustaining social capital. Social capital is the ability of people to work together for common purposes in groups and organizations. In CR, community members are treated as participants and not as objects (Fraser and Estrada 2002).

Rural broadcasting for sharing information and connecting people

In the early 1980s the term 'rural broadcasting' usually referred to a division within the national broadcaster that produced programmes in the capital and broadcast them to the countryside. Now rural radio is 'local radio' (Girard 2001). Broadcasting that is inbuilt within the state system continues to remain all over the world and in Asia too. This type of broadcasting has always been more concerned about agricultural development broadly, and in addressing issues

Box 2: CR as a tool for social change

Bosch (2014) observed that CR is a tool for social change as well as a medium to reach the illiterate. CR offers a space for those who are neglected or marginalized by mainstream media. It has the ability to connect people around common objectives, thereby leading towards social change (Kaur 2012; Mainali 2008; Servaes 1999). Rajaseharan and Nafala (2009) explained that CR programmes can range across several issues –from health, education, environment, agriculture, and social development to entertainment. It uses technology suited to the economic capacity of the people, and not that which leads to dependence on external sources. Above all it is motivated by community well-being, and not commercial considerations. As a driver of social change, CR has specific characteristics. Tucker (2013) explained that CR is locally driven, run by volunteers, owned by the community, meant to be non-profit, and provides space for everybody's participation. Klimkiewicz (2010) emphasized more on community ownership and democratic structure but confirmed at the same time that the other characteristics that Tucker identified is also vital.

affecting farmers, providing timely and vital information, and connecting farmers and extension service providers.

Agriculture in general, and extension service in particular, has always been a highly knowledge-intensive sector requiring continuous information and a high level of connection between farmers and the service sector.

Farmers' quest for reliable, trustworthy and practical information – both from established systems and traditional practices – is ever increasing in this fluctuating global environment. The rapid changes happening due to urbanization, globalization, and technology development along with continuing farm crisis emphasize the need for timely, appropriate, and need-based information and knowledge that can help tackle the many developmental challenges.

Information is important for farmers so as to maintain livelihoods and to gain a competitive edge in a rapidly changing economic and production environment where traditional farming methods might be ineffective to meet new demands. Agricultural extension represents a mechanism by which information about new

technologies, better farming practices, and better management can be transmitted to farmers. Reisenberg and Gor (1989) stated that extension services are experiencing a declining impact and more emphasis is being placed on the use of mass media for agricultural information transfer. Zijp (2003) observed that face-to-face communication between extension agents and farmers, while crucial, cannot fulfill all the farmers' information needs. Extension agents are too few in number and, particularly in emergency situations like those related to weather or a pest infestation, time is too short. As a result, radio has been recognized as a highly cost-effective technology to convey information, training, and technology in rural areas (Chapman et al. 2003).

Trends in South Asia

In South Asia there is a rich broadcasting culture to focus more on agricultural development. Broadcasting started in India in 1927 with the proliferation of private radio clubs. The operations of All India Radio (AIR) began formally in 1936, as a government organization, with clear objectives to inform, educate, and entertain the masses. Agricultural broadcasting has been one of the key areas of focus for AIR. Today, AIR has a network of 232 broadcasting centres with 149 medium frequency (MW), 54 high frequency (SW), and 171 FM transmitters. The coverage is 91.79% of the area, serving 99.14% of the people in the largest democracy of the world. AIR covers 24 languages and 146 dialects in home services. In external services, it covers 27 languages– 17 national and 10 foreign languages (<http://agritech.tnau.ac.in/radio.html>). Every regional radio station has its own agri-programme customized and relevant to the local content. AIR (now Prasar Bharathi) has been playing a significant role since many years in bringing new technological information on agriculture and other allied subjects to farmers.

With the recent liberalization of the broadcasting licensing policy, Community Radio has received a new impetus in India. This form of participatory



communication has proved to be very successful as a tool for social and economic development at the grassroots level. In Sri Lanka, a separate service – Farm Broadcasting – functions within the Department of Agriculture and works closely with state radio stations. The tie between the Sri Lanka Broadcasting Corporation and the Department of Agriculture has resulted in several agricultural programs from the 1980s onwards. Farm broadcasting has been an integral part of Sri Lanka's CR from the very beginning. India's post-independence experiments with ICT use in agricultural development started with radio.

Community Radio stations in Asia generally pay attention to agriculture-related programmes and providing information vital for farmers is one of the cross-cutting priorities. Some radio stations are completely dedicated to agriculture-related programs. Krishi FM in Nepal, the radio stations run by the e-Radio Broadcasting Station of the Tamil Nadu Agricultural University (TNAU), in India, and Krishi Radio in Bangladesh play a dedicated role in extending radio broadcasting to farmers.

–e-Radio Broadcasting Station-India: When it comes to CR and sharing information with farmers in a timely manner, promising examples exist in Asia. The Tamil Nadu Agricultural University's (TNAU) –e-Radio Broadcasting Station can play a significant role in empowering people with information and in bridging the gap between rural people and knowledge sources. The present project is implemented by Media Lab Asia in collaboration with World Development Foundation, New Delhi, for TNAU, Coimbatore. The TNAU Community Radio Station with a coverage of 15 to 20 km, has an 'e' component feature in it, and hence the broadcast programme is integrated into the e-Extension network. Handling Community e-Radio is an interesting and creative task. All the three types of intelligence, viz., abstract, mechanical and social, are judiciously utilized in this ICT tool for making the programmes informative as well as interesting. The 50-watt broadcast is available in 22 villages falling within a distance of 20 km from the university. From 10-11 thousand people in this region can access the radio programmes produced by TNAU. General farmer information, success stories from farmers, and information from experts will be available for farmers.

Sangham Radio-India: Sangham Radio (SR) is a unique community radio experiment which is run by poor Dalit women from rural India. Sangham Radio was launched in 2008, with the support of Deccan Development Society

(DDS). It is the first licensed community radio station in rural India. It helps through horizontal communication among their own communities as well as to take important issues to the outside world, to share their views and to find solutions. Listeners in villages about 30-40 km away from the station have also reported picking up the broadcast. Sangham reaches about 150 villages in Jarasangam, Zaheerabad and Raikod, and parts of Kohir and Nyalkal in the state of Telengana (India). The primary audience is rural women from marginalized groups, and its target is rural people in general.

Sangham Radio is an attempt to give poor and marginalized Dalit women a voice and a platform to share their views. In Sangham Radio, 95% of participation is by women. Women in farming, organic farming culture, and rural information play a prominent role in this radio. Pioneers of Sangham Radio set it up because they understood that local knowledge has not been utilized by mainstream media. Hence, illiterate but enthusiastic women's groups from the Dalit community challenged all these social knowledge spheres and created a new radio listening culture. And the role of Sangham Radio isn't limiting to just broadcasting radio programmes, they have already produced a number of short films on crop diversity, food and seed autonomy, making bio-fertilizers in the backyard, dangers of Bt Cotton, and so on. The women ideate, script, anchor, shoot, and edit their films while learning the finer aspects of filmmaking. These films that focus on development issues are screened at Sangham meetings, seminars, and film festivals.

Vayalaga Vanoli - India: In 2006, when the Indian government allowed NGOs and educational institutions to run community radio stations, Madurai District Tank Farmers Federation (MDTFF) successfully applied for a license. In 2011 it was assigned the frequency 90.4 MHz and started broadcasting from Kottampatti Village of Madurai District, Tamil Nadu, with a radius of 15 km. The FM airs nine hours of recorded programmes and three hours of live programmes covering agriculture-related tips, news, information on health, education, social affairs, weather reports, local employment opportunities, births, deaths, and special events. It also entertains villagers with cultural and music programmes. Four male and two female radio jockeys report from the field or broadcast the programmes from the studio. The station also makes use of local volunteers, while the information kiosk is in charge of community resource identification, programme recording and phone-in live programmes. The MDTFF executive

committee, made up of 15 experienced member farmers, meets once a month to discuss and review the radio programmes. Vayalaga Vanoli reaches over 5000 farmers in 100 villages of 27 Panchayats.

Krishi Radio-Bangladesh: Community Rural Radio Krishi Radio 98.8 is the only government community radio in Bangladesh, which was established by the Agricultural Information Service. The programmes of the radio are so popular that the listeners themselves have formed two listener group on their own initiative. The station receives a huge number of calls from listeners every day. Some community radios, as previously indicated, play remarkable radio programs on overall livelihood and agriculture development. In this case, ten officials and employees from the agricultural division have been working as full-time workers at the station. Moreover, 60 volunteers of the station are being trained by Network for Radio and Communication, a Bangladesh NGO, and some other organizations. Krishi Radio is now airing programmes between the hours of 9am to 11am and 3pm to 5pm. A news program, covering local, national and international news, is aired every day at 4pm. Farmers of the community are very upbeat about Krishi Radio, with one vegetable farmer saying that no one will be able to cheat them now, as they now know details of the daily market price through this radio.

With the slogan "My Radio, My Voice", Krishi Radio broadcasts a wide range of programmes in the local language of Barisali, a dialect of Bengali language, which is commonly spoken by almost all the native peoples of Greater Barisal region (Barisal Division). Topics include: agriculture, fisheries, climate change, gender issues, livestock, disaster risk reduction, health, youth programmes, as well as local songs and folk stories. To encourage community participation the programme "Listener's Letter" broadcasts criticisms and suggestions as received from letters sent by the audience. In addition to broadcasting, Krishi Radio also hosts a youth club to educate children about different issues and involve them in the production of radio programmes.

Krishi Community Radio – Nepal: Krishi Radio that broadcasts in 105 MHz is the first and the only agricultural radio in Nepal, and it was established in August 2009. It is a member of the radio network, ACORAB. It is managed by Dhunishebi Community Agricultural Communication Center, an NGO. Krishi Radio's primary purpose is to focus on technology adaptation and marketing in the Dhading district

of Nepal. Along with the above-mentioned main objectives, the radio aims at inculcating a sense of pride in the small family farming community, attracting youth to the farming sector, making people aware of organic food, discouraging the use of chemical fertilizers and pesticides, providing agricultural knowledge, and also to bridge the gap between farmers and policy makers.

Community Radio Meghna in Bangladesh also provide farmer information. The radio is being run in Charfession upazila of Bhola district; a largest island in Bangladesh. It is trying to empower the women specially the adolescents in the community. The dropped out adolescent girls of 12-18 years of age are the future mothers so if they are given proper education and awareness on reproductive health and hygiene along with skill training on different IGAs then they will be a productive force in the family. Moreover, an adolescent can bear the fruits of education throughout their remaining long life covering both her parental and conjugal family. Radio Meghna has special programs for them. In Bangladesh, Radio Sagar Dwip and Radio Jhenuk too produces programmes on issues affecting agriculture in.

Community Radio's contribution to agricultural development in South Asia

Close examination of a series of CRs in South Asia revealed that the majority of CRs has been supporting the rural agriculture sector. The leaders – both officials and community members – who are responsible for the CR has shown a great deal of dedication in serving the community through the programmes. Some of the innovative approaches the authors came across are discussed below.

- a. **Farmer gathering** - Radio Krishi in Nepal has this innovative programme called 'Farmer Gathering'. Krishi plays the role of a community mobilizer and bridge builder. In this gathering, farmers from a selected village come together and discuss existing challenges as well as likely future challenges affecting farmers, and then facilitated by the radio producer, they discuss potential solutions. In this participatory manner, new farming practices, rural innovations, and best practices are shared by the people. Some farmers bring their questions and clarifications to be posted by the radio producers. Radio producers map out the issues, record the inputs shared by the farmers, and produce a series of informative programmes in turn. In these programmes, the producers invite extension officers, farmer

leaders, government representatives and other experts to address the queries collected from the Farmer Gathering. Radio, in this context, plays a bridge building role.

b. Authentic local knowledge from local people - Popular media often deny or exclude local knowledge. CR in South Asia has a long history of mobilizing and providing a space for local knowledge from local people. MCR Radio followed a special strategy in which it located rural knowledge bases, identified people who have vital local knowledge on farming practices, and provided a space for farmer leaders to disseminate their extensive local knowledge. Similarly, the staff of Vayalaga Vanoli in India collects ideas, suggestions and requests directly from farmers in the field, and broadcast daily programmes on agriculture, animal husbandry, health, women and education. The key achievements of this radio include: building local knowledge on droughts and floods and generating coping strategies arising from community expertise/experience; facilitating knowledge sharing in agriculture based on practices; raising awareness on education, health, gender, rights, agriculture, traditional knowledge, information and communication technology for development; providing a space for community participation and debate; and identifying and showcasing local talents.

c. Building bridges - The major strength of CR is its local nature, low-cost operation and ability to reach local authorities. Indian CR Amara MSPICM produce programmes providing updated information to farmers and connect farmers with local authorities. Historically radios, like MCR, have raised up the voice of farmers, and made authorities responsible. Similarly, CR Amara MSPICM has always build a bridge between farmers and concerned authorities in several ways. Radio SSM facilitates a process whereby farmers get their crops insured. Radio Bundelkhand's programme concentrates on building resilient community ecosystems. This Radio promotes local talent and uses local art and culture as an effective way for communicating information.

d. Audio visual treatments - One of the innovative methods used by Sangham Radio in India is to produce audio visual materials in addition to the regular radio programmes. They do this to explain vital information to farmers in an interactive manner. Such

practices are commonly observed in the community radios run by agricultural NGOs and government-run media institutes. Kisan-Vani, in Madhya Pradesh, provides skills needed for the farmers on livelihood. One example is of professional agriculturists invited by this Radio to discuss future issues that could possibly harm the upcoming harvest. One thing observed was that radios' listenership is increasingly threatened due to the domination of popular media. In this context, it must be noted that in most of the South Asian countries people choose television and web media for their information and knowledge needs. In such a context, it is vital that radio is placed on an audio-visual platform.

e. Addressing human rights concerns - CR in general, being a community-based media, has the potential to address genuine concerns of the farming communities. It is possible mainly because CR provides easy access to people in the target villages. MCR Radio, which despite being owned by the government, raised the issues of affected newly settled farmers. David (2008) firmly believed that MCR Radio played a significant role in addressing issues affecting the rights of farmers. He observed that CR has extensive ability to sense the frustration of farmers.

In Bangladesh Radio, Sarabela (situated in Gaibandha's districts) produced creative programmes to address poverty issues. Addressing all forms of poverty, discrimination and injustice in the marginalized communities is the larger goal of this Radio. It works together with rural and char community of the Gaibandha districts and produce programmes on the educational, social, economic and cultural life of the disadvantaged. There are many perennial islands, called 'Char' in the Jamuna River. People in Char areas suffer from perennial natural disasters being deprived of basic human needs such as health, education, communication and information services. Now the rural and marginalized community people of Gaibandha district have direct access to discuss their own issues through Community Radio Sarabela 98.8.

Way Forward

There are several innovative CR and similar radio programme models exist in each of the countries studied. Given the innovative models available, it is important to assemble an account of such innovative programme models for the benefit of the whole sector. Community Radios operating

in South Asia have proved their high potential to exchange timely, vital information to the farming community, and thus empower farmers with necessary local knowledge. A mechanism

is therefore needed to share the experience of different models so as to enable local communities to benefit from them.



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DELIVERING AGRO-ADVISORIES THROUGH MOBILE PHONES- REALITY CHECK?

Though mobile phones promise new opportunities for reaching farmers with agricultural information, its potential remains unutilised due to several institutional and infrastructural constraints, argues, Surabhi Mittal and Mamta Mehar.

Over the past few years India witnessed several experiments on agro-advisory service delivery through mobile phones such as IFFCO Kissan Sanchar Limited (IKSL), Reuters Market Light (RML), Kisan Sanchar, Fisher Friend, M Krishi, and the recently initiated Kisaan SMS Portal. These service providers use a mix of text messaging and voice messaging along with mobile phone based applications. They provide information about weather, market prices, agro advisories, policies, government schemes, new technologies. Some of the service providers such as IKSL has reached more than 13 lakh farmers spread over 18 states in India.

Though several studies (Aker 2008, Aker 2010, Aker & Fafchamp 2010, Mittal et. al 2010, World Bank, 2011) have demonstrated the potential of mobile phones in improving the capacity of farmers to cope with agricultural risks, many others (Mittal, 2012; Fafchamp & Minten, 2012) have questioned its real impact on farmers. If farmers have to benefit, the messages delivered through the system have to be "actionable" and available at the right time. It should also be able to create awareness, strengthen capability of farmer to take informed decisions and give alerts in case of emergencies like frost, hail storm, floods. Moreover the information has to be relevant to his/her farming context and the model of mobile phone based agro-advisory should be sustainable. But how are we faring on these aspects?

The Reality Check

Content: Most of the mobile phone based agriculture information services have not been able to function effectively or meet the requirements of the farmers. Although farmers are getting information through these sources, they realise only little add-on gain from this information vis-a-vis the information received through traditional information sources (Mittal, 2012). The broad categories of information required by farmers are the same, irrespective of their location and crops (Mittal and Tripathi, 2009). However the messages delivered should be based on the information needs of farmers so that it can be used by them for daily agricultural activities. A better understanding of farmer's local context is needed to develop locally relevant content/advice that farmers need.

Sustainability: Various services started under different projects supported by different NGO's and development programs still require continued financial assistance. Sustainability issues had not been taken care of in most cases. Often the project support had been short term leaving the targeted group feel cheated resulting in loss of trust in information delivery through mobile phones. Most

of the initiatives are scattered and not connected with each other and this also acts as a constraint to realize its potential. There is a need to assess the willingness of farmers to pay for these services and develop sustainable business models.

Trust: Building trust and relationship with farmers is another aspect that can't be neglected (Kumar, 2005; Mittal et.al 2010, Lokanathan and De silva, 2010). Farmers generally trust face to face interactive sources of information such as fellow farmers and input dealers more compared to information provided through modern information sources such as mobile phones. A clear shift towards modern information sources requires the service providers to closely interact with farmers, developing trust on their motive and provision of reliable information to farmers.

Equity: Despite the increasing availability of mobile phones and supply of agricultural information the benefits are not reaching the poor (Bhavnani et. al. 2008). The main beneficiaries of the mobile phone revolution are the ones with skills and infrastructure. The poor and those living in distant areas are left behind further making them information poor (Mittal et.al, 2010). Despite the increasing penetration of mobile phones in rural areas, there is need for significant improvements in supporting infrastructure like markets, institutional credit, storage and warehouses, roads and capacity development programmes for farmers to attain the full potential of mobile phones in agriculture (Mittal and Tripathi 2009).

Harnessing the Potential of Mobile Phones

The four main components of any service delivery model are: What to deliver? When to deliver? Whom to deliver and How to deliver? In this case, agro advisories have to be delivered to the farmers using mobile phones. This looks simple! But is it that simple?

What to deliver?

The information to be delivered or the content is the "soul" of the model. This content can't be developed only by subject specific experts; it has to be validated and has to be generated on time when the crops or other agricultural activities are in a particular agricultural cycle. This knowledge has to be converted into simple language that can be understood by the target farmer groups. The local language, appropriate content creation and its validation are important parameters to be considered. The information delivery has to be demand led and not supply driven by what is available with the scientific community.

In a CIMMYT survey (2011) with 1200 farmers in Indo-Gangetic Plains (IGPs), it was highlighted that the most important information needed by farmers is about ways of addressing pest attack and advice on the right variety that can better adapt to changing climatic conditions. However the information they commonly get from various sources (including the service providers through mobile phones) include standard prescriptions on input use (pesticides, weedicides, etc.) and general seed varietal recommendations. Monitoring and assessment of farmer needs therefore has to be a continuous process with provision for a feedback loop. Also the content needs to be gender sensitive.

When to deliver?

Timing of delivery of content has to be in the cropping cycle which the farmer is operating in, but it also has to be backed up by day to day details of each of these activities and respective actions to be taken also need to be properly timed e.g., information on choice of variety needs to be timed much before the sowing period. The timing of delivery of information (giving farmer enough information to make informed decision) is crucial. One of the examples of this was saving farmers' wheat crop from the attack of rust mainly in PBW 343 variety in 2011. Farmers got alert information from SMS service providers about the traces of rust noticed in few fields and were advised to take recommended measures. Those farmers connected with the SMS service could take prompt action to save their crop.

Whom to deliver?

The database of farmers to whom specific information is to be delivered is to be created based on some predefined criteria. If a farmer does not want the information or is not accessing information on the mobile phone in the database, then this information delivery is not useful. Some service providers like RML, IKSL and the recently launched Kisaan SMS portal attempt to create database with farmers cropping pattern and accordingly form communities for information dissemination. The database has to be dynamic in nature so as to track changes mobile numbers and change of service providers. The information about their land size, cropping pattern, soil type, geographical location, types of inputs used, variety of seed used, irrigation facility etc. has to be an integrated part of the database to deliver precise information.

These types of information are not available with KVVKs, research institutes, state extension machinery, mobile service providers or NGOs in most cases. It is thus important to create a

platform to integrate these databases and also regularly update it with information collected by the field staff on the ground and tele-feedback systems. Similar attempt is being done under the CCAFS project in selected villages of Karnal, Haryana and Vaishali, Bihar. Otherwise we are just delivering what the traditional mode of ICT had been informing farmer in a conventional style.

How to deliver?

The information sent on mobile phone in the form of text message or voice message has to be based on the preference of the targeted consumers. Merely receiving messages over mobile phone will not motivate the farmers to start using this information or apply as recommended. Awareness has to be created among farmers about utility of this faster means of communication and its utility for their benefits. This has to be supplemented with demonstration of new technologies on farmer's fields and through field trials. In CCAFS project a similar approach is introduced in selected treatment villages where climate smart technologies are introduced along with information dissemination through voice messaging. Efforts have to be made to build trust with the farmers. To strengthen the relationship it is important to find synergies between the various public and private partners and also with other ICT models.

The effectiveness of the different extension systems (public and private) that are using mobile phones based intervention plays an important role in the impact of mobile phone interventions in agriculture. Sometimes, institutions and policies in these organizations constrain the development of an effective knowledge sharing system. One should also note that over time as information flow increases and information gap reduces, the noticeable change in impact will be less. This is so because as farmers become more aware, the utility of the information they receive declines. For instance, market price information through SMS is not valued by farmers who have access to price information via internet. Overall the impact will be a function of good technology, policy, efficient markets and institutions. Moreover, the financial sustainability of service provision is crucial for its long run operations.

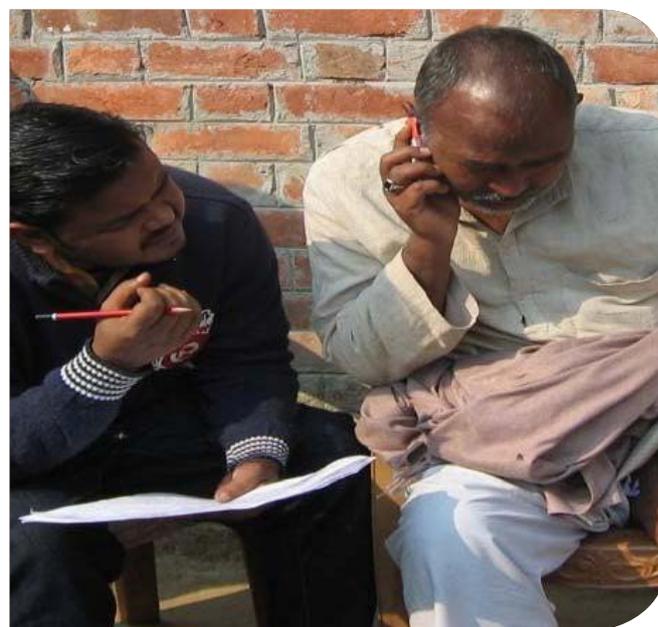
Conclusions

The process of integrating mobile phones into the traditional mode of extension to farmers is slow and still at an early stage of development. The key challenges that mobile based information system face are- its sustainability, up-scaling to wider operations, building trust with farmers, delivering

required information on time. But with increasing penetration of mobile phones and development of new applications and services many of these issues are getting addressed. These in turn will catalyze rural development and economic growth. Mobile phone-enabled information delivery mechanism should try to address the information needs of small farmers by reducing their knowledge gaps. However, enhancing the potential of mobile based advisory services will require significant improvements in supporting infrastructure, content development, client targeting, development of farmers' skills and a suitable policy environment. To enable these, appropriate policies, right incentives and institutions need to be developed.

Way Forward

- The service should be able to meet the varied and increasing demand of farmers. An assessment of the farmer's need for information should be done at the village level and continuous evaluation of needs should be an inbuilt part of the system. This will help service providers to keep track of the existing socio-economic situation of farmers and prevailing market and infrastructure constraints.
- Accuracy and timeliness of service is an important factor. To fully utilize the potential of two-way communication facility on mobile phones, help lines should be created to provide customized solutions and to enable feedback from farmers.
- Modern service providers should build synergies with existing extension services (as envisaged currently under the Farmers' Portal) so that information gaps at various levels could be better addressed.



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ENHANCING THE POTENTIAL OF QUALITY VIDEOS FOR FARMERS

Farmers like to watch quality videos, just like anybody else. However, lack of availability and distribution of quality videos on agriculture in local languages constrain farmers in accessing this tool. In this blog, Paul Van Mele and Jeffery Bentley share their experience with use of videos in agriculture and how "Access Agriculture" is making a difference in this area.

Agricultural advisory services in developing countries face many challenges, one of which is to respond meaningfully to farmers' diverse demands for advice on crop, livestock, fish, processing, business, finance and marketing issues. With limited resources advisors struggle to reach the millions of farmers. Audio-visual tools are better than written materials, workshop or radio for sharing good agricultural practices with farmers. Farmers like to watch quality videos, just like anybody else. And like most people, farmers are more likely to watch a video and remember it if the film is well made.

In 2011, over 500 extension service providers responded to an on-line survey organised by the Global Forum for Rural Advisory Services (GFRAS), the Sustainable Agriculture Initiative (SAI) Platform and the Swiss Agency for Development and Cooperation (SDC). The extensionists said they went to great efforts to find suitable training videos for the farmers with whom they work. More than 80% expressed a need to establish a specialised web-based service for sharing quality training videos for farmers in developing countries (Van Mele, 2011).

The study also revealed that farmers mainly rely on outside agencies for watching agricultural training videos. Farmers would watch videos on their own with their family or neighbours if video disc distribution mechanisms were in place - and farmers are willing to pay for video discs and video shows if they felt it would benefit their business.

About 85% of more than 500 respondents found local languages very important for farmer training videos. To ensure that videos are sharable and of use to the global community of extension service providers and farmers, producing many poor quality local language videos is not cost-effective.

Organisations are willing to translate and use videos made in other countries if they are relevant and of good quality. Therefore, the establishment of an authoritative organisation that supports the on-line viewing, downloading and physical distribution of quality agricultural training videos was answering a real demand. In 2012, two media companies, Agro-Insight and Country wise Communication, joined hands to set up the International NGO Access Agriculture, with the aim to promote the sharing and use of agricultural training videos in developing countries.

Access Agriculture

In 2012, the International NGO Access Agriculture was established with financial support from media companies and the public sector. To reach out to service providers across the world, Access Agriculture created a user-friendly website

allowing people to watch quality videos in various languages (www.accessagriculture.org). Extensionists can also download any of the videos after registering (for free). A language search function allows visitors to see which videos are available in a particular language.

By the end of 2013 videos were available in more than 45 languages. Not all videos are available in all languages. Organisations can request Access Agriculture to translate any of the videos in any language. This demand-led service at a modest cost ensures that all language versions maintain the quality standards and that the new versions become available in the public domain through its website.

To reach out to farmers, Access Agriculture also coordinates the mass distribution of local language DVDs, and relies on the creativity and resources of local service providers to share and show videos to farmers. It is an open system, non-project approach. As an example, across Africa about 50,000 "Fighting Striga" DVDs in 20 local languages were distributed to extension service providers, rural radio stations, farmer organisations and farmers.

DVD Distribution and Use in Bangladesh

A video called "Save More, Grow More, and Earn More" was developed by Agro-Insight with CIMMYT in 2012. This "Save More" video shows how farmers in Bangladesh use strip tillage and bed planting machines attached to two-wheeled

tractors (<http://www.accessagriculture.org/node/949/en>). This video was included on a DVD with four other videos on rice seed health, which were made in 2003 in Bangladesh with IRRI.

The NGO AAS (Agricultural Advisory Society) screened the machinery video in 332 communities in 11 districts and reached more than 85,000 farmers in three months (Harun-ar-Rashid, 2013). 78% of the audience was male. But wherever AAS showed "Save More," it left a copy of the DVD for the folks to watch again. They could also watch the rice seed videos if they noticed them on the menu and were interested. AAS left over 1,200 DVDs with tea stalls, NGOs, CBOs and many others.

In 2013 CIMMYT and AAS surveyed 227 video hosts by phone. About 69% of the people voluntarily screened the video between one and 25 times, with an average of four (Bentley et al. 2013b). None of these volunteers were paid to do anything with the DVDs they received. The full study report is available at <http://www.meas-extension.org/meas-offers/case-studies> some of the interesting findings from this survey are as follows:

Tea stalls

Many of the tea stall owners said that they were too busy making tea to watch the videos themselves, but just turned them on for their customers. The tea stalls continue showing the videos, probably until all the regular customers have seen them.

Type	Tea Stalls
Number	29
Showed the video	27 of the 29
Average number of screenings (for those who could estimate)	9
Average audience size (for those who could estimate audience)	50
Women in audience	Negligible

Note though, that few if any women go to a tea stall. People who go to the tea stall are those who do not like to stay at home in the evenings, or who are too poor to own a TV. They mainly go to watch Indian films. Wealthier and successful farmers don't go. Village tea stalls are a better way to reach an interested audience than tea stalls in bazaars.

Dish-lines

Cable TV could gain from showing attractive videos. Women have relatively easy access to TV. Small cable TV stations are called "dish-lines" because they have satellite dishes and run cable lines to homes and businesses. They capture 40 or 50 channels and many of them make one or two more themselves with DVDs. Channels include

Hindi musicals, contemporary and classical Bengali films, news, Animal Planet, Discovery, National Geographic and Aljazeera. Some have just a few hundred subscribers, and only charge 100 to 150 taka (\$1.35 to \$2) a month.

Despite the overload of entertainment content, all six of the cable owners showed the videos. If there was a large enough supply of attractive agricultural learning videos, a dish-line might be able to create an audience, e.g., broadcasting the programs as a regular feature, at specific times. Perhaps the best strategy to motivate them in the future is to have CBOs or local government authorities give agricultural videos to the local cable, so they feel that influential local people want them to show the videos, not an outside agency that may have money.

Department of Agricultural Extension

DAE is the government extension wing. Most of the DAE extensionists shared the videos with few farmers, although some individual agents did an excellent job, and the DAE has more potential to reach women than much of the private sector.

Union Information Service Centre

The UISC are like private business centres, embedded in local government offices and charged with helping local people process their paperwork, for small fees. Although the people working at the UISC do not have the mandate for agricultural extension, most of them did show the videos, and more frequently than the DAE. This is probably because the UISC people are younger, and also they have the equipment to show videos. Some of them showed the video because AAS asked them to. Almost all of the UISC offices have projectors and could certainly show videos in the future. To make this happen they may need to be encouraged by the union chairman or other local officials.

NGOs

NGOs are common in Bangladesh, and many have donor support. They are a diverse lot. They have the potential to reach farmers and some of them work specifically with women.

Although some NGOs did little with the DVDs, some of them work with thousands of farmers and could distribute DVDs, e.g. to groups of women.

Community-based organisations

Some CBOs are savings-and-loan groups which only move money; others are clubs sponsored by NGOs, and there are even a few IPM clubs that are keeping the school spirit alive. Some of the IPM clubs showed the videos several times. They often create a space where women can interact. If CBOs have a DVD player they usually watch the video. Several times, especially if have other information, such as a demo. Some CBOs reach women.

Type	Cable TV
Number	6
Showed the video	All 6
Average number of screenings (for those who could estimate)	6
Average audience size (for those who could estimate audience)	No idea
Women in audience (for those who could estimate)	Half?

Type	DAE
Number	7
Showed the video	4 of 7
Average number of screenings (for those who could estimate)	3
Average audience size (for those who could estimate audience)	250
Women in audience (for those who could estimate)	85

Type	UISC
Number	19
Showed the video	16 of 19
Average number of screenings (for those who could estimate)	3
Average audience size (for those who could estimate audience)	140
Women in audience (for those who could estimate)	20



Type	NGO
Number	7
Showed the video	All showed it in the office, but only 4 showed it to farmers
Average number of screenings (for those who could estimate)	13
Average audience size (for the 3 that could estimate)	130
Women in audience (per audience in above line)	80

Type	CBO
Number	12
Showed the video	9 of 12
Average number of screenings (for those who could estimate)	7
Average audience size (for those who could estimate audience)	180
Women in audience (for those who could estimate)	50

Lessons learned

Put many training videos on a single DVD.

People who received copies of the DVD were asked to pay specific attention to the “Save More” video, but they also watched the other videos on seed health that were recorded on the same DVD. As distributing DVDs requires resources, one gains more “bang for their buck” by putting 10 videos on one DVD, rather than just one video. The entertainment industry has understood this for a long time in Asia and Africa.

Some local service providers are more suitable to reach women than others.

Tea stalls attract men. Agricultural input shops in Bangladesh are managed by men and have a male clientele. NGOs could reach more women in Bangladesh, because NGOs create opportunities for women to meet. NGOs also have contact with CBOs, some of which are made up mostly of women. Even if the NGOs do not show videos, NGOs could get DVDs into the hands of local organisations that would show them. NGOs could be given many copies of a DVD and encouraged to distribute them to the farmer organisations they work with. Microcredit organisations may not be able to show videos to farmers, but can distribute DVDs to their members. Before distributing DVDs to NGOs, it may be helpful to identify the most promising ones and help them develop a distribution plan.

Distribute DVDs to as many local service providers as possible.

Some farmer clubs, UISCs, DAE, and NGOs actively showed the videos, whereas others didn’t. The UISCs could be encouraged to experiment with ways of charging to show videos. Some CBOs could give a copy to each group they work with. Reaching out to many service providers, especially grassroots

organisations increases the likelihood of reaching women.

Let as many people as possible get their hands on a DVD.

Most of the people who received a DVD showed it. Some groups watched the video many times, to study the content. Those without DVD players often gave the videos to a tea stall to be able to watch them. And, as we saw in Uganda (Bentley et al. 2013b), in order to get a DVD into the hands of every grassroots extension officer (especially public services like the DAE) the agencies must receive several copies and have a thoughtful distribution plan (Bentley et al. 2013b).

Local cable TV operators are interested in showing quality agricultural videos.

Although a few operators were hoping to get paid, they all showed the videos for free. The most successful case was where a CBO gave the DVD to their cable operator, who showed it 15 times, and various local people watched it. So the best strategy to motivate cable TV operators in future may be to have CBOs or local authorities give the videos to the cable station. Local connections can be the key to letting cable operators feel they are contributing to the community and satisfying their subscribers.

Way Forward

Farmers need information they can trust enough to try out. Ideally these should have some scientific basis and have been worked out by other farmers. If we have several competent extensionists, this information could be promoted through farmer field schools and other conventional extension approaches. But as there are so few extensionists and so many farmers who would like to learn new ideas, high quality videos and its distribution to reach large audiences becomes essential. This is where farmer-to-farmer videos come in.

We learned from the Bangladesh experience that volunteer community members will play a DVD on their own initiative for an audience, and that farmers will often ask to see the videos several times over, to study it. Some farmers follow up by seeking information in other ways, such as visiting a demo plot or contacting a machinery dealer. Since a DVD can be copied for about a dollar, a distribution plan to reach each community with a few DVDs should be cost effective.

Experiences from Bangladesh and other countries show that grassroots organisations and radio stations are happy to distribute DVDs, because it improves their relationship with the community.

Individual farmers and their organisations are keen to have their own copy of DVDs with quality training videos in their own language. As farmers are willing to pay for good videos, local service providers and entrepreneurs will increasingly play a role in distributing agricultural DVDs.

Public-sector support is still needed for local language translations, DVD multiplication and in-country distribution. With more and more development organisations becoming convinced of the great returns to investment, many farmers are becoming inspired to innovate by their peers from across the globe.



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SOCIAL MEDIA: NEW GENERATION TOOLS FOR "AGRICULTURAL EXTENSION"?

Though Social Media applications can be effectively used by extension and advisory services, lack of awareness and skill about its use currently constrain its widespread use. Moreover the organisational culture within extension organisations also restricts exploitation of its full potential by extension professionals, argues Saravanan Raj and Suchiradipta Bhattacharjee in this blog.

Agricultural Extension and Advisory Services currently face several new and complex challenges. As articulated in the GFRAS Position Paper "The New Extensionist", it needs new capacities to effectively deal with these challenges (Sulaiman and Davis, 2012). The increasing pluralism in extension funding and delivery demands new relationships, knowledge flows and partnerships among the wide range of EAS providers and other actors in the Agricultural Innovations Systems (Davis and Heemskerk, 2012). Social Media can play an important role in enhancing interactions and information flows among different actors involved in agricultural innovation and also enhance capacities of agricultural extension and advisory service providers. These are highlighted below drawing examples of its use in extension and advisory services which are primarily led by voluntary efforts of few individuals, groups and professional networks.

Social Media

Social media refers to the means of interactions among people in which they create, share, consume and exchange information and ideas in virtual communities and networks. Kaplan & Haenlein (2009) define social media as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the "creation and exchange of user-generated content."

Social media has changed the way we communicate, read, search, think, talk, watch, listen, and sometimes start a revolution – be it political and or social. Social media is more about sociology and psychology of communication than about technology. If Facebook was a country, it would be the second most populated in the world after China.

The fact that only young people and teenagers are most active in social media is turning into an urban myth. Irrespective of age, gender, religion, geography, people are entering in the world of social media. The major five social media websites that are gaining popularity worldwide are Facebook (1.32 billion+), YouTube (1 billion+ unique monthly users), Google+ (500 million+), LinkedIn (277 million+), and Twitter (230 million+).

Social Media for Agricultural Extension

Developed Countries

Developed countries have started adopting and harvesting the benefits of social media for agricultural extension for some time. For example, US Co-operative extension system and universities

have adopted social media for connecting its clients especially through facebook, twitter, pinterst, google+ and youtube (<http://www.extension.org/>).

The AgChat (Twitter online discussion group by the AgChat Foundation) started in 2009 by a group of American farmers is widely used in USA, UK, Australia and Ireland for facilitating discussions of industry issues between farmers

and agribusinesses has 50,200+ followers and 25,000 tweets (<https://twitter.com/agchat>).

Many US land grant universities developed social media guidelines for extension. Considerable number of articles written by the extension experts from the co-operative extension system and US universities emphasises the potential role of social media in extension. Some of the useful literatures in this field are as follows:

Amy Harder, Hannah S. Carter, and Christy Chiarelli (2011). Maintaining Professionalism on Facebook: Tips for Extension Agents. WC107, Agricultural Education and Communication Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. (available at <http://edis.ifas.ufl.edu>.)

Mains, M., Jenkins-Howard, B., & Stephenson, L. (2013). Effective use of Facebook for Extension professionals. *Journal of Extension*, 51(5) Article 5TOT6. (available at: <http://www.joe.org/joe/2013october/tt6.php>)

Paul Hill (2014). "Connecting" with Your Clients [on Facebook], *Journal of Extension*, 52 (2) Article # 2COM2. (available at: http://www.joe.org/joe/2014april/pdf/JOE_v52_2comm2.pdf)

Lucas Clayton Fuess (2011). An analysis and recommendations of the use of social media within the Co-operative extension system: Opportunities, Risks and Barriers. Honors Thesis, Presented to the College of Agriculture, Life Sciences, Social Sciences of Cornell University, USA. (available at <http://dspace.library.cornell.edu/bitstream/1813/23129/2/Fuess,%20Lucas%20-%20Research%20Honors%20Thesis.pdf>)

Newbury, Elizabeth, Humphreys, Lee, and Fuess, Lucas (2014) Over the Hurdles: Barriers to Social Media Use in Extension Offices, *Journal of Extension*, Article number 5FEA1, 52(5). (available at www.joe.org/joe/2014october/a1.php)

Australian Government's Caring for Our Country program funded the project on "Social Media in Agriculture" to explore the use of social media (You Tube, Vimeo, Facebook, Twitter, RSS, etc.) as an extension tool (<http://agex.org.au/project/social-media-project/>). Research findings from Ontario, Canada indicated that (since 2008) individuals and organizations in the agri-food and rural sectors are including social media tools (Twitter, blog, facebook etc.) in their communication for innovation (Chowdhury and Hambley, 2013).

Developing Countries

Social media use has gained pace in the developing countries too, especially with Facebook. Some examples are given in the table below:

All these examples presented above are initiated by individuals, small groups and networks to disseminate information by and for agricultural stakeholders through social media. The number of followers/members of these pages, communities and groups are increasing every day and many of them are professionals. Social media use in agriculture is not restricted to any specific age group but users belong to all age groups. While Twitter is a more preferred platform in developed countries, Facebook dominates in developing countries. While farmers in developed countries are active in social media to tell their stories and connect with their clients, in the developing countries, these efforts are scattered and there are only very few cases where extension professionals and farmers participate actively in social media.

Table 1: Examples of use of Facebook in agriculture extension

Name of Group/Community/Pages	Description	Target users	Region	Followers/Members*
Use by farmers				
Livestock Information and Marketing Centre (https://www.facebook.com/groups/Livestock.TN/)	Members (farmers, extension personnel, scientists, market functionaries, consumers, local leaders, etc.) of this group share information related to livestock production, management, marketing, etc. A separate page is also on facebook related only to marketing of livestock. (https://www.facebook.com/Livestock.Market)	Agricultural stakeholders related to livestock	Tamil Nadu, India	49 483

Mkulima Young (Young Farmer) (https://www.facebook.com/mkulima.young)	This page is an information sharing platform for young farmers started Joseph Macharia, a young farmer himself. Mostly agro-advisory and market information are shared.	Young farmers	Kenya	39 082
Natural farming Development Centre (https://www.facebook.com/groups/NaturalFarmingTN/)	Members of the group share information related to organic farming, permaculture, hydroponics, aquaponics, Natural Repellents, etc.	Farmers interested in organic and zero budget agriculture	Tamil Nadu, India	16 268
Turmeric Farmers' Association of India (https://www.facebook.com/turmeric.farmers)	This page was created by turmeric farmers to stabilize price of turmeric in the market. Till date, the farmers connect through the page and share information to keep turmeric price stable and increase marketing opportunities of turmeric.	Turmeric farmers	India	2 911
National Ecological Producers Association (APNE) (https://www.facebook.com/anpe.peru)	Information related to ecological farming is shared through the page.	Farmers	Peru	3 061

Use by extension centres

Krishi Vigyan Kendra, Namakkal (https://www.facebook.com/krishi.namakkal)	Krishi Vigyan Kendra, Namakkal communicates information related to farmers' training programmes, availability of inputs etc.	Subject Matter Specialists of KVK, farmers, and other agricultural stakeholders	Namakkal, Tamil Nadu, India	1464
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Use by extension professional networks

Agricultural Extension in South Asia (AESAs) (https://www.facebook.com/groups/42/8431183848161/)	Members post links to relevant publications on extension and advisory services, announcements of workshops and conferences, major policy decisions on extension, reports of meetings and workshops relevant to the broader theme of extension	Agricultural Extension stakeholders	South Asia	7 550
Global Forum for Rural Advisory Services (GFRAS) (https://www.facebook.com/groups/gfras/)	This page provides information related to advocacy and leadership on pluralistic, demand-driven rural advisory services.	RAS Professionals and others	Global	1 794

Use by extension personnel

Vivasayam Karkkalam (Let us Learn Agriculture) (https://www.facebook.com/groups/madhualan)	Mr. Madhu Balan, a public extension officer started facebook group to cater the information needs of farmers in 2012. This group, exchange information on improved farm technologies, initiates discussion with other farmers and extension personnel, share information and photos on best practices by other farmers, government schemes, etc. Question and answers, information on Terrace garden, hydroponics are most discussed topics in this group.	Farmers and others those who are interested in agriculture	Tamil Nadu, India	12 118
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*As on 7 December 2014

Challenges in using Social Media for Agricultural Extension in the Developing Countries

- 1. Passive users:** A review of the activities in most of the groups/communities/pages indicated in
- 2. Irrelevant information:** Along with useful things, frequently there is irrelevant

table 1 shows that most of the users are very passive and only very few are pro-active. While many visit the group pages, only few posts, share and discuss ideas and issues.

information also posted in the social media which increases the need of monitoring.

3. Participation of agricultural stakeholders:

Other than groups like Turmeric Farmers Association of India which is formed by farmers, other groups like AESA, YPARD, etc. are used actively only by specific type of users and participation of farmers is almost nil even though they are for all agricultural stakeholders.

4. Infrastructure issues: Limited ICT infrastructure and internet connectivity is still a major issue in rural areas of most developing countries.

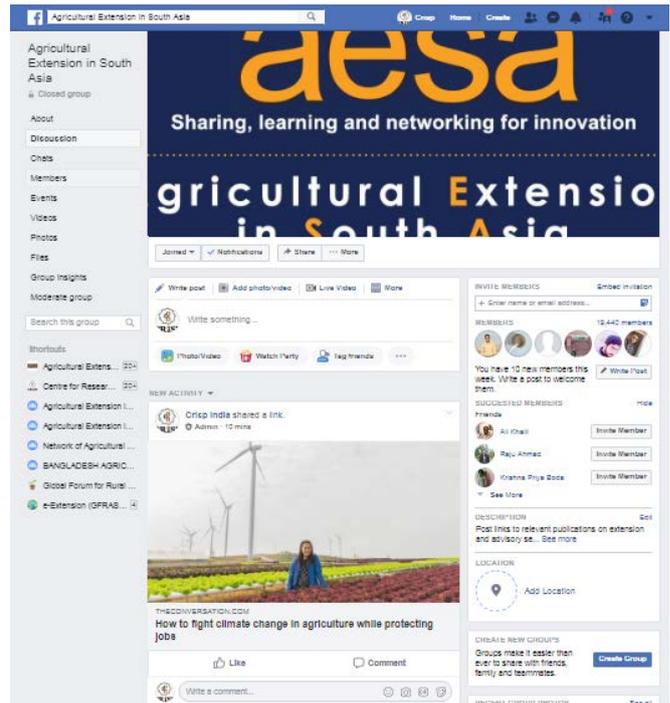
5. Mindset of users: Many users still believe that social media is "not for serious business". It is for just to share personal photos and general information.



Way Forward

- 1. Keeping relevant and adding value:** Success of social media use in agricultural extension depends on ability of users in sharing relevant information with other users. Social media champions/ facilitators or active users should streamline the postings or discussions to make it more relevant to users and should add value to the users time spend in social media.
- 2. Awareness creation and capacity building:** Social media is still not considered as an important medium for "advocacy" (advocating agriculture) by extension professionals, sometimes because of lack of awareness and sometimes because they stereotype their traditional clientele (Diem et al. 2011). Creating awareness among extension professionals and building their capacities to share more information through social media (Newbury et al 2014) can address some of these issues.
- 3. Sensible use and institutionalising social media:** Sensible use of social media and institutionalising the culture of integrated use of media including social media in day

to day activities are important to sustaining momentum and also for better sharing and networking.



- 4. Encouraging self publication and also collective contribution:** Social media platforms facilitate self publication. Also, contribution of agricultural stakeholders from across the globe creates a knowledge pool accessible to many, thus making open access to knowledge and information on agriculture.
- 5. Choosing suitable mix of social media and appropriate content:** There are different type of social media with different set of active users and followers. To reach large number of extension stakeholders with diverse content, it is advisable to use suitable mix of social media based on the type and form of the content.
- 6. Satisfying heterogeneous users:** Participants engaged or interested in agricultural extension come from diverse backgrounds and working atmosphere and they have different needs and interest. Hence, the content should be diverse.
- 7. Changing institutional culture to use social media:** Extension organisations should adopt the
 - a. "social media policy guidelines"** for use by extension professionals and encourage the stakeholders to use the social media for interaction and obtaining feedback.

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ONLINE STRATEGIES TO MARKET FARM PRODUCE

As farmers continue to struggle with increasing uncertainties in the market, online marketing strategies have come as a blessing, argues Mandeep K Pujara.

The Internet is an effective communication and marketing tool that can introduce farmers to a large number of potential customers. Farmers can advertise their farm produce with pictures and maps, take orders online, show product availability, keep in touch with their existing customers, and support other ways of selling. Farmers can create an Internet presence through their own website or by using a website run by a third party. About 35 percent of Indians use the Internet¹. This blog illustrates how farmers could use the Internet to market their farm produce.

Developing a Web Presence

Farmers who market and sell products directly to their customers may consider an online presence unnecessary, because their business is usually done face-to-face. However, a web presence offers two big advantages to the direct farm marketers:

- a. It helps them find new customers, and
- b. It enables them to better serve existing customers.

A web presence may simply make contact information available to customers or provide details about growing practices that are hard to explain in 5-minute conversations at farmers' market stalls.

Options to start creating a web presence for farm business include:

- (1) Getting listed in local food directories,
- (2) Launching your own website using free and easy tools, and
- (3) Engaging with customers and potential customers through social media, such as Facebook and blogs.

Few examples, to elucidate the farmer-market web interface are given below (Box 1).

Create Compelling Content

Farms are natural sources of interesting stories and visuals that can be posted on the Web in the form of texts, photos or videos. Not limited to photos of adorable baby livestock and beautiful pastoral landscapes, many growers also post stories about their operations and news from their farms on their websites. Other popular content on farm websites include profiles of the growers themselves, as well as workers and suppliers;

¹<http://www.internetlivestats.com/internet-users/india/>

how-to articles; behind-the-scenes features on operations; and news about current events, such as how the farm survived yet another hailstorm this season.

Compelling content helps forge a bond between grower and customer. In marketing, telling a good story requires differentiating products, using key words and phrases. A recent study of listings in the directory, which lists growers and farms that sell products directly to customers, observed that only

a minority use more than one keyword or phrase to set themselves and their operation apart.

Instead most farms listed products available for sale, instead of employing descriptive phrases about their products or operations such as, family owned and operated, heirloom or chemical free. As the Internet increases competition, it's more important than ever to communicate in a way that makes farmer's operation stand out from the crowd.

Box 1: Examples on how farmers are leveraging their web presence to access markets

Bhaskar Kamble, a grape farmer from Nashik, Maharashtra decided to tap the potential of the Internet to sell his produce directly to the consumer. Kamble's website, bestgrapes.co.in (he is now on Facebook as well) sells produce from a collective of a dozen farmers from Jalalpur, Nasik district. His plan was to sell to customers within the district, but he has now expanded to selling grapes across the state, thanks to the interest generated by his website. He says, this way he gets 2-3 times the amount he would get, if he had sold it to a middleman. Currently his initiative is limited to few farmers and the website is managed in-house by family members and friends, but he hopes more farmers will be interested to join them and that this will make the venture viable. (Source: <http://www.thebetterindia.com/23704/farmers-nashik-ecommerce-using-the-internet-grape-vine/>)

Tiwana Bee Farm is a Ludhiana (Punjab) based apiary and manufacturer of beekeeping equipment and beekeeping supplies with clients spread throughout India and many other parts of the world. Tiwana Bee Farm was established with the purpose of processing raw honey obtained from honey combs, into high quality edible grade honey. Originally a farmer, but has now diversified into manufacturing of beekeeping equipment like honey processing plant, bee hives, honey extractors, smokers, protective clothing, pollen traps, grafting needles etc. See the beekeeping equipment product's page for a complete list of equipments of this firm. (Source: <https://tiwanabeefarm.com/>)

Onlinesabjiwala.com is preferred destination for buying grocery, fresh fruits & vegetables online in India, offering fresh and best prices and a completely hassle-free experience with options of paying through cash on delivery. Now shop for your daily grocery, fresh fruits & vegetable needs with descriptions and get the best online shopping experience every time.

(Source: <http://www.onlinesabjiwala.com/>)

Launch a Website

Another way to establish a web presence is to build farm business website. In the past, this typically meant hiring a web designer or spending a lot of time learning software. Today, however, websites come in many forms, including some that are simple for a beginner to build.

Set up a basic website: Wix

Farmers can spend money to hire a company to build and host website, but it is possible to do

these things for free with services like Wix. This online tool can easily construct a basic website by dropping and dragging components into place.

Basic websites often serve as the main web presence for small businesses, providing information such as location, contact information, and brief descriptions of products and services. When launching a website, it's important to keep -Contact us information, front and center, instead of buried at the bottom. Many farmers display their contact information prominently on their home page (Box 2).

Box 2: www.strawberrycws.com

Chetan Verma is a 21 year old boy from Gurdaspur, Punjab doing strawberry farming under guidance of American Strawberry Growers. Chetan who is a Gold medalist in Boxing, one day, decided to give up the sport he was passionate about. He wanted to do something new and innovative, so he decided to take up strawberry farming in a small town of Gurdaspur. After two years of hard-work he has become the most sought-after young farmer in India.

(Source: <http://strawberrycws.com/>)

To get started with Wix, one needs to sign up for an account at www.wix.com and choose a template (a set format or look) into which farmers can add own content, including text, pictures, and video. Once a website is up and running, include the address in all advertising and marketing materials, as well as emails

and other correspondence.

Besides Wix, there are several other free services for establishing a website, for example, www.weebly.com and www.webs.com.

<http://www.wix.com/website-template/view/ht>
<http://cniffarm.wixsite.com/ml/1420>

Engage in Social Media

Farmers can use word-of-mouth promotion. As of March 2016, Facebook has over 142 million users in India, of which approximately 133 million (93.66%) access the site from their mobile phones.

Nearly 69 million people in India use Facebook every day, of which 64 million access the platform through their mobile devices². Estimated monthly active users of Facebook in major Indian cities, is given in Table 1.

Table 1: City wise breakup of Facebook users

City	Types Examples
Delhi/NCR	14,000,000
Mumbai	8,300,000
Bangalore	9,100,000
Chennai	11,000,000
Kolkata	13,000,000

Source: Facebook advertisement, as on 29 November 2015.

Facebook users, primarily use it to keep in touch with family and friends, as well as to follow all kinds of things, including businesses, trends, etc. As a result, many businesses have launched their own Facebook pages to connect with customers. The idea is to share insights, spread the word about sales and deals, and pose provocative questions that inspire followers to spread the word about your business to their network of family and friends on Facebook. This is basically the old-fashioned word-of-mouth advertising, but online.

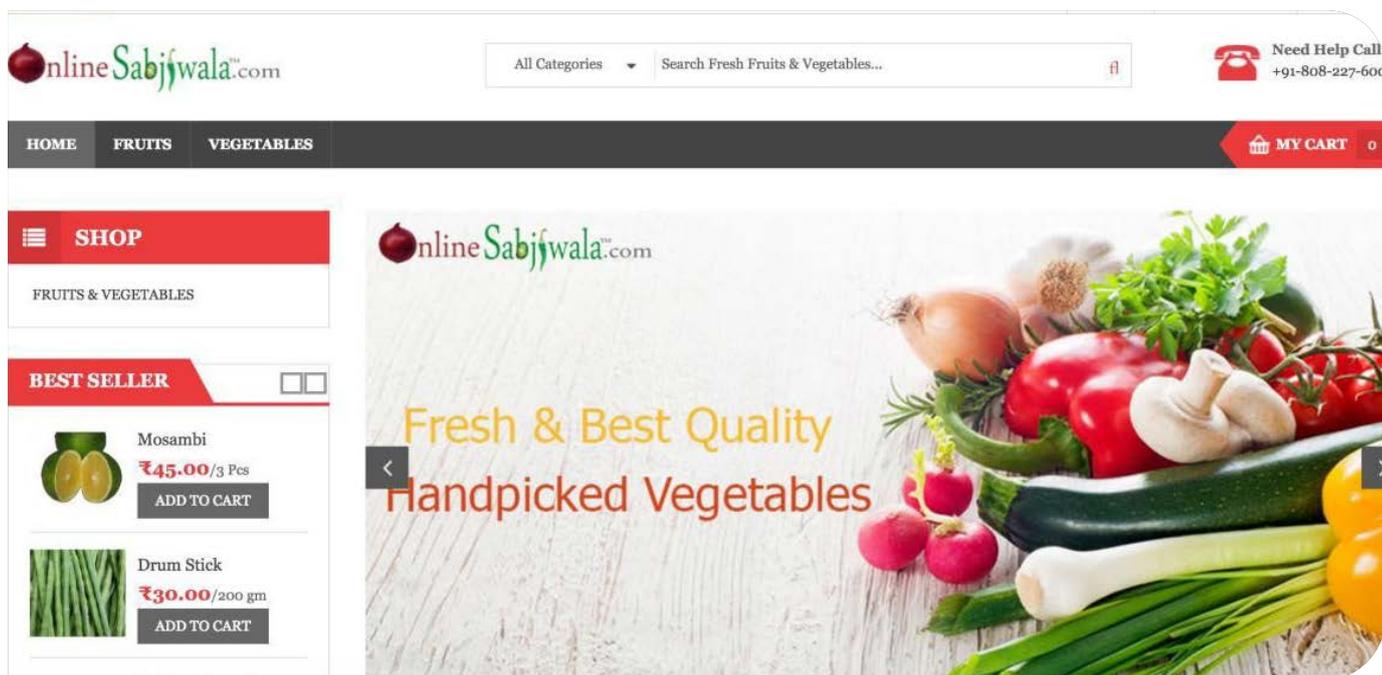
Facebook business pages, have the same look and offer many of the same features as personal Facebook pages (see example below). Facebook allows users to establish a business page at no charge.

If a farmer already has a personal Facebook page, he/she can simply add a business page to account and can login the same. If a farmer is new to Facebook, he/she needs to create an account. Go to www.facebook.com/pages/create.php.



²Vijay Shankar, Facebook Head of Products, Facebook Lite.

<https://www.facebook.com/Satvik-Organics>
<https://www.facebook.com/randhawamushroomfarm>
<https://www.facebook.com/jainhonybeefarm/>



Telling Farm Story Online: Farm Blogs

A blog is short for web log, an online journal organized by day of entry. A favorite tool of many growers, a blog allows them to showcase, personal and seasonal nature of direct market farms. Research shows that customers value the relationship with a grower (Hinrichs, 2000), and the journal format helps cement this relationship. Some farms employ blogs as their only website, while others use blogs to drive traffic to their primary website.

Like simple website programs, blog software is easy to use, maintain, and update. Farmers can create a blog and start posting entries within minutes where they can interact with customers via their comments on blog (see example). Commitment is critical to blogging and needs updating in a timely manner. Otherwise, readers will think the blog is out of date and might stop reading it.

There are two major free blog providers today:

1) Blogger at <http://www.blogger.com>, and

2) Word Press at <http://www.wordpress.com>.

Each of the above, offers pre-designed templates and the ability to create a blog with your own look and feel. To get started, visit Blogger or Word Press and follow the prompts to create an account and set up your blog page.

Promoting Online Marketing: Role of Extension

Extension professionals can play a significant role to make farmers aware about the power of internet and its usage. They should organize training for farmers and provide hand-holding support to help them access this opportunity for the using online space. Extension professionals should advise farmers to exploit the potential of online marketing, either as individuals or as groups. However, to support farmers fully, extension professionals do need training. Building capacities of extension and advisory services to perform these tasks should be an important priority for extension in India.

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A TREATISE ON NAVIGATING EXTENSION AND ADVISORY SERVICES THROUGH DIGITAL DISRUPTION

Digital disruption can seem like a threat, but it can truly be a game changer for Extension Advisory Services (EAS) opines Shaik N Meera.

If you are an extension professional involved with the field demonstrations, you must have observed that extension advisory services are being disrupted, and we are at the receiving end. Apparently the disruption will be happen not only due to digital technologies (please see my blog <http://www.aesanetwork.org/disruptive-technologies-big-data-and-internet-of-things-in-strengthening-extension-advisory-services/>), but also through farmers' centric approaches that offer retail like extension services (advisory & supply chain coordination) specifically designed to meet and exceed expectations of farmers.

Extension Advisory Services (EAS) delivery in India have limited scale, sustainability and impact. Globally, it is estimated that public extension systems' outreach does not exceed 6.8 per cent of farmers (GFRAS, 2012). NSSO, 2014 has indicated that of the 40.60 per cent households who received extension assistance, only 11 per cent of the services came from public extension machinery most of which were advisories. Farmers expect much more than access, quality and affordability of knowledge (advisories) and services (financial inclusion, supply chain and marketing). Seldom have we dared asking ourselves what farmers want. This shows how prepared EAS systems are!

Perhaps, the current thinking process of EAS does not take into consideration (not delivered if already considered) personalised, exceptional, retail-like experience: time and mission criticalness of extension services. It is about providing these services as how, when and where it is most convenient for them, not us.

I argue that digital technologies may help us achieve this. Not digital technologies alone! As was discussed in my earlier blog (Meera, 2017), the disruptors leverage digital tools and technologies to provide enhanced experience to farmers. The disruption in EAS should be caused with commitment to provide a superior farmers experience, not by our commitment to digital technology.

Digital disruption is happening across industries (agriculture is no longer an exception!) bringing significant values to individuals and organizations. We are spotting disruptive trends in commerce, health, hotel, governance, banking industries, but have seldom tried to relate them to rural advisories and agricultural development. What could be done to leverage the strengths of digital disruption requires a bit of analysis. This blog is about this. This is presented in the following sections.

1. Give Farmers what they want.
2. Start-up Digital disruption - where do we stand?

- 2.1. Current avenues for digital disruption from pilots from public sector.
- 2.2. Start-up based digital disruptions models
- 2.3. Strategies to redesign practices public extension systems.
3. Winning the game of disruption – extension way.
4. Navigating through Digital Disruption – Conclusion.

1. Give Farmers What they Want: Philosophy of Extension

Extension Systems were impactful in the past when there was an information and technological disequilibrium between farmers and service providers. Over time, as increasing numbers of farmers become aware of a specific technological thrust, the impact of such extension diminishes, until the opportunity and need for more information-intensive technologies arise. This situation warrants extension systems to focus on disequilibria shift from production technology to market linkages and information access issues. This paradigm shift poses real threat to the conventional understanding of extension philosophy (though one can find literature related to market led extension etc.). Performance of extension system is monitored in terms of budgets, staff levels, and other bureaucratic, rather than substantive indicators. Accountability to the farmers is nominal, as typically there is neither a mechanism nor incentives, to actually induce accountability to farmers (e.g., Howell 1986, Farrington et al. 2002). This is ironic, as farmers are the only ones who can relatively easily observe the quality and effectiveness of the extension service they receive. This could not be done, perhaps due to the lack of standards and inability to handle personalised data from farmers. Sooner or later, one of the indicators that an extension professional has to deal with is his/her ability to provide information and technology that farmers want – in a time and mission critical way. (Think about the definite success indicators of a private extension professional though not similar to the public extension professional). I believe that, to be relevant - we need to define to what extent 'can EAS provide farmers what they want'.

Mission critical is a popular term used to describe the essential services required for day-to-day operations. All indispensable farm operations absence of which may affect production, are termed mission critical.

My team at Rice Knowledge Management Portal

(www.rkmp.co.in) at the ICAR-Indian Institute of Rice Research (ICAR-IIRR), Hyderabad has analysed around 11,000 queries of rice farmers from the database of Farmers' Call Centres during 2011 (Meera, 2013 and www.rkmp.co.in). We found that there was a clear shift from production oriented questions to protection and postharvest market related questions. Specifically, there is and will continue to be a shift from crop diagnosis and pest/ disease management towards prediction and prevention. Can we really handle simple personalised pest management that includes pest surveillance and forecasting at individual field level, if not village level? That means to be effective an extension professional has to elevate his job role from giving knowledge advisory (bulletins / POPs) to retail like personalised predictive analytics. While diagnostics immediately should be followed up by management options (pesticides delivery and spray), predictive analytics should be followed by precision advisories. Both require huge amount of data from the farmers (if not comprehensive, at least representative). That is exactly what a data driven extension is all about. Linking the data and organizations to enable time critical supply of pesticides and other inputs is happening in the private sector, but not comprehensively (please refer to my earlier blog). Empowering farming communities in handling diagnostics and predictive analytics in a simplistic way will bring disruption in pest management. Providing farmers with the diagnostics and management options - when, where and how it is convenient to farmers (even field delivery experience of Amazon) will be the next game changer. Pest diagnostics is only a small component of a whole range of extension deliverables. Consider providing farmers personalised, exceptional, retail-like experience: time and mission criticalness of extension services related to every single enterprise (crop or allied sector) they are dealing with. It is about providing these services how, when and where it is most convenient for them, not us. Sounds challenging?

If not done by traditional extension advisory systems, the incumbent extension organizations will become vulnerable to those farmer-centric ventures that offer the same or similar services, but with a delight to the farmers. To prevail - EAS must acquire and implement digital tools for a truly modern, farmer-centric, retail-like operating model that integrates available and emerging digital technologies to meet and exceed the expectations of agriculture sectoral needs.

Sooner or later we need to answer the 10 difficult questions in effectively harnessing digital technologies in EAS (Meera, 2013). Currently the

digital pilots while providing extension advisories do make use of digital technologies, but within the traditional operational models that may not provide an exceptional experience to farmers. In such cases we end up with the digital extension, but not with the digital disruption.

Retail like Extension?

The retail format influences the consumer's store choice and addresses their expectations. At its most basic level, a retail experience is when a consumer shops he/ she usually looks for something specific and wants to be able to find it easily, they expect to get their personalised product delivered quickly and for free. And now retailers are literally racing to consumers' doorsteps to meet rising expectations.

Farmers demand a confluence of convenience, choice, and control when they seek advisories and services. If we can cater to their needs then it is a retail like experience for farmers.

2. Start-Up Digital Disruption - Where do we Stand?

A report by Derrick McCourt (2017) on digital transformation in public sector from UK indicated that nearly half of public sector organisations (41%) think that their industry will be disrupted within the next two years and there is no roadmap - only 35% of public sector senior and middle managers said their organisation has a clear digital transformation strategy.

It is difficult for the large organizations such as public sector extension systems (State Departments of Agriculture in India per se), to embrace digital strategies that would quickly bring disruptive innovations. The pressure further mounts when governments expect the organizations to work in the same way as a small digital start-up. We need to address this by analysing existing start-up digital models from the private sector, try to understand the current avenues for digital disruption, identifying the processes where disruption could be planned (?) and working out strategies for redesigning the EAS processes for improving the disruptability.

This brings us to a point where we need to analyse 2.1. What are the current avenues for digital disruption from pilots in public sector 2.2.what are the digital disruption models that are start-up based - but lack the scale 2.3. What are the strategies to redesign practices, simulate innovations and crowd source within existing public extension systems?

2.1. What are the current avenues for digital disruption from pilots from public sector?

In India like many other Asian countries, National e-Governance Program – Agriculture component (NeGP-A) aims to provide an integrated and seamless interface to the farmers for making informed decisions. The NeGP-A mission mode projects envisaged providing Information to farmers on seeds, fertilizers, pesticides, government schemes, fertilizer recommendations, crop management, weather, and marketing of agriculture produce. Most of these mission mode projects have either of the one - scale or comprehension, not both.

Agriculture Information Portal of Ministry of Agriculture and Farmers Welfare, Government of India (<http://agrionline.nic.in/>) features various platforms such as Farmers' Portal, mKisan Portal, State Specific Agrinet Portals, Direct Benefit Transfer- DBT, Agriculture DBT Portal, DBT-Agriclinics and Agribusiness Centers, Forecast Weather and Agromet Services Information, RKVY Management Information System, SeedNet Portal, Soil Health Card Information System, Industry Specific Projects like Plant Quarantine Information System (PQIS), Fisheries Input management System, National Agriculture Market (NAM), Agriculture Census, DBT in Agriculture Machinery, Farmer/Public Centric Projects, AGMARKNET Portal, Computerised Registration of Pesticides (CROP) and Seed Export Import System etc.

Most of these initiatives are aimed at creating platforms without much emphasis on comprehensive, up to date and real time data/ information/ knowledge sharing. They appear to have scale in terms of frameworks, but do not have substantial quantities of data that would make a difference. The Direct Benefit Transfer (DBT) platforms (please see <https://dbtdacfw.gov.in/Home.aspx>) are more like G2G kind of initiatives that aim to faster expedite fund transfers and monitoring of progress under each category.

Similarly on ICAR website one can find links to 100 mobile apps (<https://icar.org.in/mobileapp>), KVK Portal (<https://kvk.icar.gov.in/>), other knowledge initiatives such as Agricultural Education Portal, ICAR-e courses, CaneInfo, Compendiums, Consortium for e-Resources in Agriculture (CeRA), KRISHI, Knowledge Innovation Repository of Agriculture in the North East, National Innovations on Climate Resilient Agriculture

(NICRA) and Rice Knowledge Management Portal. While these are comprehensive initiatives in terms of scientific and validated knowledge for different crops, the knowledge is not customised to suit a specific village/land holding. Some of the platforms are not directed to be used by extension systems.

Even though one can find a number of digital initiatives in agriculture sector, such initiatives are not comparable with the digital disruption models experienced in other sectors. While these are all push based platforms (with few exceptions), the ability to provide customised and personalised information and services all along the value chain is questionable. For a crop based enterprise, farmers may require at least 14 different information and service assistance at multiple stages that would make a difference in informed decision making (please see fig.1).

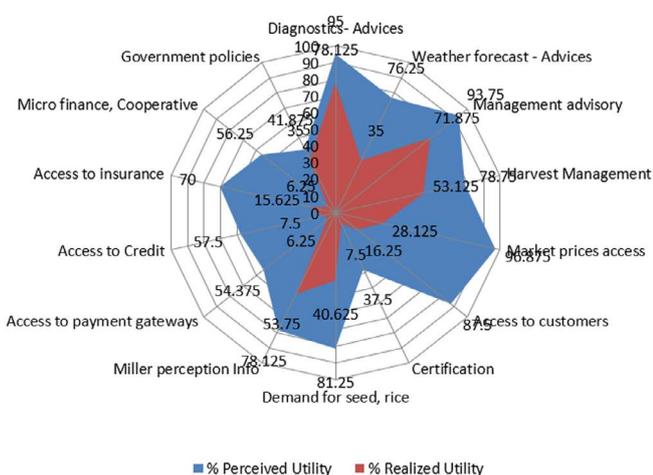


Fig. 1: Radar chart representing Data driven services accessible through mobiles

A study conducted in Indian rice industry (Meera, 2018) revealed avenues for digital disruption when data driven services are provided by extension functionaries. While there is a huge gap between perceived and realized utilities of various data driven services, disruption is remotely realized by the current mobile extension initiatives. Among the extension advisories, diagnostic and crop management advisories are the only available knowledge services through the public extension systems. Not to mention the personalised advisories on every single avenue for digital disruption in rice sector.

The flagship digital pilots in public sector such as farmers' portal, mKisan portal, eParwana, AeFDS, RKMP, Krishi Portal etc., have made much dent in developing repositories of scale, but have not reached a level of digital disruption. The reasons are several - one of which is lack of comprehension and inability to provide personalised retail like experience to farmers.

You name any publicly funded digital project in Indian agriculture; it has limitation to disrupt the incumbent processes. While the public sector EAS has an advantage in terms of scale, reach and data; they have limitations in terms of rigid workflows and inability to bring innovations abruptly. This necessitates analysing some alternate examples from digital start-ups and then trying to map the functionalities for deployment in public sector. Let us see what could be learnt from digital start-ups in agriculture from available models.

2.2. Start-up based digital disruptions models

In several sectors it is not the incumbent organizations but the new entrants and entrepreneurs who are creating new waves, meeting consumer needs in novel ways. The job charts of professionals are changing fast with strong digital skill sets. Their work styles and ways of approaching a problem are different. If we are sceptical about this for agriculture, it is probably because we have seen many digital projects before, without much 'wow' factor.

2.2.1. Digital Start-ups and Data Driven Extension Perspective

I prepared an analysis from Coffee book 2017 of a-IDEA (Association for Innovation Development of Entrepreneurship in Agriculture), a Technology Business Incubator(TBI) hosted by ICAR-National Academy of Agricultural Research Management (ICAR-NAARM) & Department of Science & Technology, Govt. of India (DST, GOI).

a-IDEA aims at fostering innovation and entrepreneurship in agriculture in India. Out of 12 start-ups being mentored by a-IDEA, four are digital start-ups that have potential to serve farmers in a better way.

The following analysis is not to suggest what should be done by these start-ups. Rather what could be learnt by the extension advisory systems (preferably under public sector). The analysis is carried out based on the two publications (Meera, 2018; Maru, 2018).



Table 1: Digital Start-ups and Data Driven Extension Perspective

Digital Start ups	Agriculture related information, access to agri inputs	Buying & selling of agri outputs	Predictive analytics Big data	Process automation	LBM IOT	Mobile / cloud Social media/ networking	Ai others
Agrowbook	Yes	Yes	No	No	No	Yes	No
Scope for DEAS	LD, ID	ID, ED	LD, ID, ED, AD	LD,ED	ED, AD	ID, ED	AD
Agmart	No	Yes	Yes	No	No	Yes	No
Scope for DEAS	ED	ED AD	ID, ED, AD	ED, AD	ED, AD	ID, ED	AD
Bharatrohan	No	No	Yes	No	Yes	Yes	No
Scope for DEAS	LD ED	-	LD, ID, ED, AD	LD ID ED	LD, ID, ED, AD	LD, ID, ED	LD, ID, ED, AD
StampIT	No	No	No	Yes	Yes	Yes	No
Scope for DEAS	LD, ID, ED,	LD, ED, AD	LD, ID, ED, AD	LD, ID, ED	LD, ID, ED, AD	LD, ED	ID, AD

*DEAS Data driven extension advisories – data types (Please see the text box for details)
(LD: Localized, ID: Imported, ED: Exported and AD: Ancillary data)

Agrowbook (<http://agrowbook.com/>) features a list of services that enable a rural farmer with agriculture related information, access to agri inputs through door delivery services for agriculture, these include *AgrowTube*, *AgriOnMobile*, Video extension service, soil testing service, farm mechanization /automation service, *Agrowbook Suite*, *Agrowlist*, and Agri Contests. The data dimensions are unclear on - how - personalised extension advisories will be achieved based on the four types of datasets.

The challenge lies in collection and micro utilization of localised data and imported data while dealing with the production management advisories. Critical to this challenge is coordination with the door delivery of inputs to the farmer's fields. Taking cue from *Agrowbook*, if public EAS wishes to bring digital disruption, they need to focus on both scale and comprehensive solutions. The limitation denial of small start-ups is understandable for not involving themselves in process automations, use of location based monitoring and use of Internet of Things. But their ability to use social networks is something worth emulating. For strengthening similar pilots/ roll outs, public EAS need to focus on dynamics of various data types across the value chain components while using disruptive digital tools.

AgMart (<http://agmart.in/>) is a classified portal for buying & selling of Agri outputs, including Niche commodities like medicinal, tuber crops etc. It is an ICT platform enabling transactions of farm Produce and other value added agri products by registering

the crop details of the farmers and facilitating buyer linkages. It is a classified ICT portal and mobile App connecting farmers with buyers like traders, processors, retail chains & wholesalers. *AgMart* is also involved in statistical analysis of gathered data to generate timely reports on future arrivals, crop mapping, agri input demand prediction etc.

This start-up essentially focuses on buying and selling along with predictive analytics. This combination can really bring disruption. The advantage - this kind of initiatives currently have (especially when we have operational e-National Agricultural Market) is their ability to bring the complementor stakeholders and aggregation ability of niche commodities. Surely they have scale problem.

Public EAS may like to focus on developing similar strategies with eNAM and start piloting using their exported data and ancillary data from a cluster of villages. Clubbing these efforts with social network analysis and location based monitoring would bring better market realization to farmers.

BharatRohan (<https://bharatrohan.in/>) is an exciting start-up that empowers farmers with precise information about the status of crop and land through applications of Unmanned Aerial Vehicles (UAVs). It is a platform that provides actionable information to apply fertilizers and chemicals only where they are actually needed and prevent crop losses even at the onset of pest and disease outbreaks. *BharatRohan* has a capability

Box 1: Tetragon of Extension Data

LD stands for Localised Data: Data generated and collated on the farm for use only on the farm. This is called 'localized' data. This includes soil data (soil form; soil depth; nutrient composition), seed and fertilizer use, date of sowing, production practices, water use, etc. that farmers have about their immediate location. This data can be generated and managed by the farmer or by an agent acting for the farmer. Since the data per se does not have any bearing on farmer's actions – the ability of EAS system to translate this into advisories (unlike in developed countries) becomes very important. For example soil health based fertilizer recommendation largely depends on Localised Data.

ID stands for Imported Data: Data generated and collated off the farm, for use on the farm. Examples are climatic data and market prices that have been interpreted and customized for on-farm use. This data is usually owned, managed and controlled by a third party and made available, directly or through intermediaries, to farmers. The disruption happens when there is ability of EAS to synthesise and infer from this data and translate this into effective advisories. For example weather data on 45-50 days after planting rice crop does not have any meaning until it has been inferred and gets translated into an advisory as what should be done by that farmer.

ED stands for Exported Data: Data generated and collated on the farm for use off the farm. This is usually processed, aggregated or combined with other data and information generated elsewhere and is used by various actors and stakeholders. Right from public EAS to market intermediaries, farm input and service providers including banks, insurance agencies, farm advisory services, ICAR, other farmers and farm networks can bring disruption with this data.

AD stands for Ancillary Data: Data generated and collated (on and) off the farm, mainly for use off the farm. A large proportion of 'agricultural' data such as government statistical and research data, FLD data, demand & supply analysis data, milling data, export and import (market watch) etc., across the value chain will bring next level of EAS.

The data interoperability across the databases and repositories is the name of the game (to get a feel about what is data interoperability please see an interview with Shaik N Meera at <http://aims.fao.org/community/interviews/collaboration-rice-data-interoperability-interview-shaik-n-meera>).

Adapted from Maru et al. 2018 and Meera, 2018

to survey more than 10,000 acres of area in a single day using fixed wing UAVs. The technology enables them to identify biological changes that occur in the plants once a pest starts to affect the crop which otherwise are only identifiable when their effects become visible to human eyes.

Providing highly personalised advisories and linking it to supply of inputs can never be as exciting as it is in the case of this start up. Predictive analytics, Big data, Process automation, LBM, Mobile / cloud, Social media / networking can easily be harnessed with exported, imported and ancillary data. If public EAS has constraints to experiment with the use of UAVs on their own, then public private partnership models can be explored. uberization (like Uber Eats, you can have Uber Inputs) on a real time basis will bring unimaginable benefits to the farmers. The time series data of two to three seasons from each landholding will bring predictive analytics into the forefront of EAS.

StampIT is a start-up (<http://www.stampit.biz/>) that enables business process automation for farms especially plantation crops. They focus on niche business process automation solutions for industries such as agriculture, seed, retail, and marketing services. *Crop Terrain* is a full

module, online/offline, mobile and browser based application that provides a streamlined information flow between field level activities and management vision. *CropPro 360* is a trendy offline/online information system designed to run on Android based Mobile Tab devices to collect real-time farmer and plot details from the field. Application facilitates agri companies to collect details of associated farmers, which include farmer socio-economic details, bank details, plot details; GPS based automatic area measurement, water, power, irrigation, crop, inter-crop details, harvesting, transportation details and picture of the farmer and crop. *Falog* is a self-service comprehensive field agent/ sales force management solution designed for sales & marketing teams of industries such as retail, real estate, agriculture, seed, manufacturing, banking & financial services. The application's main functionality is to track sales people on the field based GPS co-ordinates with no clue to the sales person.

With support from various stakeholders and public EAS, this can be a good model to showcase the impact of data driven extension. The digitised localised data (that's incorporated into the same field after processing), imported data, exported data and ancillary data will flow/ flows freely when this start-up moves with the public EAS

that has rich sources of much of this data. A strong scientific back up with different tools - Agriculture related information, access to inputs, market access, predictive analytics, big data,, social network analysis, LBM, virtual aggregation may help public EAS to a great extent.

2.3. Strategies to redesign practices simulate innovations and crowd source within existing public extension systems?

Some of the creative, innovative and entrepreneurial-inclined extension professionals who joined the public sector in the past, found that these qualities were not valued enough. Of late, many public sector organisations now form partnerships with digital and social enterprises blurring the lines between entrepreneurial spirit and public service (aIDEA of NAARM/ Agrinnovate of ICAR). But how effectively this convergence gets integrated into the public extension systems is something that is worth watching in future.

To realise the digital disruption in public EAS we need to create avenues for redesigning the extension processes (work on the frameworks not on the guidelines), stimulate new thinking (capturing innovations and start-ups within the system) and include crowd sourced extension innovations (allowing partnerships and local redesigning to certain extent).

For redesigning the extension processes, the EAS may draw lessons from these digital start-ups under four categories. They are EAS for Precision agriculture, EAS for Financial inclusion, EAS for Data-driven agriculture and EAS for Digital knowledge sharing / delivery. Prime Minister Narendra Modi has called for doubling of farmers' income by 2022, India's 75th year of Independence. Government of India initiated several moves some of which are Startup Agri India scheme, Digi Gaon (Digital Village) initiative, and Bharat Net project which can all work together towards making this a reality. Initiatives like agri-hackathons can also bring together aspiring entrepreneurs from diverse sectors.

3. Winning the Game of Disruption – Extension way

Digital disruption can seem like a threat, but it can truly be a game changer for EAS. It throws open innumerable opportunities to rethink the way we handle extension. Across industries, the perception that disruption is imminent has many executives scrambling to launch digital side projects in the form of programs, products, and services that can

stand on their own. Organizations like ICAR and SAUs tend to think about development of digital products in a linear way. In recent past, more than 100 mobile apps were developed in India that were mostly standalone apps. Moreover a careful analysis reveals that the offline CDs developed during the 1990s and the expert systems developed after the year 2000, transformed themselves into mobile apps adding nothing but ate in to the cloud space on google play store. I am yet to see a smart phone user who has installed more than 100 apps for regular use and we expect farmers to do so. What we need is a single interface like BHIM (Bharat Interface for Money) or a wallet that pulls money like PayTM.

A critical review of 32 digital start-ups (Table A in Annexure) has been carried out to understand the functional core areas of digital services. The core areas are broadly classified into Precision Agriculture, Financial Inclusion, Data Driven Agriculture and Knowledge Sharing & Delivery. A qualitative Disruptability Index has been worked out on a specific extension function based on Performance, Efficiency, Innovation, Defences (barriers to adapt). These start-ups are judged qualitatively for indicative results, not empirically. Finally, based on the desk study, current status of public EAS is given (1 for presence of similar initiative 0 for absence).

Out of 32 digital start-ups, 11 have focused on precision agriculture tools, 3 focused on Financial Inclusion, 23 on Data Driven Agriculture and 12 on Knowledge Sharing & Delivery of inputs (multiple core areas).

Seamless integration and exponential thinking is required for bringing digital disruption in EAS. Basic lack of connection between digital start-ups and structural and functional frameworks of EAS is evident across the country. When you are facing disruption, or launching a disruptive effort, recognize the leverage that comes from finding unidentified gaps in the current service provision. A disruptive move will tend to undermine regulations and governance structures that have been built over time, wherein people internalize the behaviour and turn it into a norm. The real challenge for disruption in EAS is not only about capacity building and digital skill development but of attitude too (doing the right thing is wrong).

The basic principles to realize digital disruption in EAS remain;

- 1) Engaging farmers and providing them with retail like experience.
- 2) Empowering extension professionals to take up the challenges. Encouraging them to enjoy

flexibility in terms of tasks and making them aware that they are judged by the outcomes/ impacts.

3) Optimising the extension systems with available digital start-ups, collaborations and partnerships. Recognizing the role of plurality in digital strategies and their complementarity is essential.

4) Transforming EAS in the digital era with structural and functional adjustments along with focus on collective action. The conventional job chart of extension professionals will undergo rapid changes.

We need to comply with both essential and sufficient conditions for disruption to happen. The disruptions in each of the EAS services will take place when a complementors ecosystem is evolved. For a better understanding I would

like to give an example of eNAM and how disruption like Amazon could be possible with (or within) an ecosystem. Amazon= eNAM+ Complementors (aggregators + retailers+ courier+ payment gateway). While eNAM per se cannot be a disruptive force in EAS, a combination of complementary organizations will help bring n disruption in the way agricultural marketing has seen in recent past. These kind of expanding opportunities could be captured when organizations are flexible and role of other agencies are valued.

From the analysis carried out from the Table in Annexure 1, a qualitative assessment of various disruption dimensions in EAS have been worked out. The Fig 2 indicates disruption ideas from digital start-ups on x axis and the scope for redesign of EAS process on y-axis.

Table 2: Indicative strategies for redesigning EAS Processes – Current DAC Activities

Activities	Redesign Process – Digital Strategies
Powering extension systems with disruptive innovations: Medium term plans	Building capacities and initiating schemes with cloud, mobile computing, big data analytics, IOT, Block chain technologies etc., Digital Start up Platform – Linking them to Digital India Initiatives (like T- Hub) Developing support systems for NeGP-A 2.0, Farmers’ Portal, mKisan Portal, eNAM, KCC, etc.,
Building capacities of extension systems	
Role of Value Chains – Doubling Farmers Income	Mobile Apps – Cross Learning for Financial inclusion, Value chains, market access, insurance, production management. Social experiments, Convergence Models
Training of Trainers	Brining best of the class global experiences to local extension units. Next generation MOOCs, leveraging strengths of 3D printing in extension
Field Extension	
Skill Development	
Out of Box – Opportunities for Collaborations for EAS	Uberization, Traceability Models for Government & Private Sector Digital support for Crop Colonies of Government of Telangana Amazonize with aggregation – Complementors Ecosystem for eNAM
Knowledge Management strategies	Facilitating development of Integrated Farmers’ Portal by synergizing different web, mobile sites for input supply, financial inclusion. Capacity building in Knowledge Management strategies in extension systems
Policy advocacy	Advocacy for bringing next generation extension that is responsive to emerging challenges

If we need to incorporate digital start-up ideas in EAS in knowledge sharing, data driven agriculture, financial inclusion and precision agriculture, Fig 2 will give an idea as which start-up would give best suited strategy to readily embrace.

Big data and **predictive analytics (PA)** at EAS level (not at farmers level) can help farmers to access and apply crop choice, market recommendations, pest modelling, soil test value, and crop yield predictions, as well as nutrient management — all across varying field conditions. The advantage that

public EAS have over private start-ups is availability of huge quantity of data. But absence of action would lead to experiences of likes between Skymet and Indian Meteorological Department.

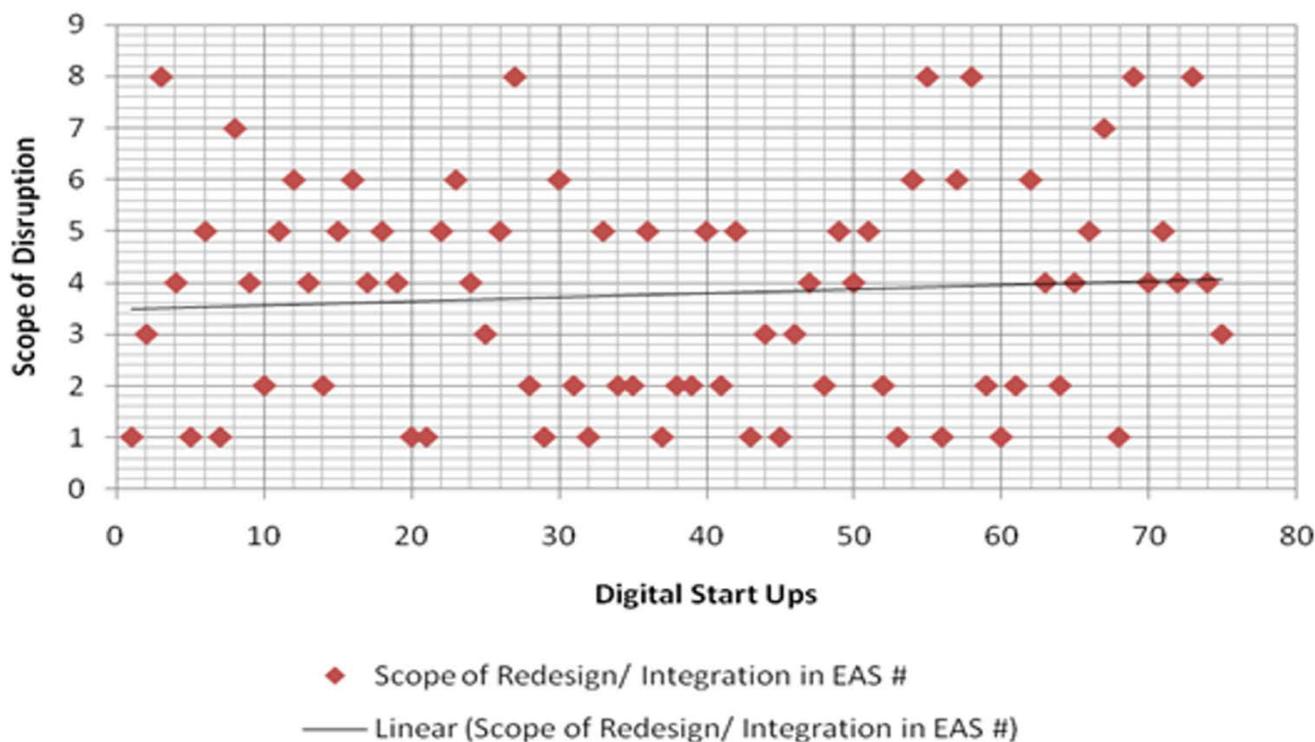
Better **market price realization (Mkt)** is difficult to achieve by simply establishing eNAM kind of online platforms. We require real disruption in the way farmers market their produce. The complementors that were discussed in my earlier blog (<http://www.aesnetwork.org/disruptive-technologies-big-data-and-internet-of-things-in->

strengthening-extension-advisory-services/) will help realise the benefits. Many digital start-ups are approaching this issue with different models (direct marketing apps are increasingly seen now a days). The EAS can consider this as a low hanging fruit for bringing about digital disruption.

Prima facie the words reforms and redesign sound threatening to many extension professionals. But if we look around in every sphere, several departments are re-aligning the way they carry out their activities. State Departments of Agriculture (SDA) are requested to redesign few activities as pre-requisites for eNAM. In order to facilitate

unification of market and online trading, it is necessary for the states to undertake reforms such as a single license to be valid across the state, a single point levy of market fee, and provision for electronic auction as a model for price discovery. Only those States/UTs that have complied will be eligible for assistance under the scheme.

Knowledge Transfer (KT) through personalised advisory and multiple delivery channels have been tried out by digital start-ups. This is another strong area for public EAS. All we need is to sit together and understand what structural and functional changes are required.



Legend PA=1, Mkt=2, KT=3, Acc=4, Agg=5, FI=6, SN=7, Aes=8

Fig. 2: Scope of redesign/ Integration in EAS from Start ups

It is important to link up advisories with the inputs and other services. eFresh pvt Ltd., is trying to develop a model in Telangana where door delivery of inputs/ services based on personalized needs are worked out. Public EAS can work out a series of collaborations and partnerships to realize this.

Aggregation model all along the value chain (Agg) brings together small farmers for accessing numerous services (mechanization, bulking, input buying, markets etc.). A careful analysis of several start-ups reveals ways and means achieving this using digital technology.

Financial Inclusion (FI) of small and marginal farmers includes credit and insurance. Quite a few models are available across Asia and Africa on this front. Digital financial services (DFS) are

fundamentally about saving money, accessing credit and insurance, and performing transactions via digital channels like eNAM.

Social Networks (SN) and Media analysis in EAS has to move forward from mere perception studies. The ability to synthesise the results of network graph theories and social network behaviour would bring customised services to the door steps of farmers.

Aadhar enabled Services (AeS)- Unique Identification Numbers enabled Services - is proven to be quite successful in public distribution systems and many other public sector endeavours. Aadhar Enabled Fertilizer Distribution System (AeFDS) is being executed in Krishna district since March, 2016 with an objective to effectively monitor the distribution of fertilizers across the

value chain from manufacturers till farmers to ensure timely and correct distribution of fertilizers based on biometric authentication of farmers. The AeFDS is a change management initiative that has the potential to streamline subsidies to

actual beneficiaries and also facilitate in releasing subsidies to fertilizer companies based on the actual sales made. There are umpteen avenues for public EAS in Indian agriculture awaiting disruption.

Box 2: Stages of Digital Disruption in EAS

If we need to incorporate digital start-up ideas in EAS in Knowledge sharing, data driven agriculture, financial inclusion and precision agriculture, we need to understand where from the next best idea is coming from!

To take advantage of disruption, executives need to deploy a tailored strategy, underpinned by a combination of four actions (Omar Abbosh, 2018). I tried to adapt this to suit different industries/ organizations. Since I have dealt with the processes, all the four stages may not happen in sequence. Certain extension functionalities may fall into viability period, whereas others in either durability, vulnerability or volatility stages.

Researchers recently proposed two important qualifications to disruption theory that could be relevant to rural advisory services. First, higher-performing products and services result in higher profitability (so they have an economic motivation) and second, using "extendable core" that could be used to do more and more sophisticated things at a lower cost than incumbents (Wessel and Christensen, 2012).

Steps in driving Digital Disruption in EAS organizations:

1. In the Viability period, it is time to focus on expanding the core activities by offering new products / solutions using innovations, or increasing the reach exponentially without compromising on the quality of EAS.
2. In the Durability period, the emphasis needs to be on transforming the core extension activities, while experimenting massively with new disruptive processes taken from start-up ideas.
3. In the Vulnerability period, where public EAS organizations benefit from the continued presence of high barriers for entry by other agencies, it is time to scale up new opportunities. The public data that till now is in the hands of public EAS organizations make them custodians of certain actions and they apparently discourage other organizations to undertake similar activities./create hindrance for other organisations undertaking similar activities.
4. In the Volatility period, where there are pressing issues in the core extension processes to address, focus should be placed on retaining only the relevant parts of the core extension, while increasingly redirecting efforts to new directions of extension.

4. Navigating through Digital Disruption - Conclusion

Powering Extension and Advisory Services (EAS) with disruptive technologies such as mobile/cloud computing, Internet of things, location-based social networks etc. is a new game changer. Use of digital technologies in rural advisories has been documented well in the past two decades. While most of the digital pilots reported success, the empirical evidences of such digital extension strategies on farmers' income and in adding value to the extension advisory systems have not been sufficiently deliberated upon.

As discussed in the blog, disruption does not happen only because of digital technologies, but through farmers centric approaches that offer retail like extension services (advisory & supply chain coordination) specifically designed to meet and exceed expectations of farmers. This lengthy blog aims at presenting a perspective in a single go, so that the future EAS will be empowered to give farmers what they want.

Because, the large organizations such as public sector extension systems (State Departments of Agriculture in India per se), find it difficult to embrace digital strategies that would quickly bring disruptive innovations, there is a need to analyse existing start-up digital models from private sector. Based on this blog, the policy makers should try to understand the current avenues for digital disruption, identifying the processes and working out strategies for redesigning the EAS processes for improving disruptability.

In terms of digital disruption, public sector is uniquely positioned in terms of scale, reach and data, if only proper strategies are adopted. To realise digital disruption in public EAS we need to create avenues for redesigning the extension processes (work on the frameworks not on the guidelines), stimulate new thinking (capturing innovations and start-ups within the system) and include crowd sourced extension innovations (allowing partnerships and local redesigning to certain extent).

Digital disruption follows an understandable pattern. The starting point for the leaders in agriculture is to understand where in this pattern their organization is positioned and why that is the case. A public extension professional today may be happy serving farmers with the linear flow of knowledge and services (mostly it is because of their position in hierarchy, rather than the quality of services they provide), sooner or later new players will disrupt the linear flow of services and will try to provide retail like experiences.

Epilogue

A case study of Kodak's response to digital technology (Lucas and Goh 2009) revealed that inability of Kodak's rigid, bureaucratic structure and middle managers prevented them responding fast to emerging technology which dramatically changed the process of capturing and sharing images. By the way, the first prototype of a digital camera was created in 1975 by Steve Sasson, an engineer working for Kodak. Unfortunately it could not capture the new opportunities (Lucas and Goh 2009). We have missed out many opportunities in agriculture / EAS as well in past. Remember hybrid rice development in China as a disruptive force! Way back in 1954, two scientists from Central Rice Research Institute (CRRRI), Cuttack, India - S. Sampath and HK Mohanty were the first to draw attention to the possibility of developing hybrids

in self-pollinated crops like rice. But it was China that surged ahead, we followed suit.

Organizations often see the disruptive forces affecting their industry. They frequently divert sufficient resources to showcase their presence. Their failure is usually an inability to truly embrace the new business models / processes that the disruptive change opens up. Kodak created a digital camera, invested in the technology, and even understood that photos would be shared online. Where they failed was in realizing that online photo sharing was the new business, not just a way to expand the printing business.

The response to digital revolution is not many pilot projects and large scale investments in digital extension projects. Rather, a systematic approach to bring new learnings and incorporate them to next generation EAS. As per Registrar General of India & Census report 2011 the total farmers or cultivators population of India is 118.7 million (2011) & 144.3 million agricultural workers/labourers which consists 31.55 of total rural population. More than 20 million farmers must have taken birth after 1990s. They are all digital natives and this number is increasing exponentially. We need to remember, among many others, EAS will have to cater to these farmers.

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Annexure

Table A: Disruptability Index from Digital Start ups – Implications to Redesigning of EAS

No.	Digital Start Up	Description	Precision Agriculture	Financial Inclusion	Data Driven Agriculture	Knowledge Sharing & Delivery	Disruptability Index*	Current Status of Public EAS	Scope of Redesign/Integration in EAS #
	Aarav Unmanned Systems	Agricultural decisions are made precisely when every detail of the farm and farmer is captured. The startup's drones provide high-value engineering solutions to enterprises across GIS (geographic information system) surveying/mapping, industrial inspection and precision agriculture. There is a potential to use 3D representations of the terrain surface, it for informed decision making to optimise irrigation, fertilisation, pesticide distribution and early failure warnings. There is a huge requirement for public sector R&D support.	1	0	1	1	3	0	PA KT AeS
	Gold Farm	Operating in Karnataka and Tamil Nadu, this start up helps to give Uber like services for farm equipment such as solar-powered pumps. Beneficiaries have included over 25,000 farmers on ground, who tap the services of 250 booking agents and over 500 tractor owners connected via a mobile app. The equipment is also tracked with IoT devices, resulting in rich data sets for analysis and forecasting. The Public R&D and EAS can leverage the strength of such initiative by knowledge based services and data processing.	0	0	1	1	3	0	Acc PA Agg
	Farms 2 Fork	Water management has never been the focus of EAS in the past. But now there is a solution. It offers water monitoring solutions for better productivity by using less water. The solution includes IoT wireless soil sensors, AI support, and real-time analytics. While earlier agri-tech solutions were based on batch processing of data, Farms2Fork operates on real-time data. For outreach and services, farmers are contacted via farmer associations and networks.	1	0	1	1	2	1	PA SN
	Agribolo	Information dissemination, quality input procurement, market linkages, irrigation facilities and farming equipment through a franchise network. Operational in Rajasthan, the model uses the aggregator model to connect farmers to experts, development institutions, financial services, and training institutes.	0	0	0	1	4	1	Acc Mkt Agg FI
	eFresh Pvt Ltd	A farming services platform in Telangana and Andhra Pradesh - spanning activities such as information dissemination, quality input procurement, market linkages, irrigation facilities and farming equipment. It also uses the aggregator model to connect farmers to experts, development institutions, financial services, and training institutes.	0	0	0	1	4	1	Acc Mkt Agg FI
	Agrostar	To transform Agri-business "Direct to farmer" m-commerce platform is developed. Here farmers can acquire agri-inputs at their doorstep by just giving a missed call on 1800 number and the executive will return the call and take care of the rest. The agri-inputs include seed, crop nutrition, crop protection and hardware. It focuses primarily to provide Quality, Convenience, Availability, Price, Ease of Use and Service to the farmers.	0	1	0	0	2	1	Acc Agg
	TQ Pump starters Kisan Raja	GSM-based Mobile Motor Controller which is controlled by the farmers even from their homes through mobile phones or landlines. Earlier farmers used to get up at odd hours to switch off the motors. This agri tech social enterprise resolved this problem. Its key features are Convenience, Protection and Comprehension.	1	0	0	1	2	0	Acc PA

Skymet	To forecast accurate weather condition to prepare the farmers to act accordingly and avoid crop damages. Farmers are provided with the options on Crop Insurance, Weather Forecast, Media and Risk Management. It is likely to enhance the yield as it prepares the farmers for drought and heavy rainfall, and consecutively prepares farmers to take preventive measures for the same.	1	0	1	1	3	0	PA Agg FI
EM3 Agri Services	A sequential advisory system along with input services is the key focus of this initiative. Farm mechanisation services company EM3 Agri provides pay-per-use farm services for every step of the cultivation process, including land development, land preparation, seeding, sowing, planting, crop care, harvesting and post-harvest field management. Access is provided through mobile app and a local fulfilment centre or "Samadhan Kendra."	1	0	1	1	3	0	PA Agg FI
Reuters Market Light (RML)	It helps in linking farmers, traders and agribusiness companies. It has benefited over 2 million people from 13 Indian states. It offers Agri Decision Support Solution to farmers through cutting-edge technology. RML makes sure that farmers are selling their produce at an appropriate rate.	1	0	1	1	3	0	PA Agg FI
AgroWave	A perfect blend of research, analytics, and technology that optimises agriculture supply chain. Demand and supply analytics connect farmers in Panipat, Sonipat, Harpur, and Rajasthan to caterers, retail shops, restaurants, and canteens. This is a step ahead of not only serving farmers, but also to the consumers.	0	0	1	1	3	0	Mkt PA Agg
Earthy Tales	Appears as if it is a back end production management activity, this initiative helps farmers indirectly by providing them with the good agricultural practices and other services. Founded in 2016, works with farmers across 11 states to provide chemical-free fruits, vegetables, groceries, and dairy products. These include snacks, jams, preserves, and pickles, provided direct to consumers.	0	0	1	0	1	0	Mkt
Truce	A B2B web and mobile platform that directly connects farmers and suppliers to wholesalers and retailers. The app is available in Hindi, English, Marathi and Gujarati, and enables tracking quotes and orders.	0	0	1	0	2	1	Mkt Agg
Farm Again	Converted 2,500 acres of land into organic farms, along with tech tools to trace the product's origin, when sold in outlets such as Reliance Retail, Big Bazaar and More. IoT devices are used to monitor and record moisture content and soil conditions, with pipes for water and fertiliser inputs.	1	0	0	0	2	0	PA Mkt
Shan-Mukha Innovations	Quality standards do affect the farmers' income. Incubated at IISc, this is a portable solution for detecting contaminants in milk. The palm-sized box uses microfluidic nanotechnology to identify contaminants such as melamine. The device reportedly costs less than Rs 2,500, and each test costs less than Rs 2. A series of such initiatives with EAS can transform the traceability standards in Indian agriculture.	0	0	1	0	2	1	Mkt Agg
Crofarm	Direct marketing and contract farming was not the focus of public EAS due to its inherent organizational problems. Digital tools give them new opportunities. For example an agri-supply chain startup founded in 2016, buys fresh produce directly from farmers and supplies them to online and offline retailers. It is estimated that nearly 8-10 tonnes of fruits and vegetables is supplied and connects 100 retailers to more than 5,000 farmers.	0	0	1	0	2	0	Mkt Agg

Aibono	While public EAS is questioned about the use of big data and AI applications in Indian agriculture, this start up wanted to prove it empirically. Envisages improving farm yields by using AI on a cluster of parameters like weather and soil condition. Testing and measurement services indicate parameters such as crop stress, along with recommendations on the right fertiliser mix to be used based on the soil condition.	1	0	0	1	2	1	PA KT
Fasal	Microclimate forecasts are tailored to each farm location and are performed at a point scale, not at a kilometer-wide spatial scale. It collects more data; the AI-based microclimate forecasting algorithm incorporates real in-field information and relates it to publicly available weather forecasts, so that farmers can benefit from real-time, actionable information relevant to day-to-day operations at the farm. The KVK system can do wonders with the collaborations with this kind of initiative.	1	0	0	0	2	1	PA KT
ONganic Foods	A combination of Traceability, organic farming and direct marketing tools will be one of the killer applications for improving the profitability of small farmers. Based on contract farming, this start ups identifies higher-priced grains and spices and gives quality inputs to farmers to increase their yield. It connects farmers to various government schemes as well as e-commerce platforms such as Amazon and Spencer's Retail.	0	0	1	0	3	0	Acc Mkt Agg
Oxen Farm Solutions	Several entrepreneurs starting working on 'Farming as a Service' (FaaS) model. The platform connects farmers, farm equipment manufacturers, and government schemes. Access to such machinery can boost farm productivity in an affordable manner. The company operates in Punjab, Madhya Pradesh, Uttar Pradesh, Chhattisgarh, and Odisha, and connects to corporates such as PepsiCo and Yes Bank.	0	0	1	1	2	0	Acc Agg
Farmizen	Real time dash boards will have far reaching positive consequences in EAS in future. Among the numerous opportunities thrown open by real time dash boards, Farmzen tried a small service using a mobile-based platform that lets users grow vegetables and fruits on mini-farms, and monitor the process of growing food on a real-time basis. Located in the outskirts of Bengaluru, users get pictures and live videos of their farm plots. The startup also provides recommendations based on real-time inputs from the field as well as pre-defined schedules for over 50 different types of crops.	0	0	1	0	1	0	Mkt
Harvesting	Financial inclusion based on the harvest indicators will offer win-win situation to farmers and financial organizations. Offers smart farming solutions based on analytics and AI. It also uses farmer profiles to build creditworthiness profiles for financial organisations.	0	1	1	0	3	0	PA FI AeS
SatSure	In spite of being a private venture, SatSure uses IoT and Big Data effectively to provide financial security to farmers, via its 15-year database of satellite images. It makes recommendations clustering techniques for farmers to get an estimate of the total agriculture production, and provides this data to agri-insurance companies as well. KVK system and ICAR's extension wing can showcase the worthy of this approach.	1	1	0	0	3	0	PA FI AeS

Triton Foodworks	This start up should inspire public EAS as how to think out of box not limiting themselves to the conventional definitions of extension as a service. Based in Delhi, Triton is a hydroponics startup growing fruits and vegetables. It has reportedly set up more than 2 lakh sq ft of hydroponic farms across three locations in India, and produces more than 700 tons of fruits and vegetables each year.	1	0	1	0	1	0	Mkt
vDrone	The Ministry of Civil Aviation has approved regulations on the commercial use of drones or the Remotely Piloted Aircraft System (RPAS) wef December 2018. Uses drones and thermal imaging to increase yield. It analyses areas of the farm that need attention, and helps the farmer cater to these needs. Parameters include soil, cropping pattern, and use of fertilisers.	1	0	1	0	1	0	PA
Ninjacart	Demand side of crop production can be the focus in near future/ Ninjacart enables retailers and merchants to source fruits and vegetables directly from farmers without resorting to middlemen. It connects 2,500 farmers.	0	0	1	0	2	0	Mkt FI
BigHaat	Amazonization is tried by many start ups and this one adds to their vision of serving farmers. Online agro e-store for farmers that lets them buy seeds, crop protection nutrients and solutions, and agro instruments. Last-mile connectivity is enabled via logistics partners like India Post and Ship Rocket.	0	0	1	1	2	0	Acc Mkt
Ravgo	Uber in the success story of digital sharing economy. Uberization is tried by this initiative. It is solving the farm mechanisation problem among India farmers who cannot afford to buy the farm machinery. The target market is currently small farmers based in Punjab.	0	0	1	0	3	1	Acc Agg SN
FlyBird Innovations	Sensors use in start ups is found only in terms of water management and fertilizer management. This is yet another start up that uses sensors in the soil to detect moisture content and control irrigation in farms across South India. The information is used to optimise irrigation practices, improve crop yield, and save water, time, and labour.	1	0	0	0	2	1	PA AeS
farMart	Uberization with agri-machinery is tried by this. Large farmers put underutilised agri-machinery up for rent on the farMart platform, and are connected to farmers who need such machinery; they can then book it via app or call centre. The database includes 300 villages and 1,500 farmers.	0	0	1	0	2	0	Acc Agg
AgroStar	Pune-based m-commerce startup, sells agricultural inputs directly to farmers. The platform can be accessed online or giving the company's 1800 number a missed call. Products are sourced from national and multinational brands, and include seeds and nutrients.	0	0	1	0	2	1	Acc AeS
CropIn	Leverages GIS and data science to deliver a range of services apps to farmers and other players in the agri chain. It feeds real-time data and advice on practices related to a range of crops.	0	0	1	0	2	1	Acc KT

Index for Table A

* Disruptors -1 Performance -1 Efficiency – 1 Innovation -1 Defences - 0 (judged qualitatively for indicative results)

Acc- Access to inputs, supply chain

Mkt – Access to markets

PA – Predictive analytics, Process automation, Personalisation, Forewarning advisories

Agg – Aggregated services - Uberisation

SN – Social Networks – Local sharing

FI - Financial inclusion credit insurance

AeS – Aadhar enabled Services like AeFDS

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AGROWBOOK.COM: WILL THIS ADDRESS THE INFORMATION NEEDS OF AGRICULTURAL STAKEHOLDERS?

Agrowbook.com is an initiative of Input Agri Tech Pvt Limited incubated in a-IDEA (Technology Business Incubator) at NAARM (National Academy of Agriculture Research and Management). Subhash Lode who founded Agrowbook.com discuss the features of this initiative here.

Every action is dependent on information. Decisions most of the times are backed by data or history of the events. We learn with data points, but when it comes to agriculture, we see that proper information or data sources are missing. Despite continuous failures to achieve profitability, there is reluctance to either change the cropping patterns or cultivate the commodity in demand. Agrowbook.com is making a comprehensive effort to provide information in solution format to these types of issues faced by farmers. Issue gets resolved if there is action in the form of a product or a service. To ensure positive balance sheet of marginal farmers, Agrowbook.com initiative is crafted to make information available at finger tips and associated product or service to farmer's door step.

What is Agrowbook.com

Agrowbook.com is a comprehensive ICT solutions platform for agriculture ecosystem. Apart from farmers as main stakeholders, it includes farm input vendors, students, agronomists, researchers, agribusiness companies and those engaged in banking, finance and Insurance too.

Information along with associated services is the key to propagate any action at farm. With the advent of smartphones and affordable internet connectivity, farmers and other stakeholders in the agricultural sector can experience the tremendous and unprecedented information flow among the all the stakeholders. This can catalyse the growth of agriculture in each corner of the world.

With our Agricultural background, experiences and discussion with multiple stakeholders we have identified the pain points in Agriculture ecosystem.

What it offers

Let's take a peek at what agrowbook.com has offered already and what is in store.

AgrowTube: This is an agricultural video aggregation platform where video content produced is verified and showcased. There were instances where after watching these videos farmers and youngsters have contacted Agrowbook team to provide further information. One such example is a young boy Prakash from Tezpur (Assam, India) who is a first time Internet user. He was motivated to utilise his land partially for poultry, after watching a successful example of poultry rearing on AgrowTube. We provided him with further information and directed him to reach out to NABARD office to get further help.

There are more than 15, 000 videos on agriculture which not only provide information, but also motivate farmers with these audio-visual success

stories. We have partnered with NAARM and software companies that are interested in rural economic development. The companies have agreed to address the issues of low connectivity and high internet rates.

AgriOnMobile: With our farming experience and discussion with KVK and ATMA centres, we also realised that farmers need to have mechanisms for interaction with experts to solve the problems at the farm - be it a crop disease or animal health issue. Farmers should be able to convey the exact problem to the experts and get the suggestions to address them quickly. We have launched AgriOnMobile in test version during November 2015. In this, the farmer takes pictures of the problem and posts it with their observations and comments to the AgriOnMobile module. This will be available to everyone in an open database. A few retired agriculture professionals, agribusiness company's advisors and *Krishi Vigyan Kendras* are responding to the farmer's issues and queries. Farmers can find these solutions to issues they have, on mobile on their own or assisted by younger members in his/her family.

The modules are available in 28 languages. As there are no reference database available to farmers and very less number of veterinary clinics exist in developing countries, this system would also be able to provide immediate solutions to animal health issues. Here we are providing a mechanism to solve the issues with crowd-sourced approach. We have few organizations that came forward to sponsor these activities, which will not only help to resolve the basic problems in rural sector but also improve the digital skills of rural India.

This open database will also serve as source of ideas for agricultural scientists to do a need-based research. We are strategically planning to enter into farm Input supply chain in 2016 based on a studied approach and working with farm Input manufacturers for the same. As part of this, Agrowbook has hosted its Marketplace where farmers can make the pricing discoveries and information on few products. Apart from these products, Agrowbook hosts **AgrowList** which includes a list of agricultural businesses, institutions, instant messenger, forums, blogs and **AgriEvents. AgrowJobs** section dedicated to agriculture is currently under development.

Progress

Agrowbook.com can be a global platform for farmers. Eight months after the launch, it was accessed in 1778 cities/towns of 149 countries. This is despite the fact that the platform is available in only English. We are keen to have it in multiple

languages where agriculture has predominance.

With Agrowbook's innovative processes, it has been included in Telangana government's "State Agriculture Infrastructure Development Program" for "Agriculture Research and Extension through strengthening of KVKs, Technology Research Centres, ATMA and Kisan Call Centres" under RKVY.

Agrowbook was judged among top 15 start-ups, jointly organized by NAARM a-IDEA & IIMA-CIIE in India's first Food & Agribusiness Accelerator. Agrowbook was also featured among top 35 innovations in India by Networked India organized by Ericson & CNN-IBN in July 2015

Challenges

Though manufacturing, transportation and financial sector have made good use of information technologies, agriculture is still lagging and is in nascent stage as the major user base is scattered across remote locations. In recent time connectivity has improved, but there is a lot more needs to be done to achieve the last mile connectivity. We are working on innovative approaches towards addressing it.

Way Forward

We are passionate about agriculture not just because of the need to secure food, but a majority of the farmers wants to move away from this profession, the average age of the farmer is rising and farmers are ending their life. Then who will stand up to secure the food for next generation. Improving farm economics is the only solution to this crisis and right information, right product and service at the right time with appropriate pricing are the key components. We are focused on contributing to this cause.

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AGRILORE- AN INNOVATIVE CONTENT MANAGEMENT SYSTEM

Open and distance learning systems of education can potentially help farmers and extension staff in accessing new knowledge provided good quality learning materials are made available, argues BS Hansra and PK Jain.

To address new challenges and to fully exploit new opportunities, farmers need access to new knowledge. Conventional models of extension and farmer education alone won't be adequate to support farmers in this regard. Traditional educational systems are under increasing pressure to experiment with new and efficient ways of reaching large number of farmers. Open and Distance Learning (ODL) system of education is one such approach that has the potential to better reach the unreached (farmers, rural youth and extension staff). Wider access to advanced digital platforms and range of digital content technologies has provided new opportunities to enhance the power and reach of distance learning.

AgriLORE

AgriLORE platform (www.agrilore.org) is an innovative content management system which allows for collaborative creation and unrestricted use of learning materials in agriculture. These Learning materials are developed in the form of Re-usable Learning Objects (Box 1).

AgriLORE platform emerged from the NAIP (National Agricultural Innovation Project) supported project entitled "Innovations in Technology Mediated Learning: An Institutional Capacity Building in using Reusable Learning Objects in Agro-horticulture". The project was implemented by the following partners:

- The School of Agriculture, Indira Gandhi National Open University IGNOU, New Delhi (lead partner)
- School of Agricultural Science, Yashwantrao Chavan Maharashtra Open University (YCMOU), Nasik;
- Directorate of ODL, Tamil Nadu Agricultural University (TNAU), Coimbatore; and
- Division of Knowledge Management and Sharing, International Crops Research Institute for Semi Arid Tropics (ICRISAT), Hyderabad

RLOs in AgriLORE

RLOs are prepared using PowerPoint presentation (Fig.2) taking into consideration the level of an VIIIth pass learner. The text content of the RLO is supported with pictures, graphics and videos wherever required to facilitate clear understanding of the concept. Emphasis is given on presenting the knowledge visually using animation and graphics. The RLOs are hyperlinked using automatically generated metadata tags and are equipped with self-assessments.

About 500 RLOs having sound pedagogic value with flexibility to be used in various learning/ instruction contexts: instructor-led, learner-

Box 1: Re-usable Learning Objects (RLOs)

Re-usable Learning Object (RLO) Technology is based on the philosophy of "Open Educational Resources (OER) and is a new paradigm in Life Long Learning. The term Open Educational Resources (OER) was first adopted by UNESCO in 2002 and it refers to educational resources available freely and openly to anyone who can use, re-use, remix, recycle, redistribute under restricted or un-restricted manner. RLO is smallest stand alone and an independent unit of learning designed for re-use in multiple instructional context. RLO can include text, audio, video, photograph, animation, table and chart that can be suitably combined to form new body of knowledge in the form of learning lesson, unit, module, course, program, etc. It is a type of online instruction that provides a digital educational resource that can be scaled and shared from a central online repository in the support of instruction and learning.

managed or facilitated by a community were developed on five themes covering six crops namely rice, potato, grapes, tomato, banana and mango. These themes include:

- Nursery management,
- High value crop production technology,
- Integrated nutrient management,
- Integrated pest management and
- Post harvest management and value addition

Course Development

AgriLORE enables learners to design and develop the courses based on their need by meaningful grouping of RLOs out of the available pool of RLOs. A course consists of a set of RLOs. Development of curriculum through meaningful grouping of such RLO's to provide the educational resources needed to fulfill credit requirements in a certification process, is an innovation attempted in the AgriLORE platform (Fig. 3 and 4).

Challenges

We faced several challenges in developing the course materials. Most of the experts who developed these RLOs were good in their subject

knowledge but lacked skills in instructional designing for development of open and distance learning materials. To address this constraint, extension training in instructional design had to be organized. Similarly RLOs are embedded with various types of multimedia components. Development of dynamic multimedia components in RLOs is difficult and requires special expertise. The experts involved in RLO development were facing problem in development of multimedia components.

Ways Forward

- The 500 RLOs developed so far could be translated into regional languages for its wider coverage of the clientele.
- RLOs can be organized for developing certificate course on a specific topic so that it provides complete learning on a given topic.
- In order to make RLOs more effective, multimedia components like audio, video, animations, etc can be incorporated.
- Presently, RLOs are on offer through PC based browsers and these could be delivered in multimode such as mobile phone and print.

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CO-DEVELOPED CONTENT THROUGH AGROPEDIA - EXPERIENCE SO FAR

While India witnessed rapid improvements in its ICT infrastructure, it continues to face serious challenges with respect to provision of relevant content. Initiatives such as “agropedia” evolved mainly to address this challenge in the field of agriculture. Though agropedia offers several options for knowledge management in agriculture, much more needs to be done to fully utilize its potential, argues Kiran Yadav and NT Yaduraju.

Lack of access to right information at the right time has been noted as the major impediment in lifting the peasants out of poverty, deprivation and hunger. Lack of proper linkages for information sharing and non-availability of content in local languages constrain farmers as well knowledge intermediaries such as extension staff in using information effectively. Potentially useful knowledge and information generated by the researchers more often do not reach those who need it the most due to these weaknesses in knowledge management. Though improved connectivity and enhanced access to computers and mobile phones (Box 1) offer new opportunities to manage knowledge better, lack of quality digital content and information management architecture has been constraining sharing of locally relevant knowledge.

However, improved ICT infrastructure and access to new gadgets can contribute to agricultural development only if relevant content useful for farmers is made available through these. This is possible only by aggregating content from diversified sources and organizes it in a way that is amenable for easy and quick access and sharing by all stakeholders.

With this premise the Indian Council of Agricultural Research (ICAR) through the National Agricultural Innovation Project (NAIP), facilitated the formation of a consortium of institutions to implement a knowledge management project from 2008 to 2014. This project developed a comprehensive and integrated platform for agricultural content management (organization, storing and sharing) called “agropedia” to support and promote knowledge flows and exchanges between different stakeholders.

Agropedia

Agropedia platform (<http://agropedia.iitk.ac.in/>) consists of a knowledge repository, a social networking platform and content distribution services.

It is the first Indian agricultural knowledge repository developed with knowledge-models for localized content for a variety of users with appropriate interfaces built in collaborative mode to support information access. It is also the first and unique site having multi-lingual capabilities to deliver agro-advisory in a country like India where you have to deal with many languages.

Knowledge Models

Knowledge models (KM), developed by professionals who are acknowledged experts in their specific agricultural domain, link

different concepts in agriculture through robust relationships. These models enable agropedia to produce a better multi-lingual agricultural information search and display results. Crop knowledge models of 24 major crops have been developed using IHMC tools and are made available on agropedia. FAO's AGROVOC, a global thesaurus of agricultural terms, served as an input for concept mapping to develop Crop Knowledge models. These Knowledge Models enabled agropedia to produce a robust multi-lingual search facility for retrieving agricultural information stored in different digital formats like word documents, images and videos which comes with appropriate live tags attached making them easily visible and searchable.

Content organized using Concept Mapping Technique can be accessed via search or through visual browsing of the crop knowledge models. Having incorporated AGROVOC standards, Team agropedia is in the process of universalizing these crop knowledge models in different National/International languages.

Agro-advisory delivery networks

vKVK: Voice Krishi Vigyan Kendra (www.vkvvk.iitk.ac.in)

Agropedia has several mechanisms for delivering the content to various stakeholders. It has an e-mail based delivery mechanism where advisories can be sent to farmers over email. A Simple Messaging System-based platform allows these advisories to be sent to the farmers' cell phone using SMS. Finally a phone based delivery system allows an agriculture expert to transmit a voice based alert/advisory to be transmitted to farmers using a mobile phone. A recorded message can be transmitted to all farmers under the guidance of an expert. This will overcome the problem related to text messages, which are normally sent in English, as many handsets do not support local fonts. For this reason, agropedia's voice messaging system to deliver agro advisories was introduced in local language to farmers irrespective of which service providers they are subscribing to.

Box 1: Enhancing connectivity and capability

Governments in developing countries have been investing heavily on improving IT infrastructure in a big way. In India, the initiatives include: setting up of over 126,574 Common Service Centers (CSC)- covering 6.5 lakh villages across India (as of March 31st, 2013); connecting over 1500 institutes of higher learning through National Knowledge Network (www.nkn.in); and providing broadband connectivity to over 100,000 *GramPanchayats*. India has about 200 million internet users by September 2012 and this is expected to increase to 300 million by 2014. Added to this is the massive penetration of mobile phones in the rural hinterland. As of January 2013, there are 862.62 million wireless subscribers in India (TRAI- 2013) and their number are increasing every day.

Box 2: Agropedia

Agropedia aspires to organize and manage the widespread knowledge relevant to different agricultural practices of different regions by building up an agricultural e-community and strengthening the networks of that community. It aims to harness the information using social networking and knowledge models based on web 2.0 concepts. This is a platform where everyone, ranging from scientists, researchers, teachers, students, extension workers, farmers, traders and businessmen, can interact with each other. The agropedia is essentially a read-write web interface which has been developed using semantic web technologies that help the system relate concepts in a meaningful way.

Within a period of four years of its inception, agropedia has the distinction of being visited by people from over 140 countries with over 400,000 page views till date. Google analytics reports that the agropedia site gets on an average of over 1150 hits a day. Today it boasts of having over 8500 registered users, with over a thirty thousand documents from voluntary users. The combination of getting authentic agricultural knowledge and information with the option of sharing them with stakeholders can hardly be found in any other agricultural portal. In this sense the process of gathering the wide spread agricultural knowledge and dissemination of this knowledge through e-network is unique.

In order to overcome problems related to connectivity at KVKs and the erratic power supply to operate computers, mobile-mobile service has been launched, wherein a registered expert can record messages on their mobile phones and push the messages across to farmers. This is very helpful

in issuing alerts. For instance, an expert visiting a field having some pest outbreak can alert other farmers in the constituency about the impending risk and its management. As of now the service is being successfully pilot tested in 125 KVKs of 12 states covering over 30,000 farmers. ICAR is

planning to upscale the service to cover all 631 KVKs during the 12th five year plan.

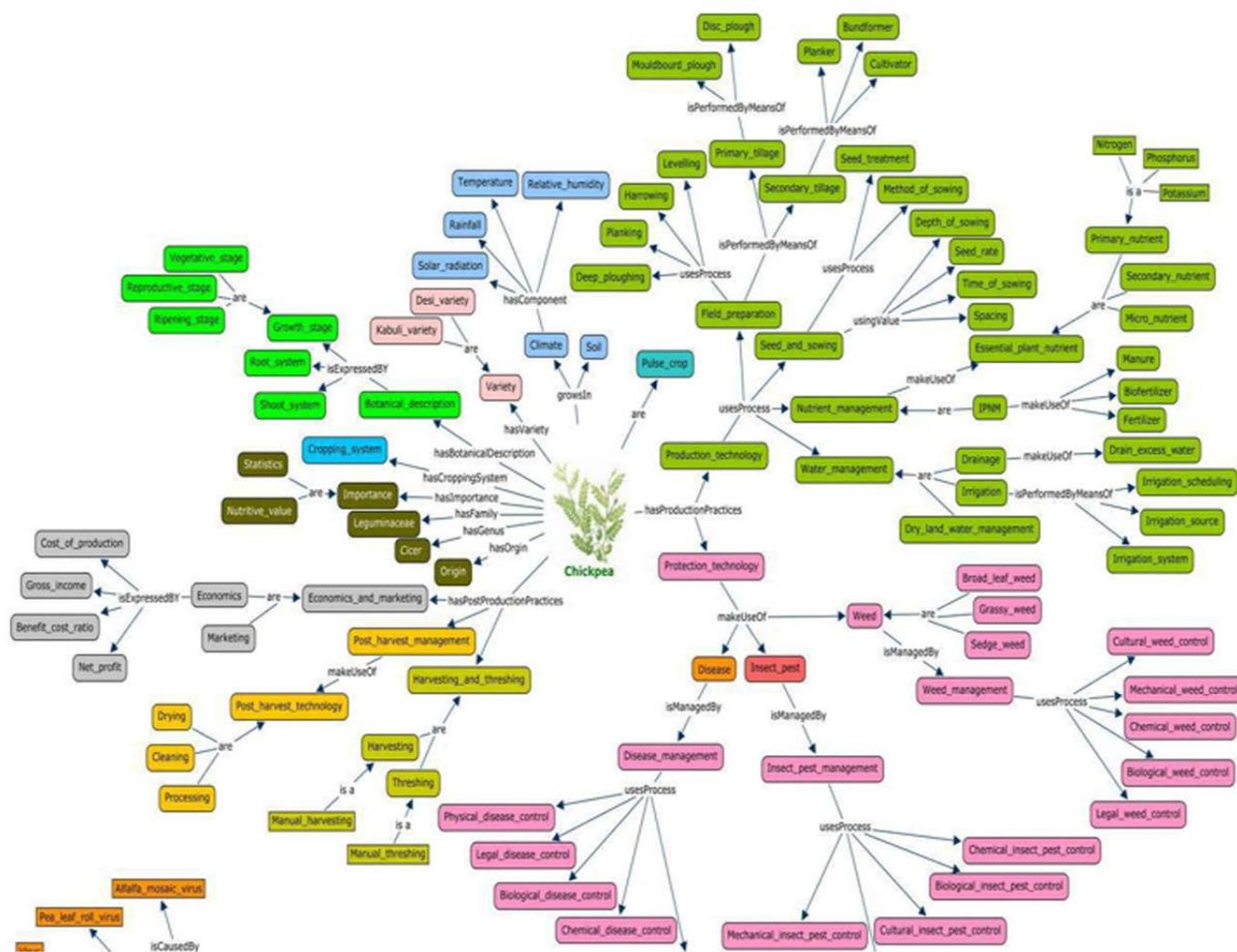
OpenAgri (<http://www.agropedia.net/openaccess>)

OpenAgri is a content management system based platform for hosting agriculture documents such as journal articles, conference papers, books, book chapters, proceedings, preprints, multimedia content etc. As of now it has over 500 publications.

Challenges

Although agropedia is a robust and efficient ICT platform for Agri-knowledge dissemination, its full potential is yet to be realized due to the following

challenges: Despite being around for over four years, the agropedia has not been adopted extensively by the NARS (National Agricultural Research System) community. Sensitizing and training several hundreds of scientists has had little impact. Ownership of the portal and above all ownership of the content are major issues. Envisioned to cater to the entire agricultural community comprising of crops, commodities, animals etc, it has become a nobody's baby. May be creating agropedia for individual organization could be a possible solution. IIT Kanpur has developed a protocol, where agropedia could be rolled out as a software as a service (SaaS) and agropedia could be created for any organization, crop, sector, individuals etc.



Except a few, most of the NARS organizations have posted very little content on their websites which is often not updated regularly. There is lot of reluctance to share knowledge. The mindset is that knowledge is power and so hold on to it. This is ironical considering the fact that Open Access movement is sweeping the world. The institutions must be mandated to develop institutional repositories and embrace "Open Access policy" in creating and sharing knowledge. Individuals and institutions should be encouraged to create digital content and share with peers and public. Change

of mind set, work culture and policy guidelines are required urgently to promote content creation and knowledge sharing using ICT.

ICT projects in agriculture are multiplying fast but there has been very little interest in evaluation of these initiatives. Agropedia is not an exception. Though IIM-Calcutta and G B Pant University of Agriculture and Technology (GBPUAT) did an impact assessment of agropedia, more efforts are needed to monitor progress and track its impact pathway. There are also other issues related to

The graphic illustrates the Agropedia project's structure and goals. At the top, it features the Agropedia logo with the tagline 'Serving the Indian Agriculture'. Below this, a central hub labeled 'Agropedia' is connected to various components:

- Partners and Sponsors:** IIT Kanpur, ICRISAT Patancheru, IIM Calcutta, UAS Raichur, ZPD IV, Indian Council of Agricultural Research, and FAO Rome.
- Content and Tools:** Traditional wisdom with modern knowledge, Indian Council of Agricultural Research, Crop calendars, Extension material, Package of practices, Knowledge models, and Research publication.
- Technical and Social Features:** Social semantic web application for agriculture, hasWebsite, integrates, isSponsoredBy, hasPartners, hasCollaborators, hasCollaborationTools, is a, and like.
- Knowledge Collection:** Collection of all agricultural knowledge, Agroblog, Agrochat, Agroforum, and Agrowiki.
- Visuals and Semantics:** A 'Visual representation of important concepts of crops' and 'Semantically assigned for indexing browsing the content' are shown as network diagrams.
- Interface and Social Networking:** Screenshots of the Agropedia website and a 'Social Networking' section with user avatars are included.

 The bottom of the graphic features the website URL <http://www.agropedia.net>, the slogan 'Be a witness of agriculture knowledge revolution - Join Agropedia', and a list of project partners: IIT - Kanpur, ICRISAT - Hyderabad, IIM - Calcutta, UAS - Raichur, and ZPD-IV - Kanpur.

access to computers, internet connectivity, limited bandwidth, erratic power supply, etc. which also needs greater attention.

Way Forward

Agropedia is the first agriculture related repository in the country capable of sharing information among different agriculture-stakeholders. However some of the following measures are required to take this great initiative forward:

- As there is a challenge to own the content and the queries for the specific content, the Agropedia should be institutionalized (Agropedia 2.0). Thus research centers and scientists working on specific agricultural domain have to be made responsible for hosting the multilingual content of their mandated crops/area and answering questions in their specific areas.
- ICRISAT-Agropedia has been developed as model institutional repositories for other to

follow it. It contains the scientific content of all the mandated crops of ICRISAT in HTML/ image/audio/video formats. Others could follow this model. Among other agropedias, UAS-Raichur-agropedia, horti-agropedia, ICAR-Agropedia and 8 more have already been started. Indian Institute of Spices Research-Calicut has taken Spicepedia as their institute's project for three years. Likewise if the other research centers also take Agropedia forward, this initiative will become sustainable.

- The offline apps for Package of Practices (PoPs) in text and audio format for all the agricultural crops of Uttar Pradesh and Karnataka have been developed with the help of State Agricultural Universities. Similar apps for all the states are in pipeline. This will be useful for the field investigators who work directly with the grass root farmers and even for the illiterate farmers. Soon these voice PoPs will be used for Interactive Voice Response services (IVR) through vKVK platform.

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ARE CELL PHONES USEFUL AS LEARNING TOOLS FOR STUDENTS?

Students are accessing cell phones every day for several hours and even during classes. As teachers, can we use this media to enhance our teaching? S Ramkumar and DV Sivaji explore the issue in this blog.

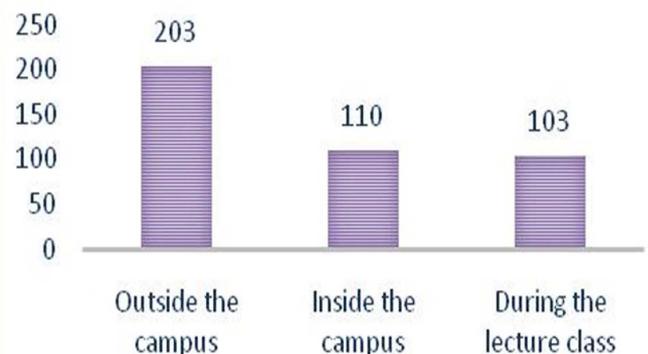
One of the most important technologies that has widespread and accelerated diffusion among people in the last decade is the cell phone. The nature of this technology is dynamic. It keeps on undergoing drastic changes to suit various types of users. From being a luxury initially, it is fast becoming a need for each and every person. Due to various policies and applications, such as cashless transfer of money and paperless transactions of different types, the role of mobile phone has grown beyond the simple connectivity function of just 'talking'. Given the direct and fast penetration of this technology among the student community, we undertook a study among the undergraduate students of Rajiv Gandhi Institute of Veterinary Education and Research (RIVER), Puducherry, India, to understand the use of cell phones among them. We share the salient finding of this study in this blog mainly to raise certain critical questions/issues on the findings, that has direct implications on the 'learning situation' as well as on the need for changing pedagogical perceptions of the faculty.

Salient Findings

Use of Cell Phones

The sample comprised of 203 students, of which 108 were girls and 95 were boys. All of them own cell phones, of which 88% have smart phones. All the students definitely use it off-campus but almost 50% of the students use it in the campus and classrooms (Fig. 1). The cell phone is being widely used for chatting, browsing, music & videos, apart from talking of course.

NUMBER OF STUDENTS



**multiple responses*

Fig. 1: Number of students using cell phones

Use of Cell Phones outside the Campus/Day

Understandably all the students use cell phones off the campus – on an average one hour and 45 minutes is being spent on cell phone use off-campus per day. Students' daily cell phone usage ranges from 20 minutes to 4 hours.

Use of Cell Phones inside the Campus/Day

More than 50% of the students (110 out of 203), use cell phones in the campus for 32 minutes on an average every day. The usage pattern is almost similar for boys and girls (boys 35 minutes and girls 30 minutes). It is largely being used during leisure time, like during lunch break or between classes.

Use of Cell Phones during Classes/Day

Only 10% of the students (20 out of 203) responded that they do not use cell phone at all during lectures/classes. 103 students affirmed using a cell phone during lectures/classes. 80 students did not respond to this question. On an average students use a cell phone for 22 minutes

a day spread over different times. They use it for checking their messages and calls.

The main reasons the students give for using cell phones during lectures are: (i) the sessions are not interesting enough; (ii) sometimes they use it to keep awake during lectures; and (iii) occasionally when they can't understand what is being taught.

Major activities for which Cell phones are used

It was observed that 95% of the students use internet in cell phones. On an average, per day 1 hour 40 minutes are spent by students on social media, music and videos, information seeking, playing games (Fig. 2).

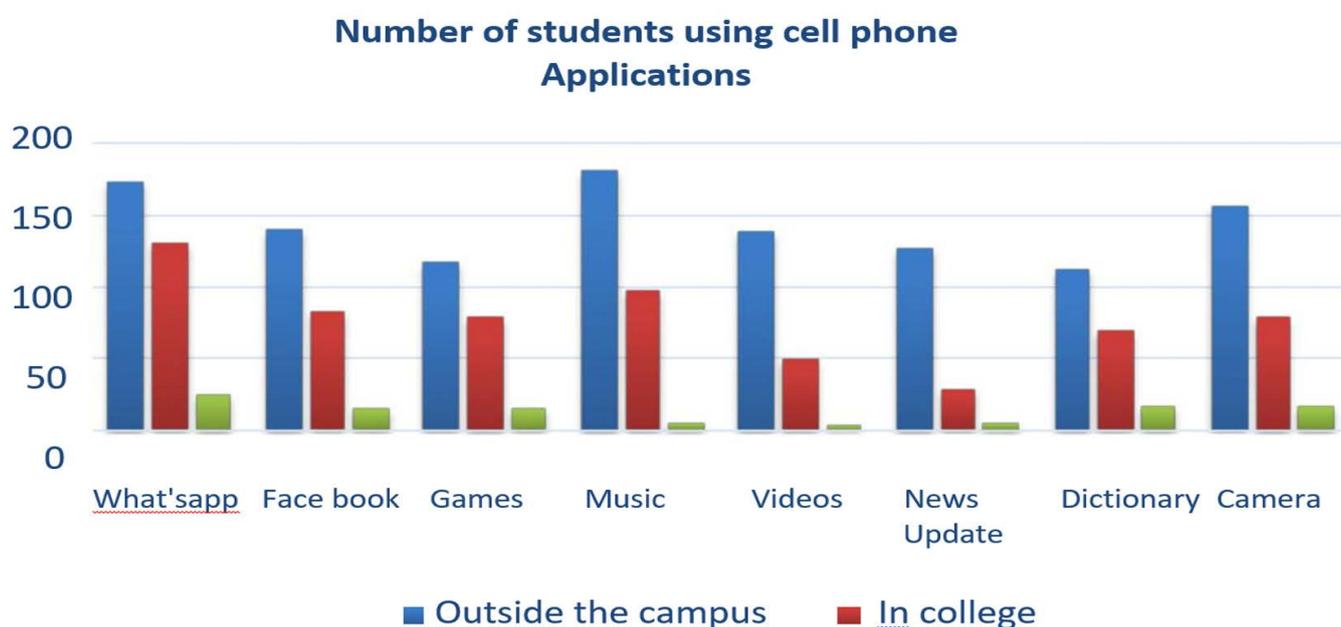


Fig. 2: Number of students using different cell phone applications

WhatsApp

The study revealed that 110 students spend on an average 2 hours per day on WhatsApp, in and off the campus and during lectures.

WhatsApp is an internet-applicable application for sharing information, images, videos, songs, and also has a facility for calling. It is because of these facilities that most of the students use this application, both in and off the campus and during lectures.

Facebook

Facebook is the platform where students can share their emotions, pictures and activities. The study revealed that 80 students spend on an average 1 hour 40 minutes on Facebook daily (Fig. 3). This was similar to the findings made by Alexander (2011).

Implications

We need to accept that cell phones play an important role in the life of students, as it does for everyone else. It is synonymous with information seeking and sharing in all domains of life – private, social and academic. Cell phones offer instant connectivity to information and entertainment. Many functions of a computer are being replaced by the cell phone. In this context, it is important to view the opportunities for using a cell phone as a teaching aid.

Cell Phone as a Learning Tool?

As all students are using cell phones, the potential of this tool could be explored in areas of 'learning'. For instance, lectures could be video graphed and making repositories of these videos available to students can help students to either access classes in advance, or later, if they happen to miss a class.

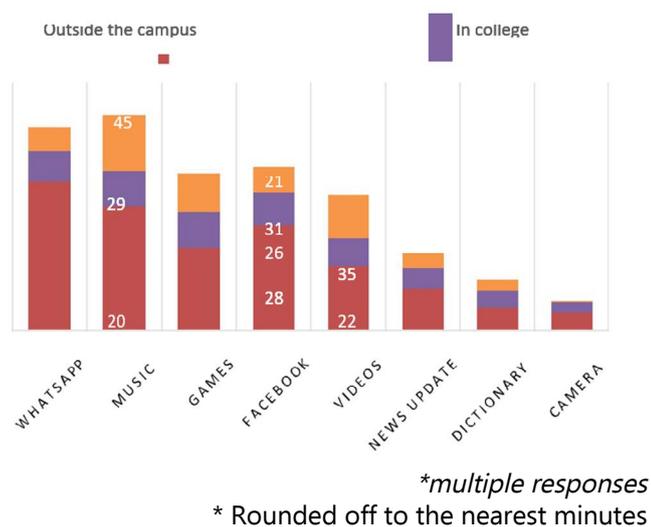


Fig. 3: Average time (in minutes) for which Cell Phones are used for different activities

As noted earlier, majority of the students are using cell phones even during the classroom sessions for chatting, hearing songs and watching videos. So it would be useful to explore how this tool can be used to promote learning. For instance, 'internet searching' exercise on a specific theme for a short while in selected lectures can be used purposely to stimulate the students and help them participate more actively in the learning process (Box 1).

'Flipped classroom' is an instructional strategy and type of blended learning that reverses the traditional learning environment by delivering instructional content, often online, outside of the classroom. In a flipped classroom, students watch online lectures, collaborate in online discussions, or carry out research at home and engage in concepts under the guidance of a mentor (Wikipedia).

Box 1: Enhancing learning opportunities inside the classroom by means of a cell phone

The general thumb rule is that cell phones can be an effective 'once-in-a-while' interest generating study tool in a class. Some examples of its possibilities during a class are given below:

1. Teachers can use cell phones to facilitate a learning situation by asking the learners to read a topic online for a short time (10-15 minutes) and can then initiate discussion on it (maybe in 2 classes out of 20 in a semester).
2. Students may be permitted to record on cell phone videos or audios, on topics that are relatively complex and take time for full assimilation. This may be more useful in some practical classes, on such difficult topics as anatomy, surgery, livestock products technology, etc., which usually involve method demonstrations. This will also aid in supporting students who require more/special/continuous assistance in the learning process.
3. Students can instantly check the meanings of certain words, dosages, alternate drugs, etc., that are used in the lecture via browsing the internet, that they might feel hesitant about asking their teacher.
4. Occasionally, in a few classes, students may be allowed to answer specific questions by sending the answer to the cell phone of the teacher. This will mainly help those students who are otherwise uncomfortable in sharing their answers in front of the whole class.
5. Use of cell phone can also help in 'paperless evaluation' of the subject content taught, the teaching process, and also the teacher. The students may use apps such as 'Poll Everywhere' to provide feedback.
6. Share questions with students and answers from students through cell phones.
7. Organise at least one mock test through cell phones in a semester.

Other possibilities

- Cell phone as a teaching aid to project Power Points;
- WhatsApp groups for teachers and students for clarifying doubts, for sending reminders on important assignments, and sharing documents (images, short videos) with students;
- Creating a YouTube channel to share videos of lectures and demonstrations;
- Give an opportunity to the students in the groups to post small videos, images, or write-ups prior to a lecture or a practical class.

'The Traffic signal approach' proposed by Rao (2012) in school education breaks down mobile device usage in the classroom into three manageable components – that is when a teacher is taking class he/she may show any one of three different coloured cards like red, yellow and green. Red card means students must keep their cell phones completely away. Green card means as directed by the teacher for a search & discussion activity. Yellow

card to clarify doubts students may use cell phone in between a lecture class. Distractions arising from the use of a cell phone can be limited by approving its use by students for specific purposes that will aid teaching in a class.

Mind set Change among Teachers

Use of cell phones as a teaching-learning tool requires a mind set change among teachers.

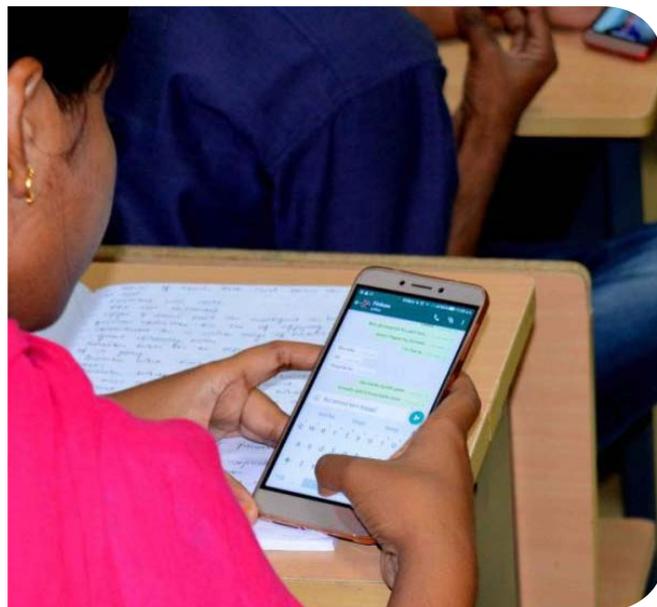
Teachers need to appreciate the new learning opportunities arising from use of cell phones and the merits of combining conventional methods, such as lectures with cell phone applicable pedagogic approaches. The situation also demands 'technology-friendly' faculty who need to enhance their skills in using different ICT-enabled tools in teaching.

Thomas L Friedman in his recent book, *Thank you for Being Late* (2016) noted the exponential growth of technologies and how professionals and public need to adapt to these as soon as possible in order to benefit/contribute to these advances. Teachers need to review these types of books that highlight the importance of changing mind sets for a better tomorrow.

Way Forward

Limited and purposive use of cell phones as a teaching-learning tool has several advantages. It demands increased involvement of teachers in identifying the degree and nature of its use in classrooms. For majority of the students each day

begins and ends with a cell phone. The cell phone is becoming an indispensable, trustworthy appendage, always beside them providing confidence, entertainment, hope and connectivity, in addition to the information we speak of. Probably, it is their best and most intimate friend.



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DISRUPTIVE TECHNOLOGIES - BIG DATA AND INTERNET OF THINGS IN STRENGTHENING EXTENSION & ADVISORY SERVICES

Future Extension and Advisory Services (EAS) needs to strategize convergence of big data with disruptive technologies such as mobile/cloud computing, Internet of Things, location-based social networks etc. Shaik N Meera presents a framework to exploit these developments to strengthen EAS provision in this blog.

We hear yet another buzz word viz., disruptive technologies, but what does this really mean? Is it a negative term as it denotes disruption? Not really. Instead, disruptive technologies are exciting because they challenge established patterns and the way we do things. I will spin this blog around a framework harnessing disruptive technologies and integrating them with the digital extension and advisory services (EAS) strategies. The conceptual framework describes the role of each stakeholder organization in harnessing the big data for better, faster and cheaper solutions to farmers. With the inexorable rise of smartphones in rural India, the real challenge is to develop agricultural applications and provide real time services to farmers.

Future EAS needs to strategize convergence of big data with disruptive technologies such as mobile/cloud computing, Internet of Things (IoT), location based social (LBS) networks etc. Highly personalized extension advisories are possible in India only when EAS embraces big data analytics and links them to unique *Aadhaar* (12 Digit unique identification number of Indian citizens) numbers of farmers. Supplemented with the digitized land records and soil health status linked with GPS coordinates, the future of input supply can lead to a radical transformation. Big data in EAS will integrate information provided by farmers, players in the agri-food chain and markets (e-National Agricultural Market), which can be used to enhance productivity, reduce risk, increase resilience and improve profitability. This will bring new values to farming with small and marginal farmers getting maximum benefit out of such strategies.

Last two decades have witnessed several digital pilot projects in India. Now there is a need to bring rapid transition so as to remain relevant and cater to the emerging - information and service needs of farmers. With the proposed EAS framework, it is expected that farmers will be in a position to pull the knowledge and services on real time basis from a variety of sources. If this can be realized, from seed to harvest, post-harvest to storage and marketing, every farming decision can be supported with the digital extension strategies.

Disruptive Technologies

A disruptive technology is an innovation that creates a new market and value network, and eventually disrupts an existing market and value network, displacing established markets, leading firms, products and alliances. The term was defined and phenomenon analyzed by Clayton M. Christensen beginning in 1995.

I see this in relation to extension systems in two ways: a) Bringing disruption in an extensionists'

functioning that includes transformed services, new innovations in the extension processes and b) Emergence of new players in EAS with disruptive innovations. Through farmers' perspective, it is a situation where extension systems cease to function in the usual manner, and start responding to rapid changes that may transform the very nature of the organization. A disruptive innovation in agriculture will allow small and marginal farmers' access to technologies and/or services that were historically inaccessible to them or accessible at higher costs only. For instance, rural communities are now able to access e-commerce goods and other services such as railway tickets due to the availability of digital platforms. Similarly, goods (agri-input, credit) and services (extension advisory, marketing) are yet to be accessed in agriculture, as there is no disruption.

There is a difference between bringing improvements to the existing extension system with digital technologies and bringing radical transformations into the very nature of extension services. To explain in easy terms, personal computer (PC) displaced the typewriter and forever changed the way we work and communicate. We are not talking about improving the efficiency of type writer here. Instead, we have witnessed a new form of communication and publishing. Social networking has had a major impact in the way we communicate. It has disrupted telephone,

email, instant messaging and event planning. Smartphones with mobile apps disrupted pocket cameras, MP3 players, calculators and GPS devices among many others.

Cloud computing has been a hugely disruptive technology in the business world, displacing many resources that would conventionally have been located in-house or provided as a traditionally hosted service. The next and most radical generation of mobile communications—fifth generation(5G) – is three years away from now (<http://www.gsma.com/network2020/technology/understanding-5g/>). The 5G may radically change the technologies and business models of the mobile telecommunications industry. It will have positive consequence in primary sector like agriculture and extension systems will have to gear up to develop frameworks for best use.

Thinking Beyond Conventional Digital Extension Pilots

Are we ready for digital disruption in extension? Or do we continue to initiate new digital extension pilots? The moot point is eventually how fast can we disrupt (in a positive way) the way extension organizations work? Are extension systems working towards capitalizing on the potential efficiencies, cost-savings or new opportunities created by low-margin disruptive technologies?

Online and mobile banking makes it possible to almost completely bypass the physical bank entities and human bank teller. Amazon, Flip Kart and Olx have revolutionized the classified advertisements and person-to-person sale of all matter of items, including farm equipment. Big basket has changed the way we buy fresh vegetables and fruits.

Initially big organizations dismiss the value of a disruptive technology because it does not reinforce current organizational mandates. I see a similar indifference in extension organizations as well. Improving the efficiency of extension systems had been attempted with a series of digital pilot projects in India (Meera, 2013).

One such digital pilots rolled out in 2016, at the national level in India, is eNAM (www.enam.gov.in/). We are aware of National Agriculture Market (NAM) - a pan-India electronic trading portal which networks the existing agriculture produce market committees (APMC) to create a unified national market for agricultural commodities. The NAM Portal provides a single window service for all APMC related information and services, including commodity arrivals and prices; buy and sell trade offers and provision to respond to trade offers, among other services. While material flow (agriculture produce) continues to happen through *mandis*, an online market reduces transaction costs

and information asymmetry. This is an essential condition for disruption, though not a sufficient one.

Uber app is one of the best examples of disruptive force seen in the taxi industry that could be used to understand the disruption in EAS (Box 1).

Now replace the word Uber App with Input supply App. Replace taxi industry with the supply chain management (specific to input supply). Keep in mind the farmer's need to access extension advisory with integrated supply chain management. You have the answer! Now please read further:

Input supply App can become a disruptive force in the supply chain management in agriculture. The app allows a user to submit a request for a specific input based on the personalized advisory. Approved input suppliers in the area are notified by the app and they respond. Payment is not passed from farmer to input dealer – it's done via

the app which accesses the farmers Adhaar Card/ Unique ID card linked to bank account number / credit card / subsidy vouchers (please see Zoono vouchers program, Box 2). The app also makes use of smartphone GPS capability to show you exactly where and how far away the prospective

input dealer / field officer of a private company is. The app and the technology are quite simple, but provide a completely new approach that challenges how input supply services have been obtained for decades. This is disruption!

Box 1: Uber app

The app allows a user to submit a request for a ride. Uber-approved drivers in the area are notified by the app and respond. Payment is not passed from rider to driver – it's done via the app which accesses the user's credit card. The app also makes use of smartphone GPS capability to show you exactly where and how far away the prospective Uber ride is. The app itself and the technology behind Uber are quite simple, but it provides a completely new approach that challenges how taxi services have been obtained for decades.

Box 2: Zoono Vouchers in Zambia

Electronic Prepaid Vouchers for Input Purchases was piloted in Zambia that enables farmers to pre-pay for inputs. This system was developed by Zoono, a Zambian company that develops and offers electronic financial transactions systems. Each prepaid card contains a code that is electronically registered at the point of purchase, together with the farmer's unique national identification and mobile phone number. Upon registration, the network sends the farmer an SMS that validates the purchase and notifies them of the date and location where the inputs can be picked up. Prepaid vouchers can help input supply companies to increase sales during the period that farmers/ customers have resources available. The electronic registration of farmers' prepaid vouchers and their profile also enables companies to compile a database of customers for targeted SMS-based marketing, information and product promotion. Participating retailers can benefit by stimulating sales during traditionally slower periods. Farmers benefit by purchasing seeds at a discount and by gaining assurance that they will have the seeds they need during the planting season.

(Source: http://pdf.usaid.gov/pdf_docs/PA00J7PB.pdf)

Now you replace the word *Input supply App* with *Farm Marketing App*. Farm Marketing App can become a disruptive force in the way farmers sell their produce. The app allows sellers to submit a request for selling a specific produce / commodity. Approved buyers in the area are notified by the app and respond. Payment is not passed from buyer to farmer – it's done via the app which accesses the buyers *Adhaar* Card / Unique ID card linked to bank account number / credit card. The app also makes use of smartphone GPS capability to show farmers exactly where and how far away the prospective buyer is. Similarly it will show buyers how many prospective sellers are available in nearby villages and how to virtually pool the marketable surplus (remember the Olx experience?). The app is quite simple, but it provides a completely new approach that challenges how agricultural marketing services have been addressed for decades. This is disruption!

Individuals are the backbone of any innovation and many entrepreneurs are innovative in their own ingenious ways with disruptive technologies. Often recognized as what is called "Jugaad Innovation", it is a very flexible, frugal and un-structured method of generating original ideas and solutions. We have enough of pilots, but what we need is a disruption in EAS.

Big Data in Agricultural Extension

Big data is extremely large data sets that may be analyzed computationally to reveal patterns, trends and associations, especially relating to human behavior and interactions. I guess if there would be one sector that has the potential to harness this functionality to the maximum, it would be agriculture. Within agriculture, EAS can do wonders with big data analytics. The EAS intentionally or unintentionally work on empirically driven data - but such data, information and knowledge continuum, could not be managed till now, because the data was not digitised.

Big data is being used to arrive at shocking and seemingly innocuous conclusions like "a car painted orange is highly likely to be in good shape for a used car deal" or when airline ticket prices are going to be favorable to the buyer. We can have several applications such as estimating rainfall or market prices by manipulating numerous data points.

Farmers have been managing their land with extension advisories coming from multiple sources. But neither the extension advisories nor the decision-making is based on the microscopic analysis of data from each farm. If such huge data is collected, collated and processed with big data

analytics and real time advisories are pushed, then we can realize much talked about personalized advisories.

From pre-production (credits, input supplies) to production (varietal to management) and to post-production (processing and marketing), extension systems can harness big data platforms for better and informed decision-making. Agriculture may not immediately come to mind when considering opportunities for the application of big data particularly in Asia and Africa where small and marginal farmers dominate. But to begin with, it can offer solutions to EAS and private agribusiness firms. Micro level data (such as soil health status, soil temperature, rainfall, moisture content) pooled at the village, block, district and regional level could serve as the big data for planning agricultural interventions. Extension informatics (personal, field history linked to advisory) can be achieved with predictive modeling. Remember that Google advertisements are customized based on our search history and access IP? Can we achieve this for providing personalized/ plot specific advisories?

Data visualization (visual representation of data in charts and graphs) has become popular in recent years. Organizations have invested in the production of data visualization, committing to the belief that visualization is an effective form of communication. Imagine the use of such visuals at the joint director agriculture office at district level or private sales executive at regional level, to plan the demand and supply, and product (varietal) targeting, based on empirical data.

Connecting extensionists' smartphones to a cloud-based analytics engine, can give farmers customized products and increase efficiency of advisory services. This technology will be more suitable for developing countries, characterized by the pre-eminence of small farms with very low investment capacity and reliance on intermediaries to a greater extent than farms in developed markets. Better market, crop and input information could boost yields and returns for farmers. For private firms, inventory tracking and product traceability with GPS vehicle tracking (telematics – like in case of ePDS) will result in better supply chain management.

The big data analytics in extension will bring significant changes in the personalized, field specific solutions along with pre-production to post-production service needs of farming community. It will lead to higher yields, lower input use per hectare and lower cost of cultivation. For example, the magnitude of yield improvement from commercial precision fertilizer application,

according to various agribusiness market participants, ranges from 10 to 15 per cent. If effectively implemented (in combination with Internet of Things (discussed below), this will help small and marginal farmers in every step from credit access to marketing.

Internet of Things (IoT)

According to Industry Trend Analysis - IoT & Big Data in Agribusiness: Driving Future Sector Growth - NOV 2016, the integration of Internet of Things (IoT) and big data technology in agriculture will pick up in the coming years, and be a major factor behind future improvement in global yields. (<http://www.agribusiness-insight.com/industry-trend-analysis-iot-big-data-agribusiness-driving-future-sector-growth-nov-2016>)

'Internet of Things' (IoT) is defined as connecting 'things' that can passively or actively monitor, collect and exchange data over a wired or wireless communication network. The IoT can have positive consequences on farm production, soil health, water, nutrient management, pest management, traceability and tracking, supply chain management, processing, transportation, storage, retailers, inventory management, food safety etc. The IoT can provide farmers with on-demand information based on the differential contexts that can be sensed through a network of IoT sensors. Large scale utilization of IoT systems in extension organizations will optimize efficiency of advisories and supply chain management.

Dairy and livestock farmers have been using radio frequency identification (RFID) to enable tracking of individual animals' health and levels of production for quite a number of years. There are many other potential areas for development, including sensor networks to monitor soil and crop conditions, equipment monitoring and automation (self driven planters/ harvesters etc.). These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.

While in developed countries (particularly where landholdings run into '000 of hectares), these technologies are used by farmers directly, recommending the same for developing countries with smaller landholdings (with no need to remotely monitor fields), is like barking up the wrong tree. I see potential of the IoT more at the level of extension professionals (both public and private) rather than at field/ farmers' level. For example, customized advisories can be planned for a village/ cluster of villages based on sensor data received on irrigation (channels), pests surveillance/management, weather based agro-

advisories, real time contingency plans, animal disease outbreaks etc.

For instance, municipal dustbins with sensors send alerts to garbage collectors (truck drivers) to pick them up. Similarly sensors can send alerts to extension professionals about the possible outbreak of a pest / any other exigency under its jurisdiction. This is one way of reducing the higher costs of face-to-face contact methods employed by extensionists and will appropriate the human resources in extension systems.

To facilitate the purchase of farm inputs and selling of farm products, the smartphones of buyers' and sellers' can be equipped with IoT technologies such as Near-Field Communications (NFC), that facilitates the purchase of products without using cash. Mobile Internet and low-cost sensors could enable farmers to interact directly with the consumers, cutting off middleman. Kenya has developed M-Pesa kiosks in the rural communities for mobile money transfer.

With the use of IoT, decision makers can undertake appropriate agricultural interventions through large scale extension programs. These technologies can be integrated with a central system and help disseminate relevant personalized advisories to farmers. This can be used to identify pest outbreaks and map other trends. IoT systems can track farmers requiring transport to carry their farm produce to distant markets. Similarly IoT will help consumers and traders with traceability of agricultural commodities.

Location Based Social Media (LBS)

The inclusion of mobile positioning in social networking services that lets people know where they are at any given time may be termed in short as Location Based Social Media (LBS). LBS media monitoring could be used for segmentation of data from social networks (e.g., Facebook, LinkedIn and Twitter) by geographical location to identify patterns. For EAS, LBS networks present unprecedented large-scale check-in data to describe a farmer's (extensionist's) mobile behavior in spatial, temporal and social aspects. Based on the trends, contingency action plans and time critical advisories can be made available to farmers.

Several LBS could be provided - such as resource tracking along with dynamic distribution, finding nearest farmers willing to transport together to fetch higher market prices, weather fore-warning, proximity-based notification (push or pull) of extensionists/experts targeted advertising.

The Framework

There is never going to be a blueprint for how to

proceed with disruptive technologies in extension. As stated by Hall (2016), what is clear is that business as usual is the anti-thesis of disruptive innovation, and as evident from e-commerce sector, in the early stages of disruption, the lower-performing technologies only meet the needs of a small segment of existing customer base. In most of the digital pilot projects initiated across the globe during 1990 - 2002, this was witnessed in agriculture sector.

As new technologies evolve, its efficiency improves and the innovation meets the needs of additional customers across the industry. Eventually, the original firms are driven out as the disruption meets the needs of the mainstream market. In the case of EAS, the disruption may not be to the magnitude of e-commerce (though in agriculture this may be seen).

The EAS Framework for harnessing disruptive technologies may be explored with three distinct areas viz., pre-production, production and post-harvest (Please see Fig 1).

Pre-production

Weather details, aberrations, climatic factors, crop selection etc., in extension advisory provision depend largely on remote sensing, geographic information systems, management information systems, predictive modeling solutions and high impact knowledge management models. This also requires harnessing big data analytics and at times IoT (for e.g., advisories based on soil temperature, humidity). Mix of farming systems, various government schemes, access to credit and insurance could be handled with the emerging technologies to give personalized solutions to farmers and here, digital networking solutions will be of great help.

Production

Sowing apps, cooperative land preparation, input management, water fertilizer management and pest management can be effectively handled by developing sensory devices, proximity devices, e-commerce/ m-commerce platforms/ applications, digital networking solutions, big data analytics, smart mobile apps and high impact knowledge management solutions.

Post-harvest

Marketing, food processing, packing, storage and transportation will play an important role in future farming. Perhaps these factors will drive global agriculture in the coming years and this will have a bearing on the way small farmers operate. Digital cashless transactions, transactions linked to unique IDs and bank account numbers, linking credit and

marketing with bio metrics will give EAS leverage over the past efforts. Digital networking solutions, risk sharing systems for agricultural lending,

agricultural value chain networks, e-vouchers distributed through mobile interfaces, will transform EAS strategies in the developing world.

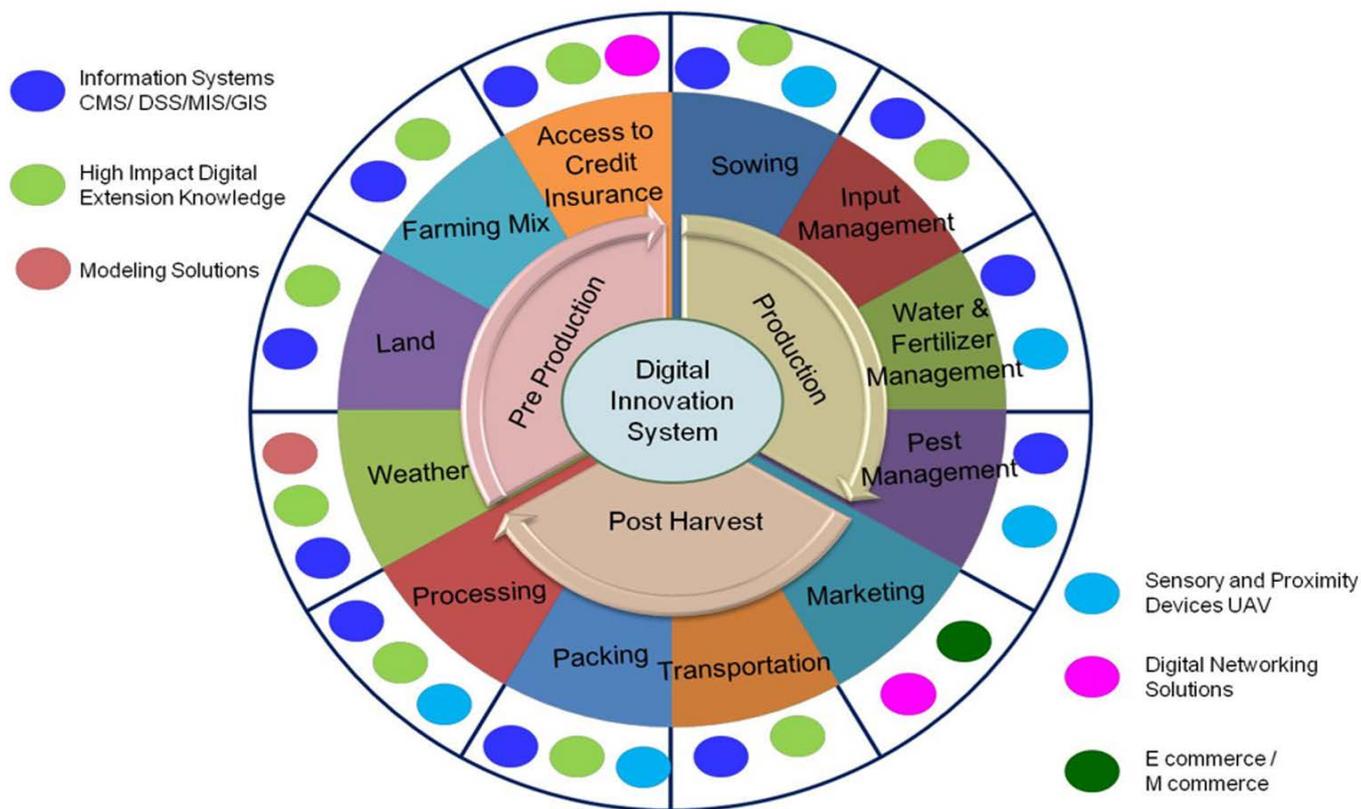


Fig. 1: Digital Framework for Disruption in EAS

I will discuss the disruptions in each of the EAS services in a separate blog, but for the time being I would like to give an example of eNAM. Initiatives like electronic National Agriculture Market (eNAM) portal that provides a single window service for all market-related information and services is an essential, but not sufficient condition for bringing disruption. Anyone with basic understanding of agricultural marketing would know that price information (or price prediction as well) is only an essential condition but not sufficient condition for realizing the benefits to smallholder farmers. If a farmer gets to know about higher price in a distant market, it is not economical to lift his produce to such a market. In such cases there is a need for market disruption (with the technologies discussed) to realize the benefits to these farmers. This can be realized in many ways.

Virtual pooling (that was tried to some extent in ITC's e-choupal in India) will help pool the marketable surplus within farmers in proximity, who wish to collectively market in distant markets. Who knows there may be commission agents/farmers with digital skills - transforming themselves to take advantage of this win-win situation (remember local retailers taking advantage of online marketing)? Together with virtual pooling, a series of e-Voucher platforms across the country could enable extension agencies to provide

specific non-cash services. Such e-Vouchers are much easier to track than cash vouchers, and they also help avoid fraud, which is a common problem with paper vouchers. Think about joining this with the online soil health cards, Nutrient Manager App, optimum fertilizer recommendation and fertilizer supply, using e-Vouchers. This will dramatically improve fertilizer demand and supply dynamics.

Another interesting aspect to look is the effect of product imagery and experience with the upcoming technology in virtual reality environments. Apart from 3D, virtual reality is going to be a huge player in e-commerce in agriculture, both for farmers and private organizations. When all support systems are in place, I guess the market disruptions may happen that would ultimately help farmers and consumers alike.

Google is a good example of how innovative companies drive digital disruption across many industries. It was a simple website search engine few years back. Now Google has changed dynamics in many industries such as media, retailing and banking. With many new initiatives like fibre-to-home, home automation, Google Car and Google Glass, the company continues to drive creative disruption in telecoms infrastructure, utilities and the insurance industry. In a similar way,

disruptive technologies may offer new expanded opportunities for extension system, to evolve into a completely unimaginable service providing organizations. The disruption may positively

impact the very nature of EAS if only extension policies could be flexible to make structural and functional adjustments (Please see Fig 2).

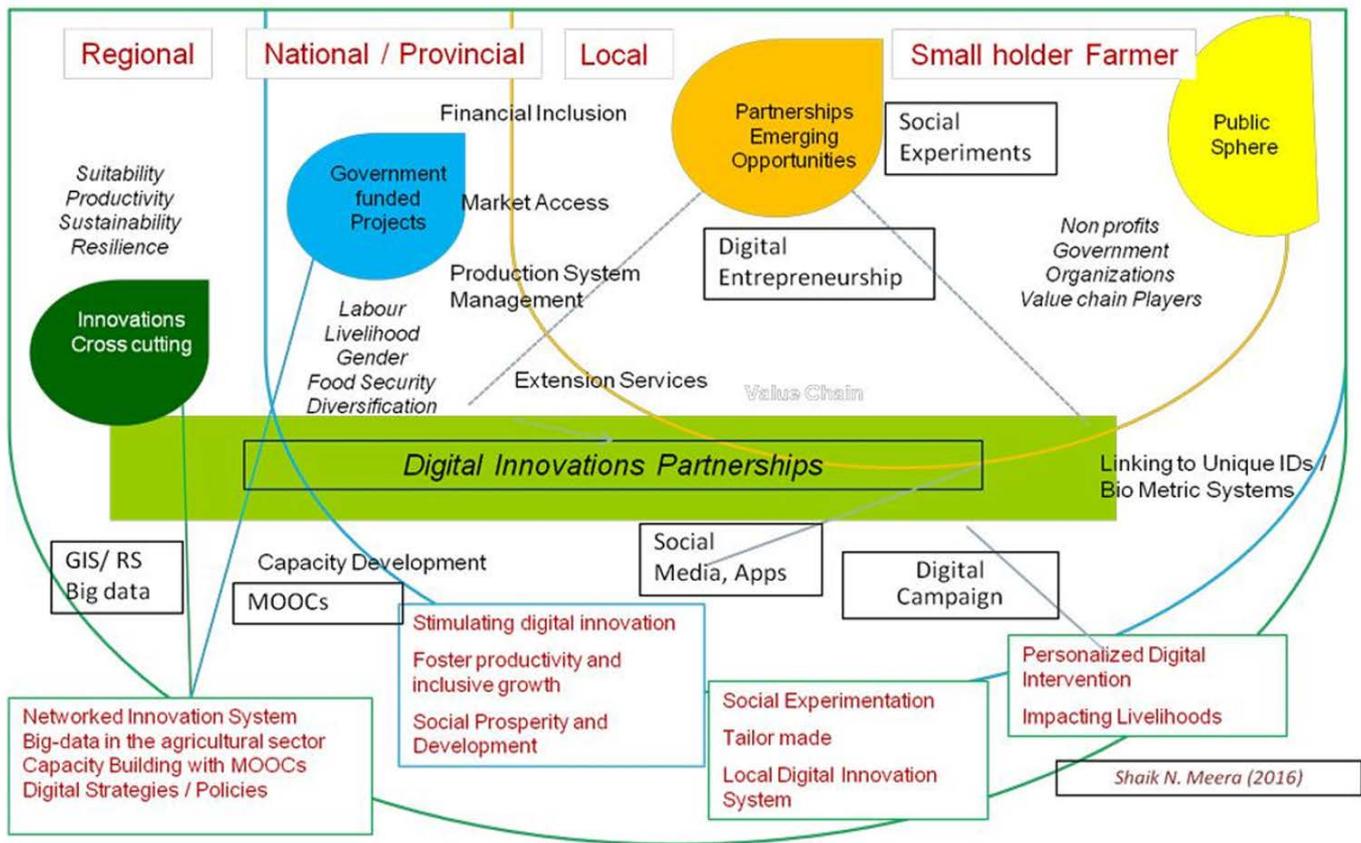


Fig. 2: Digital Framework for Disruption in EAS

At provincial or nation level GIS / Remote sensing / big data can bring disruption for productivity, suitability and sustainability dimensions. Similarly the Massive Open Online Courses (MOOCs) strategies are capable of bringing disruption in capacity building within extension advisory systems. Provincial and local EAS organizations can focus on financial inclusion, market access, production system management and core extension services with a number of disruptive innovations. For this, a series of social experimentation within extension organizations (public and private) is required that can catalyse local digital innovations systems. Digital extension strategies would accelerate the impact of extension advisory, when they provide highly personalized, time critical services to the farmers.

Is doing the right thing wrong?

Clayton Christensen, in his book, 'The Innovator's Dilemma', argued that successful executives tend to follow the path of past successes in their decision-making. This helps sow the seeds of their own demise by allowing other firms that innovate to move beyond the status quo. He therefore defined the innovator's dilemma as, "doing the

right thing is the wrong thing". If we really feel there is a need for radical change in EAS, disruptive technologies provide better opportunities.

To begin with, a few private firms started exploiting prescriptive planting strategies that have the potential to disrupt the agricultural industry. For example, there are big data applications to precisely understand where is one of the 25 million mapped agricultural fields in the USA, to plant what type and volume of seed, to achieve the desired crop yield. Monsanto's Field Scripts product combines an extremely detailed database of 150 billion soil observations, 10 trillion weather-simulation points and hundreds of thousands of seed-yield data points. Monsanto's planting machines, which can steer themselves using GPS, can plant a field with different varieties at different depths and spacing according to the climate data. Farmers who have trialed Monsanto's system claim it has increased yields by around five per cent over two years. All these do not mean that the same could be replicated at farmers' level in South Asia or in many other developing countries. But within EAS, these strategies could well be deployed, or other forms of disruptions suiting South Asian conditions could be explored.

ITC Infotech's Digitaligence services and solutions are designed to meet the growing needs of the Banking and Financial Services industry, providing cutting edge insights, superior customer experience and engagement, and delivering an 'anywhere, anytime' service to consumers. In a similar way if we were to think about disruptive technologies in extension advisory, then what would the opportunities be? If disruptive technologies are a combination and integration of telescopic, microscopic, processor and remote functionalities, we need to think how these four functionalities will help extension in creating disruption.

<http://www.itcinfotech.com/digitaligence/>

Investing in disruptive innovations in agriculture can boost garnering and harnessing new ideas. Governments should support entrepreneurs with business models which have the potential to strengthen and promote digital agriculture. Many start ups are emerging that can initiate digital disruption in EAS. The vision of digital disruption is exciting. However, pathways to prosperity need to be more clearer. The success of disruptive technologies such as IoT and big data analytics for rural development depends on the participation and support of both, public and private bodies. Support could be in terms of finance, standards development, data sharing and access, analytical tools and technology.

Way Forward

Whether one likes it or not, disruptions are likely to happen (or already happening) in the extension processes, activities and methods. Perhaps, disruption may not happen within EAS immediately. My main intention behind writing this blog is to provoke thoughts to bring about disruption in extension processes rather than bring disruption in the organizational structures. A series of such disruptive extension processes will surely transform the very nature of EAS. Until then keep thinking and exploring what best could be done by us.

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**SKILL
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SKILL DEVELOPMENT IN VETERINARY EDUCATION

Skill development is not merely meant for farmers and entrepreneurs. It is also about having the needed skills among field practitioners. For instance, the main purpose of veterinary education is development of appropriate knowledge, skills and attitudes among veterinarians. But are we doing enough to develop the much needed skills required for field veterinarians? Lack of clarity on the different types of skills to be developed and absence of adequate infrastructure for skill development have led to poor skill development among veterinarians and this needs to change, argues SVN Rao.

A field veterinarian is expected to play two roles one as a clinician and the other as a livestock advisor. For a veterinarian both hard and soft skills are equally important. For instance, he/she must be a good clinician (hard skill) but also be good in interpretation of results for proper diagnosis (soft skill). Hard skills could be defined as well as measured and hence considered as tangible, whereas, the soft skills are intangible and difficult to quantify. It is comparatively easy to impart hard skills which are mostly physical in nature. The soft skills are to do with mind.

Skills such as Artificial Insemination (AI), surgical interventions, treatment of cases, analysis of samples etc are examples of hard skills. The examples for soft skills include, approaches on personality development, interpersonal communication (Interaction with clients, collecting history of the animal from the clients, building rapport with the clients etc), interpretations and diagnosis of cases, prescription, entrepreneurial skills etc. He/she also needs to be a good livestock advisor which involves mostly soft skills, necessary for effective delivery of livestock services. This is one of the reasons why very good clinicians with poor communication skills or poor personality often fail to attract the clients and also fails to develop rapport with livestock owners.

The skills could be placed on a continuum of very simple to very complex.

Imparting Skills

Skills required for a veterinarian as a clinician

To acquire skill one has to learn certain things in a systematic manner. For instance, the veterinarian has to "diagnose and treat a case" successfully. This necessitates him to:

- Collect the history of the case from the owner
- Examine the animal for various clues which help in arriving at a tentative diagnosis
- Collect the required samples from sick animal (blood, skin scrappings, dung, etc.
- Obtain the required information through various diagnostic tools
- Combine all this with the help of his past experience to arrive at a diagnosis.
- Treat the case accordingly.

This means the veterinarian must have the following knowledge, skills and attitude:

- Skill to build rapport with client to collect proper history (soft skill)
- Knowledge of the symptoms of a disease
- Skill to look for the symptoms in the animal (soft skill)
- Skill in interpreting the results of clinical diagnostic tests (soft skill)

Box 1: Knowledge and Skill

Education is defined as the process of bringing about desirable behavioral changes in people. These changes could be in the areas of Knowledge, Skill, Attitude and Action (in short KASA changes). Knowledge is a body of information applied directly to the performance of an act. When once we use this knowledge for performing an act it becomes skill. Knowledge is information that we have in our head and skill is the ability to use and apply this knowledge to perform certain tasks. Knowledge refers to theoretical information acquired on any particular subject whereas; skill refers to the practical application of that knowledge.

Knowledge can be learnt whereas skills require practical exposure. Certain skills could be imparted through training in practical situations whereas, certain other skills could be inborn and difficult to impart through training. It is said that Skill gives teeth to the knowledge. Both knowledge and skill are required to perform an activity successfully.

Knowledge normally precedes the skill. A person must be definitely knowledgeable. Any skill must be acquired properly up to the required depth. Partial acquisition leads to poor application and it is often compared to a blunt knife. Individual variation exists among the trainees although the trainer and the situation in which the training was given are the same. If skill is not practiced regularly one may lose its touch. One may not forget it entirely but the fineness with which he does or applies varies. Practice makes a man perfect in that skill.



- Knowledge on various lines of treatment with degrees of success
- Knowledge on the prognosis of the case and cost of treatment
- Skill in arriving at an appropriate diagnosis (soft skill)
- Skill in administering the medicines or injections (hard skill)
- Skill in dealing with the clients (soft skill)
- Attitude towards the case as well as towards the client

skills to a required depth. The teachers will be using different methods singly or in combination to impart skills.

- Method demonstrations by the trainer
- Practicing on dummy animals (for complex skills)
- Hands on training in situ
- Providing enough opportunities to enable the trainees to acquire skills in a farm/hospital and later in farmers' field.

Knowledge is also sometimes construed as theoretical knowledge different than practical knowledge which is sometimes referred to as skill (applied knowledge). Knowledge could normally be imparted in a class room setting through training programme.

To train UG students on AI technique the following activities must be undertaken:

1. Knowledge of heat symptoms & stages of heat (theoretical in class room)
2. Skill in identifying the cow in heat (soft skill in ILFC/ TVCC)
3. Skill in examining the genitalia per rectum (hard skill in TVCC)
4. Skill in determining the stage of heat (hard skill in TVCC)

Similarly to impart skills on "pregnancy diagnosis in cows" we need

- Trainer (Gynaecologist)
- Sufficient number of cows with varying gestation periods
- Interested trainees
- Appropriate place (dairy farm)
- Other things like trevis, gloves etc.

Cases which require surgical interventions need different types of equipments and in the absence of which the surgeon is constrained to treat the cases effectively. As the saying goes "Practice makes a man perfect" we need to expose the students to a number of cases to enable them to get sufficient exposure to help them acquire the

5. Loading the AI gun (hard skill in TVCC)
6. Inseminating the cow (hard skill in TVCC)

Once the students are confident in performing AI in TVCC they can be permitted to practice in ILFC and the field (farmers' animals).

As it could be noticed that to impart AI skill, we need infrastructure in terms of cows (both dummy/ condemned cows and healthy cows), AI equipment, Semen straws, LN2 containers etc in sufficient numbers to provide enough opportunities for the trainees to acquire the skills. For this reason the Veterinary Council of India (VCI) insists on Instructional Livestock Farm complex (ILFC) with different species of animals to help students to acquire both knowledge and skills in rearing animals through "earn while you learn" projects and Teaching Veterinary Clinical Complex (TVCC) which receive quite a good number of cases.

Skills required by a Veterinarian as livestock advisor

If we wish to impart skills in organizing a "deworming campaign" we need

1. Extension professionals
2. Students
3. Development and use of communication aids such as specimens, charts, posters etc.
4. Organization of various materials like microscopes, slides, deworming medicines etc.
5. Coordination of various departments like Parasitology, Clinical medicine, State Dept. of AH
6. Appropriate location in the village(s) – open area to hold animals, place to keep microscopes, suitable place for exhibiting the specimens, posters, charts etc.
7. Logistics like transport, drinking water etc.

This involves meticulous planning of both men and material resources. The dairy farmers need to be sensitized for getting their animals dewormed, involve village leaders in site selection and local publicity, seek coordination of various departments, arrange for dung examination, administration of medicines, record keeping etc. All these activities must be done by the students while the extension faculty plays the role of facilitator. Excepting collection and examination of dung samples, restraining the animals and administration of dewormers, rest of the activities involve only soft skills. These soft skills include:

1. communication skills to build rapport with the village leaders and cattle owners,
2. organization skills to arrange for the materials at appropriate places,

3. skills to achieve coordination of various departments,
4. skills to resolve the conflicts that arise among the cattle owners(Group dynamics) etc.

To impart skills in organizing a method Demonstration of "Full hand method of milking" to the dairy farmers, we need

- Trainer or milker/students
- Few Milking Cows
- Interested farmers
- Appropriate place
- Other items such as milking vessels, milker rope etc.

The students must have:

- Knowledge about different methods of milking
- Skill in milking the cows with full hand method
- Advantages of full hand milking vis a vis disadvantages of knuckle method of milking
- Skill in organizing demonstration
 - ❖ Building up rapport with the dairy farmers
 - ❖ Winning trust and confidence among the dairy farmers
 - ❖ Identification of opinion leaders and key communicators
 - ❖ Selection of an appropriate place in the selected village
 - ❖ Skills to motivate the followers to participate in the demonstration
 - ❖ Arranging the cows in milk, milkers, milker ropes, utensils etc.
 - ❖ Skills to initiate discussion among the participants after the demonstration.
 - ❖ Skills to evaluate the impact of demonstration through arriving at the responses from the participants (spot evaluation)
 - ❖ Skills to motivate the participants to come forward to acquire the skills in Full hand milking
 - ❖ Skills to cultivate the habit of full hand milking through farm and home visit
 - ❖ Net working of the participants to resolve the issues during the learning process and help other farmers to acquire the skills

Most of the extension related skills are soft in nature and these skills include:

- Communication skills to build up rapport with the farmers, collection of relevant data,
- Analysis of the farming situation, root cause of the farmers' problems,
- Selection of appropriate extension methods to interact with the farmers

- Winning the trust and confidence of the farmers
- Group dynamics- composition, structure and functions of various groups, leadership etc. to involve them in livestock development programmes
- Ways and means to help the farmers
- Preparation and use of various teaching aids
- Organization of demonstrations, on farm testing, impact analysis etc.

It is also equally important to assess the type of skills required at different levels viz., Livestock owners, para vets and vets.

Constraints in Skill Development

There are no two opinions that more the exposure or opportunity provided to the students the better it is for them to acquire the skills properly. Unfortunately in many veterinary colleges the required skills are not being imparted mainly due to lack of or inadequate infrastructure in ILFC/ TVCC resulting in the students not able to acquire the skills in managing the farms or treating sick animals effectively. Shortage of trained faculty further aggravates the problem. This is one of the reasons why the veterinary graduates do not venture to establish livestock farms on their own as entrepreneurs.

Way Forward

The ILFC and TVCC must be strengthened to provide ample opportunities for the students to acquire the skills. One or two veterinary Dispensaries (working under State Department of AH) which receive good number of cases could be converted into rural veterinary centres and must be

brought under the control of TVCC to increase the student exposure to more number of cases.

The 6 months rotator training could be flexible to suit to the options of the students. As on today, this is not happening in any veterinary college because we implement the internship programme in to without any deviation. The net result is that our graduates are incapable of working in large scale or commercial establishments. They cannot venture into farm business. Therefore this 6month training could be organized as follows:

- Assess the areas (dairy, poultry, goatery, meat processing, Value addition etc) where there is a scope for the UG students to improve their skills.
- Prepare a list of students based on their interests.
- Document the list of entrepreneurs who wish to train our students.
- Invite these entrepreneurs for campus interviews for selecting their prospective students based on their interests.
- Accordingly the students could be attached to the respective entrepreneurs for a period of about 6 months.
- Negotiate with entrepreneurs for payment of stipend.
- The students who wish to go for advanced studies (MVSc) in particular disciplines may be given opportunities to sharpen their skills in colleges/ departments where such facilities are available. For example a student who wishes to go for small animal practice may be permitted to undergo training of 6 months in a TVCC or urban hospitals where turnover of small animal cases is good.



- Similarly the students who are interested in wild life may be sent to a Zoo for 6 months to provide enough opportunities to learn the skills required in wild life management.
- Those students who wish to become “jack of all master of none” could be given the existing 6 months internship programme.

This, I am sure will help the students to acquire the skills of their choice which enable them to get employed in the respective farms or processing plants and or embolden them to start enterprises on their own.

- **Entrepreneurship programme:** Some veterinary colleges are successfully implementing the “earn while you learn programme” to help students acquire the

required skills in their respective areas of interest. However, it has limitations in terms of the size of the farms and also the number of students to be accommodated. There is a need to increase the farm size, facilities in processing departments (LPT) to enable the students to acquire and sharpen their skills.

- **Extension skills :** The major constraints in imparting extension skills are inadequate faculty, poor infrastructure, lack of logistic support like transport to visit villages and ill defined curriculum to mention a few. As a result the students are not able to acquire the desired skills in extension and they as veterinarians are not able to play the role of “Livestock advisor” effectively. All these need to be addressed.

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SKILL DEVELOPMENT FOR A NEW RURAL RESURGENCE

Recent initiatives such as the National Skill Development Corporation have begun to address some of the needs related to skill development in various sectors. However, the needs of the rural areas, and those of agriculture/allied sectors are yet largely unaddressed. In this blog, Girish G Sohani illustrates some of his thoughts on skill development for employment, self-employment and enterprise development in rural areas based on the experiences of BAIF Development Research Foundation.

India today faces a massive skills deficit compared to the tremendous demand generated within all sectors of the economy – industry, construction, infrastructure on the one hand; and agriculture and allied sectors on the other. In order to address emergent needs and challenges in rural areas, there is need for an approach based on skills development as an important strategy.

The Approach

In our view an appropriate approach for skill development in rural areas should contain the following key elements. (We propose this approach based on our experiences in this area).

- Rural Focus: Skills development for employment, self-employment and enterprise development in rural areas.
- Coverage of both farm-based and off-farm sectors.
- Delivery of skills development close to the setting of trainees.
- Open school system for certification.

Over the last few years, the BAIF (BAIF Development Research Foundation) has worked upon skills development programmes in agriculture, animal husbandry and land and water resource management (Box 1).

In the recent past skills development programmes have been started in construction technology areas such as masonry and bar Bending. Other potential areas such as plumbing and the hospitality sector (through rural-/agri-/eco-tourism) are also being explored currently.

Sectoral Coverage

BAIF plans to leverage its existing knowledge base and experience in the above sectoral areas to put in place a skills-development programme focused on the rural sector (Table 1).

Roles

A skills-development programme in all the above areas will require work on

- Development of contents and pedagogy in partnership with key institutes.
- Setting up an Assessment and Certification system in the open school system.
- Organize the delivery through a hub-and-spoke model and using ICT.

Teams: BAIF proposes a core team at a central level (at Rural Resource Centre for Skill Development) and extended teams at the delivery end (skill development centres) to design and implement skill development programmes.

**Table 1: Skills Development in Rural Areas: Scope and Levels
(Illustrative Themes in BAIF Programmes)**

S. no.	Areas/Themes for skill building	Skills for Service-Delivery / Setting Enterprises	Upskilling of Practitioners
A	Natural Resource Management <ul style="list-style-type: none"> Water Harvesting and Management Watershed Management Watershed Development Technician 	<ul style="list-style-type: none"> Water Technicians (Turkey planning/installation of water pumping/application systems) Water Technicians (Maintenance) Handpump Technicians Microclimate Management: Shade Nets/Poly houses 	<ul style="list-style-type: none"> Efficient Water Usage Improving Soil Health
	Agriculture/Horticulture <ul style="list-style-type: none"> Crop Planning Sustainable Agricultural Practices (SAP) Soil Health Management 	Grafting of Horticulture species <ul style="list-style-type: none"> Nursery Raising Nutrition Gardens Systems of Crop Intensification (SRI, SWI, SSI) Seed Production SAP Input Production (including organic fertilizer) Soil Health Monitoring and Advice IPM IPNM 	<ul style="list-style-type: none"> Farm Implements Maintenance Post-harvest handling of farm produce Crop Intensification / Diversification Soil Health Management Improved Fertilizer use efficiency
C	Livestock Development <ul style="list-style-type: none"> Dairy Cattle Management Goat Rearing Management 	<ul style="list-style-type: none"> Artificial Insemination and Allied Services Buck-Rearing for Goat-Keeping Disease Diagnostics and Preventive Health Care Milk Handling and Preservation 	<ul style="list-style-type: none"> Feed/Fodder Security Economic Milk Production Clean Milk Production Reproduction and Nutrition Management of Cattle
	Forestry Based Livelihoods <ul style="list-style-type: none"> Planning for NTFP based livelihoods 	<ul style="list-style-type: none"> Management of Young Silkworm Rearing (chawki) Running Silkworm Granages Post harvest operations on Sericulture Cocoons Raising forestry Nurseries Lac Cultivation Mangement Seed Lac Production Honey Processing 	<ul style="list-style-type: none"> Sustainable Honey Harvesting Improved Silkworm Rearing
E	Construction and other Appropriate Technology <ul style="list-style-type: none"> Assessment of Technology needs and Scope 	<ul style="list-style-type: none"> Operating "Building Centers" Fabrication and Maintenance of Agricultural Machinery/ Implements Ferrocement Technology Bio-energy Technologies 	<ul style="list-style-type: none"> Basic Construction Skills-Masonry, Plumbing and Painting
F	Community Mobilisation <ul style="list-style-type: none"> SHG Formation and Management 	<ul style="list-style-type: none"> Book-keeping for Small Groups Accounting of Enterprises/Farmer Organisations 	

The resource center will provide technical knowledge base to other centers by shouldering responsibility of developing course material (in local language) for Instructors and demonstrators. The thematic experts (subject experts) at the central level will work on pedagogy of courses, develop a team of Instructors and demonstrators and also develop linkages with concerned universities and experts and involve them in developing the curriculum and certification of the course. They will organize:

Curriculum Development Workshops- Through these workshop experts from the related fields are brought together to develop curriculum of each course. The course curriculum will be developed on modular basis, in line with NSDC or open school curriculum.

Development of audiovisual aids and training materials- For effective transfer of knowledge, audiovisual aids will be developed as supplementary tool in training. They will be

Box 1: BAIF Approach

Over the last 40 years BAIF Development Research Foundation (www.baif.org.in) has worked on innovative approaches for livelihood generation in rural areas through Natural Resource Management and creating gainful self-employment through development of livestock, agriculture, horticulture and forestry. These programmes have positively impacted about 4 million families in a dozen States of India. Demystification of technology and capacity building of participants have been important planks of BAIF programmes. One important feature of BAIF programmes is the thrust given to participation of women, not as passive beneficiaries, but in active spearheading of development initiatives. The women are further organized into Self Help Groups (SHGs) which function as the social capital for development action.

BAIF programme have over 7000 SHGs (representing over 1 lakh families) and involved in micro-credit, contributing to better social security, absorption of technology and skills and promotion of enterprises. Through its programmes, BAIF team works with women SHGs as well as Common Interest Groups (CIGs) of farmers, which are further federated into second tier organizations which take up aggregate-level activities for supporting farming as well as engaging with markets. BAIF has been recognized as a study center by national and state level universities and open schools. For instance, BAIF is recognized as a Study Center for Natural Resource Management course under from Indira Gandhi National Open University (IGNOU) and has been undertaking various diploma and certificate level programs with Yashwant Rao Chavan Mukta Vidyapeeth, Maharashtra.

in the form of either standardized power point presentations, small 3-5 minutes films on good practices or processes or visual presentation. Considering the constraint of availability of uninterrupted electricity and internet connectivity, this material will be in the form of offline CDs. To supplement this, material in flex and print form will also be developed for each course.

Training of Trainers- A Core Faculty Team (CFT) will conduct Training of Trainers to suit requirements of various module. The duration may vary as per the course structure. The first batch of trainees in the first location can operate as Master Trainers (MT) for starting another center in new location.

At each Skill Development Center there will be one Center in charge who will take up promotional activities for sourcing of trainees and a small team for Instructors and demonstrators to impart training. The centres could develop partnership with the National Skill Development Corporation, the Open School System or similar other national level authority for assessment and certification of the courses offered.

Way Forward

The Skill Development Programmes should have a rural focus and should offer trainings on farm based and non-farm based trades. It should focus on up-scaling the skills of practitioners and creating a cadre of service providers or for self employment. Each skill development centre should be organized in such a way that it has the capacity to cater to 10,000 trainees per year. Each Skill Development Center should select the courses depending upon the agro climatic conditions and need and the list will be revised every year to suit the demand of the local area. Each course may have around 20% of theory

and 80% of practical hands on experience and the medium of instruction should be the local language.

Having worked in livelihood creation for rural areas, BAIF has a small team of trainers at many locations who can be assigned this task. BAIF has strong field programmes in Uttar Pradesh, Uttarakhand, Bihar, Rajasthan, Madhya Pradesh, Chhattisgarh and Punjab where the Skill Development Centers can be established in association with local institutes having training facilities. We look forward to engage with the rural skill development initiatives of the Government and other agencies in the coming days.



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SKILLING THE FARM SECTOR – NEED FOR A FOCUSED APPROACH

The focus of skill development in India by default is oriented towards industry and micro enterprises. Skill development in the farm sector is yet to receive due attention in the skill development efforts of the Government. A shift towards skilling the farm sector is long overdue, argues RM Prasad.

During 2008, India witnessed two draft national policies, namely, the National Policy on Skills Development (May 2008) and the National Employment Policy (August 2008). Subsequently, the final version of the National Skill Development Policy was published in March 2009. Another important draft report related to skill development “Skill formation and employment assurance in the unorganised sector” was also published during 2008 by the National Commission for Enterprises in the Unorganised Sector (NCEUS). Skill development of farmers and farm labourers is not recognised as a priority in all these documents, though half of the workforce in India continues to depend on agriculture.

Box 1: Skill Development: Meaning and Focus

The major sectors of Indian agribusiness, namely, Biotechnology, seeds, organic fertilizers and pesticides, farm machinery and food processing are major sectors of Agribusiness witnessed significant growth in the recent years. Currently, India’s Agribusiness market size is estimated Rs. 17.44 trillion and it is growing at 9% per annum driven by captive domestic demand and export opportunities. Indian Food Industry is the largest growing category in India, accounting for 31% share of the consumer wallet; approximately twice as high as any other category (Srinivas, 2011). The private equity investments in Agribusiness as a percentage of total investments have grown to 3.8 per cent in 2012 from 0.2 per cent in 2008. During the same period, venture capital investments in agribusinesses grew from 0.2 per cent to 1.6 per cent of total investments (KPMG-FICCI, 2013).

National Policy on Skills Development

Farmer and Farm Labourers are not considered as an important category for skill development in the Preamble and Vision of the National Skill Development System in India as depicted in this policy document. It appears that these categories do not fall in the ambit of skills development as per the framers of this national policy. However, to justify the stand that they are not completely excluded (to take care of inclusive development), under Chapter 5 “Skills Development for the Unorganised Sector”, a passing mention about the farmers in relation to target group is made.

Under skills development for self employment, the policy mentions that *“A large part of unorganised sector workers are engaged in informal entrepreneurship. Wage employment opportunities being limited and occasional, skill development for entrepreneurship is a priority. However, training should be a part of a*

larger package of inputs- finance, technology, market information and access, and other support services. Accordingly, priority will be given to entrepreneurship skills development for the unorganised sector and provision of complementary inputs for success. Institutes for entrepreneurship development, technology incubation centres and such other institutional arrangements will be invoked and utilized to support successful adoption of entrepreneurship by unorganised sector workers." Here also, it is quite disappointing to observe that farmers and farm labourers are not considered vital segments for skill development, as the policy is silent on the strategies for these prominent target groups.

Under 'Expansion of Outreach, Equity and Access' (Chapter 3), it is mentioned that *"for undertaking massive expansion in capacity, besides current established approaches, innovative delivery models will be explored such as public private partnership, decentralized delivery, distance learning and computerized vocational training"*. Though mention about Apprenticeship Training Scheme for the industrial sector is made, any effort about reaching to farming community for skill development is not evident. In the approach to deliverables, under delivery of skills, it would have been appropriate to mention about the need for skilling the farmers and farm labourers. A national policy on skills development cannot be comprehensive and complete without considered inclusion of the farmers and farm labourers.

National Employment Policy

The context in which the National Employment Policy is mooted in *alia* covers the following:

- Over half of the workforce continues to depend on agriculture, even though it accounts for less than a fifth of the total GDP. This implies a vast gap in incomes and productivity between agriculture and non-agriculture sectors. This is mainly due to inadequate growth of productive employment opportunities outside agriculture.
- An overwhelming majority of workers are currently employed in the unorganised sector where most of the new jobs are also created. In addition, most new jobs that are being created in the organized sector are informal in nature. These jobs are mostly characterized by low earnings, poor conditions of work and lack of social protection and organisation.
- A large number of workers, whether wage employed or self-employed earn below poverty line incomes and are 'working poor'.

Though the context is properly described, well

thought out strategies for enhancing the skill of farmers in undertaking farming as a business are not indicated. In the context of shortage of farm labour, the need for imparting skills to farm labourers and organising them by way of Labour Banks as done successfully in some pockets of Kerala, could have been a viable and workable strategy. However, the policy is silent on such vital issues.

The employment policy also recognises skill development as an important component of active labour market policies of the Government and addresses the issue in relation to three aspects, viz., matching training with demand, standards and certification and linkage with education system and other programmes. The important policy statements are:

- Labour market information systems will be set up adequately to annually assess the labour market requirements, identify labour-intensive high-growth sectors, so that skills development can be planned and delivered accordingly to meet the demands.
- The focus on skill training and development will fall on the informal or unorganised sector of the workforce. Appropriate programmes and schemes will be developed and introduced throughout the country to meet the requirements of such workers.
- Greater involvement of industry in various initiatives is crucial. To ensure greater involvement and interaction, existing and successful models will be assessed and their replication with appropriate adaptations will be taken up.
- Skill training and development will be made an important component of public programmes and schemes especially those focused on a large number of beneficiaries such as the National Rural Employment Guarantee Programme, National Rural Health Mission, *SarvaShikshaAbhiyan*, Integrated Child Development Service (ICDS) and Mid-Day Meal Programme.

Here also, there is no focused and sharp policy instrument prescribed for skill formation in the farm sector, thereby implying that agriculture as a sector is not viewed seriously for skill formation as in the case of industry and micro enterprises.

Draft Report of National Commission for Enterprises in the Unorganised Sector (NCEUS) on "Skill formation and Employment Assurance in the Unorganised Sector"

Though the report is more comprehensive, here also the neglect of the farm sector is quite

evident. On the basis of the Commission's focus on the unorganised sector and the perceived need to view skill development a little differently (given the preponderance of this sector in the Indian economy), the Commission has laid out a detailed strategy and set of recommendations for revamping, expanding and reorienting the existing skill development system in India. It envisions *"the setting up of a system that lays out clear guidelines and a coherent organizational framework for the country as a whole, while focusing on decentralized, representative and need based delivery systems at the local level"*. However, there is no mention about the role of Krishi Vigyan Kendras (KVKs) which is one of the key players in the existing skill development system for agriculture in India.

The Commission is of the view that "all entrants in the labour force must be equipped with a minimum level of education which must be gradually extended to secondary level. However, simultaneously efforts have to be made to provide these workers with skill training through modular courses so that a significant part of the labour force can be imbued with formal marketable skills within a reasonable period of time. Unless this is done, this workforce will not be able to move on a trajectory of higher productivity and higher

incomes, with deleterious consequences for the development of the economy as a whole". Providing skill training through modular courses is a welcome suggestion. Here also, it is observed that out of the 340 Modular Employable Skill (MES) courses approved by National Council for Vocational Training (NCVT), only less than 10 per cent are found to be related to agriculture. In this itself, majority are related to repairs and maintenance of farm equipments and machinery, and do not cover skill sets related to production and post production farm technologies.

Skill Development in 12th Plan

A presentation on "Employment and Skill development in the 12th Plan" by the Planning Commission, Govt of India highlights the action plan envisaged for the 12th plan period. The action plan gives thrust on manufacturing sector to bring in supportive policies to incentivise labour intensive manufacturing sectors such as textiles and garments, leather and footwear, food processing, gems and jewellery to generate more employment. The action plan also focuses on expanding employment in services like IT, tourism, trade and transport. However, agriculture as a sector for skill development does not figure in the action plan.

Box 2: National Skills Development Corporation (NSDC)

Skills and knowledge are the driving forces of economic growth and social development of a country. In rapidly growing economies like India with a vast and ever-increasing population, the problem is two-fold. On one hand, there is a severe paucity of highly-trained, quality labour, while on the other; large sections of the population possess little or no job skills. In his Budget speech (2008-09), the Finance Minister announced the formation of the National Skill Development Corporation. The NSDC was set up as part of a national skill development mission to fulfill the growing need in India for skilled manpower across sectors and narrow the existing gap between the demand and supply of skills. NSDC aims to contribute significantly (about 30 per cent) to the overall target of skilling / upskilling 500 million people in India by 2022, mainly by fostering private sector initiatives in skill development programmes and providing funding. The National Skill Development Policy mandates that NSDC would set up Sectoral Skill Councils (SSCs) to fulfill the roles and responsibilities as laid down by NSDC. (<http://nsdcindia.org/>)

The UK India Education and Research Initiative (UKIERI) had established 16 Sector Skill Councils (SSCs), of which Agriculture Sector Skill Council is one among them. Whereas some of the SSCs like leather sector, electronics sector and IT sector have definite action plans prepared based on skill gap analysis, such an approach is not evident in the agriculture sector. It is seen that crop management and agricultural information management are two important focus segments of the in Agriculture Sector Skill Council (ASCI), which are very well taken care of by the various training providers in the agricultural system.

The ASCI was formally set up in September 2012 as affiliate body of National Skill Development Corporation. However, it has a long way to go

in identifying and addressing the existing skills gaps and meeting the emerging needs and demands of the farming scenario. It also lacks focus on skill development related to managing a pluralistic agricultural extension system, innovation partnership and business development and governance of innovation system, etc, which is the need of the hour. ASCI has recently signed a Memorandum of Understanding (MoU) for skills training in agriculture with the AgriFood Skills Australia.

Way Forward

Skill development in the farm sector is yet to receive the due attention and proper projection in the skill development efforts of the Government. Until and unless this is given priority by the

policy makers, it is feared that the farming sector will remain neglected and sidelined from the mainstream skill development process now in vogue in India.

Measures that address the specific skill needs that occur at different levels of agro-industrialisation have to be initiated. The 12th Plan Working Group on Agricultural Extension for Agriculture and Allied Sectors (Planning Commission, 2012) has also recommended skill development in agriculture especially for leveraging youth for agriculture. Agricultural education and training (AET) system in India should respond to these challenges. Currently this is not a priority which is reflected in the lack of concerted efforts for skill development in the agricultural sector.

To start with, the activities of Krishi Vigyan Kendras (KVK) which were initiated as centres of skill development for the farm youth and practising farmers may be properly oriented and steps taken to revamp their functioning. In this context, it is worth mentioning that the Planning Commission (2005) had come out with a report for revamping the KVKs, which suggest various measures. One of the important recommendations is that the major aim of KVKs should be to assist in bringing about a paradigm shift from unskilled to skilled work. In fact, the Report of the National Commission on Farmers (NCF, 2006) argue for trainings by KVKs in the areas of post harvest technology, agro-processing and value addition to primary products to provide skilled jobs in villages. Some of the KVKs are already involved in skill development activities, but the importance of skill development clearly needs stronger articulation and increased funding support. Salient recommendations of the Task Force Report of Planning Commission (2005) and NCF

Report have to be implemented in letter and spirit.

Apart from KVKs, some of the NGOs, State Agricultural Universities and ICAR institutes are also undertaking skill development and entrepreneurship development training programmes. They should take a lead in establishing sector or sub-sector skill councils and/or accessing support from ASCI to organise skill development trainings.

There is also an urgent need to bring in convergence of the activities of the various line departments of the Government working for the farming community focussing on imparting new skills, deskilling and multi-skilling for developing an effective and efficient production environment. This is what is expected from the Agricultural Skill Council of India (ASCI). However, the ASCI has no functional relationship with the ICAR which is directing and supporting the KVKs. There is an urgent need to link the KVKs with the activities of the ASCI for effective skill development agriculture.



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LIVESTOCK EXTENSION

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LIVESTOCK EXTENSION - NEED FOR A PARADIGM CHANGE

While basics of extension remain the same, livestock extension needs different treatment. It is time to relook at livestock extension and bring about a paradigm change, argues DV Rangnekar.

India has the largest number of families depending on livestock for livelihood and majority of these are small holder-resource poor families. Livestock rearing supplements family income and generates gainful employment in rural areas, particularly among the landless labourers and, small & marginal farmers. Research showed that livestock rearing has positive impact on equity in terms of income, employment and poverty reduction in rural areas (Singh and Hazell, 1993; Thornton et. al 2002 and Birthal and Ali 2005).

Livestock perform multiple functions in the livelihood of rural families. It is common to recognize the economic benefits of livestock but the livestock serve different purposes to their owners. Dairy cow for example is perceived as a milking machine and all the efforts of the researchers and policy makers are geared to increase its milk production but for dairy farmers the cow serves different purposes (asset for a landless agricultural labour, source of "milk money" for milk producers, dung for agricultural land owners, source of daily income for resource poor families and in addition to serving a variety of social purposes). Women play much larger role in livestock production compared to other sub-sectors of agriculture. Research evidence indicated that women spend about 3 to 5 hours on livestock rearing activities.

There is an ever-increasing demand for livestock products in the country and livestock development can be an effective pathway for poverty alleviation. Livestock offers wide scope as the demand for livestock and livestock products is increasing over the last decade and is expected to double over the next two decades (Delgado et al, 1999, Dastagiri, 2004). This increase is attributed to increase in per capita income, urbanization, change in tastes and preferences and increased awareness about food nutrition. Livestock sector is likely to emerge as an engine for agricultural growth in the coming decades. It is also considered as a potential sector for export earnings. How to convert this increase in demand to benefit the poor livestock owners is a challenge that needs to be addressed?

Livestock Development Approaches: Key Issues

Livestock development and extension programmes in developing countries were reviewed way back in 1989 by Rollings, later by Mathewmanet al in 1996 and they pointed out several limitations in these programmes. Bhattacharya and Jhansi Rani (1995) in a working paper on Bovine Extension in Andhra Pradesh analysed planning and implementation of extension programme as practiced in the state and strongly recommended paradigm shift. The situation is similar in most other states as can be

seen from reports of Chander et al (2010) and Ravi Kumar and Chander (2011) who studied livestock extension activities of departments of Animal husbandry of some states. Rangnekar (2014) stressed the need for realizing potential of livestock development for sustainable livelihood development and extending benefit to the underprivileged families. He stressed the need for a paradigm shift in livestock extension for utilization of this potential. Major drawbacks identified in these reviews and through my own personal experience and observations in rural areas are summarized below:

- **Wrong plug –commodity approach is adopted in livestock development, extension and research while livestock keeping is part of a complex livelihood system of the rural families and livestock play multiple roles.** Though the farming systems approach (in contrast to commodity approach) has been found beneficial to the farmers, Indian researchers are still following the commodity approach. It is high time to recognize that livestock production is an integral and often essential part of several mixed farming systems in the country. We need to concentrate on increasing the effective use of different sub systems by adopting a farming systems research approach which recognizes that the household, crop and animal subsystems are closely integrated and interdependent.
- **Equity syndrome –most research outputs are high input oriented while ‘low external input production systems’ prevail in the country.** Researchers evolved several crossbreds to increase the production of milk, meat and eggs. But all these crossbreds whether it is a crossbred cow, goat or poultry require high inputs to get the expected results. This is one of the reasons why these high input- high output technologies did not find favour with the resource poor families. On the other hand these crossbreds proved their worth in “high input and high output “situations.
- **Lack of fit and functional gap - research is mostly laboratory based and there is virtual absence of ‘adaptive research’ before propagating technologies and recommendations (where extension can play a role).** Conducting on farm trials by the researchers and extension personnel jointly on the farmers’ fields help in fine tuning the technologies to suit to the needs of farmers.

Unfortunately, very rarely on-farm trials to test the livestock development technologies are conducted. The KVKs claim on conducting

on-farm trials is mainly confined to crop production technologies.

- **Weak linkages between research/ extension and development due to virtual absence of planned and systematic interaction between these systems.** There are no two opinions that the researchers and extension personnel work in isolation though they claim that they are working for the benefit of the farmers. Although, achieving better coordination between the researchers (universities/colleges/institutions) and development departments (agriculture or animal husbandry) is a “win-win” situation for all the stakeholders, hardly there is any coordination between these institutions leading to inefficient use of the scanty resources. Though organizations such as the Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry (RIVER) tried to bridge the gap between academic institutions and development departments in the livestock sector in southern states through organizing regional workshops, the success has been limited.

Livestock Extension: Current Status

A critical look at Livestock extension as commonly practiced, show that:

- **Transfer of technologies (off the shelf) is considered goal/objective of livestock extension and is implemented as a targeted programme with little consideration for variation in situations.** Urea treatment of crop residues is a good example in this context. Demonstrations of this technology were arranged all over the country (as a targeted programme). The technology was adopted by farmers as long as subsidy was provided and given up after it was withdrawn. Vaishali, in Bihar, is one of the very pockets where a good number of farmers adopted this technology. Roy and Rangnekar (2005) studied reasons for adoption in Vaishali area and reported that the main reason was that the process of urea treatment of straw fitted with the straw handling and storage system of that area and helped in storage of straw. However the impact of this practice on dairy animals was marginal. Similar conclusions were drawn in the e-conference, organized by the FAO in 2013 on adoption of feed technologies.
- **Livestock services, input supply and technology transfer are the main activities taken up in livestock extension programmes and education/improving knowledge, awareness to help animal owners make better**

decisions/choices are neglected (Chander et al 2013) It is unfortunate that the emphasis is on delivery of inputs rather than “educating the farmers” which is the essential element of extension. Research has shown that investments in exchange of knowledge, rather than one way transfer are much more effective than programmes aimed at input supply alone.

- **Messages/recommendations are centrally generated and propagated without considering variations in agro-ecological and socio-economic aspects and hence the acceptance is poor.** Topdown approach prevails as evident from poor participation of livestock owners, neglect of traditional knowledge and experience of livestock owners. Some of the NGOs (like BAIF and PRADAN), involved in livestock development, have adapted the approach of preparing extension material in a decentralized manner and involving the community in the process.
- **Most of the recommendations and technologies are high input oriented,** although it is known that majority of livestock owners are resource poor. The need for adoption of a Pro-poor approach and need for an intermediate step to ‘Pre-test’ recommendations and technologies for appropriateness before propagating these on a wider scale has been stressed by Rangnekar (2006 and 2014). Pre-testing has to be with participatory approach as it is crucial to get views of livestock owners about appropriateness of recommendations or technologies.
- **Focus is mainly on large animals (bovines)** while small animals are neglected and hence the resource poor are deprived of benefits they can get from keeping small stock (sheep/goat/pigs).
- **Livestock extension policy with a sound plan of implementation does not exist.** While many states have framed livestock policies and it recommends need to strengthen livestock extension but planning and approach of livestock extension follows that for crops. While basics of extension would remain the same, livestock extension needs to be planned somewhat differently in view of some characteristics of livestock production that are distinctly different from crops, as indicated below.
 - Livestock perform ‘multiple functions (economic, input, output, risk coverage and socio-cultural)’ in the livelihood of rural families.

- Livestock have stronger linkage with the socio-cultural aspects of rural society.
- Impact of intervention takes longer time with livestock.
- Resource poor families own majority of the livestock and make major contribution to livestock produce and hence recommendations and technologies have to be carefully selected before propagation.
- Women play a major role in livestock production.

Based on studies of extension activities of Animal Husbandry Departments, Chander (2013) and Chander et al (2013) made similar recommendations.

- **New challenges and demands for Livestock extension.** Rangnekar (2006 and 2014) pointed out the need for livestock extension to adopt a ‘pro-poor approach’ and take cognizance of newly emerging development issues. The major emerging development issues are summarized below:
 - Information about market changes and facilitating market links.
 - Promoting social mobilization and formation of interest groups for providing organizational back up and reducing dependence on other organizations.
 - The need for making livestock production environment friendly and to mitigate or cope with impact of climate change.
 - Production of clean and safe livestock products.
 - Promote sustainability based on principle of 3 Ps (People, Planet and Profit).
 - Pay due attention to ensure ‘Welfare of Animals’.

Way Forward

The role of extension has currently broadened from an intermediary between science and practice to include a wide range of roles, such as mediation, knowledge brokering, facilitation, demand articulation, organizing producers etc. (Sulaiman and Davis, 2012). There is a need to use this knowledge while developing relevant extension models to address the emerging challenges in different livestock production systems. Unfortunately, these issues do not get the needed attention from the policy makers although they recognize the importance of livestock extension in the XII plan as well as the heavily funded National Dairy Plan.

The Working Group on Agricultural Extension for

Agriculture and Allied Sectors for the 12th Five Year Plan (2012-17) observed that “*Extension support is weak or non-existent in the case of animal husbandry and fisheries. As separate extension machinery for animal husbandry and fisheries are not going to be feasible in many states, this has to be integrated with ATMA. In districts where livestock and fisheries play a major role, staffing structure within ATMA and KVKs should be modified to include more staff with specialization in these sectors*”

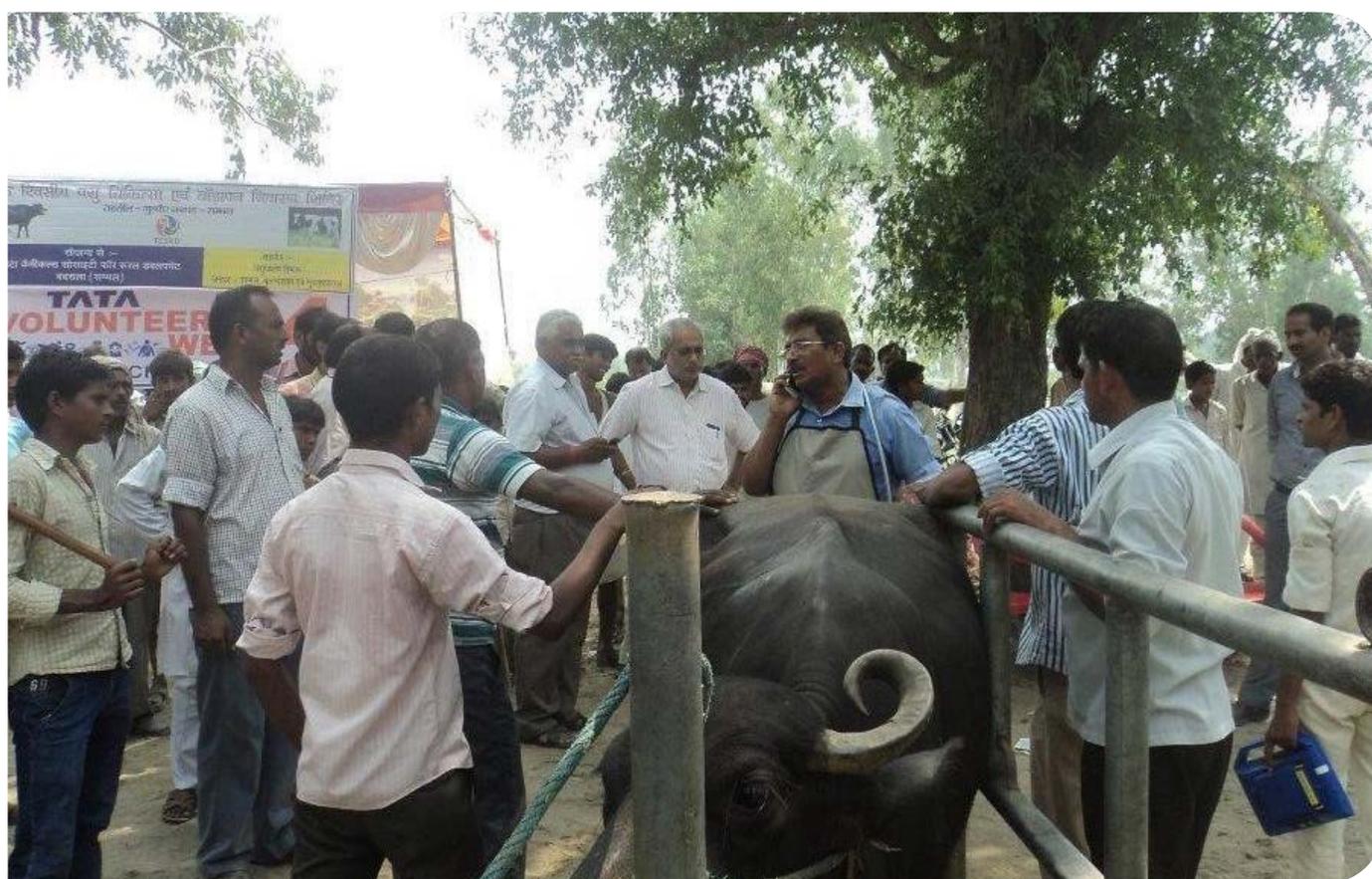
http://planningcommission.nic.in/aboutus/committee/wrkgrp12/agri/wg_agriextn.pdf

A paradigm change in livestock extension requires the following:

- **Situation analysis** of the prevailing livestock production systems in each region has to be undertaken with the participation of key livestock producer’s (to understand their needs and perceptions and knowledge) while planning extension strategy and implementing it. There needs to be shift in emphasis from “high input and high output” solutions to “low input and low output, if not low input and high output” solutions to help the resource poor livestock owners.
- **‘Pre-testing of technological recommendations** to confirm their appropriateness for livestock owners of different socio-economic strata, before wider application. There is a need to shift from “researcher managed tests” to “farmer

managed tests” of the technologies.

- **Decentralized production of extension material/tools** (except recommendations for vaccination and other such measures to be uniformly followed.) with pre-testing the messages with women/men livestock owners. Messages should be in easily understandable language (using local language and not literal translation) and well illustrated with minimum text. This approach has been effectively adopted in livestock development programmes implemented by NGOs like the BAIF and PRADAN in the states of Jharkhand, Odisha and West Bengal.
- **Extension meetings/ training programmes for women should be planned at their convenience**, should be of short duration, deal with subjects of current importance and should be practical oriented (with very few lectures).
- **Training and orientation of staff** involved in planning and implementation of livestock extension should be undertaken – periodically and is crucial for success of livestock extension. The Indian Veterinary Extension Forum (IVEF) can play a key role in this process. Initiatives by Animal Husbandry departments of Odisha and Tamil Nadu and NGOs like BAIF and PRADAN of training/orienting their staff in extension and communication, besides training in technical subjects, are noteworthy.



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BEYOND TREATMENT AND BREED IMPROVEMENT: WHY EXTENSION IS CRITICAL FOR INDIAN LIVESTOCK SECTOR?

The focus of livestock development in India should shift from breed improvement and disease management to strengthening knowledge provision to livestock keepers, argues Mahesh Chander.

While the role of extension services in enhancing crop production and productivity is widely recognized, livestock extension never got the attention it deserves and this has been one of the reasons for low productivity of India's livestock sector. The focus of all the five-year plans in India has been on breed improvement and improving health services with inadequate attention given to knowledge provision to livestock keepers. For want of coherent livestock extension policy and programmes, livestock extension activities in India continue to remain sporadic, casual, occasional and highly unorganized and therefore do not effectively meet the requirements of a vast majority of livestock keepers.

Box 1: India's livestock sector: some glaring facts

Enormous livestock (530 million) and poultry population (489 million) notwithstanding, per animal productivity in India is much lower than that of the world average for milk, meat and eggs as also the quality of products is poor. Milk productivity per lactation is only 987 Kg in India against world average of 2038 Kg. Despite significant investment in artificial insemination and crossbreeding programmes during the last 5 decades, the crossbred cattle population has remained below 15% with huge regional variations. The claim of being number one milk producer in the world is often ridiculed when contrasted with the livestock numbers which are manifold more than that in the high milk producing countries like Israel, New Zealand, Australia and USA. The per capita milk, meat and egg availability too is far lower than that of the requirements as recommended in a standard diet. The per capita annual consumption of meat, milk & eggs is 5.1Kg, 65.2Kg and 1.8Kg, respectively against world average of 41.2Kg, 82.1 Kg and 9 Kg, respectively (FAO, 2009).

Under the central sector scheme, the investments in livestock extension activities have also been consistently very low. Moreover there has not been any exclusive livestock extension programme sponsored by the government. For instance, in the 11th plan, a meager Rs 15 crores was allocated to Department of Animal Husbandry Dairying and Fisheries (DAHDF) under central sector schemes for livestock extension activities. Here too, Rs 10 crores was earmarked for establishment of private veterinary clinics while only Rs 5 crores was meant for strengthening animal husbandry extension. This small allocation too remained unutilized till close to the end of the 11th plan. Similarly the investment on livestock extension activities at the state level also remained very low.

As a result, only 5% of farm households in India access any information on animal husbandry against 40% farm households accessing information on crops as per NSSO survey done in 2003 (GOI, 2005). The same survey also revealed that public sector extension services are not the preferred option for accessing information on modern technologies on livestock production. Whatever little extension efforts are there, these are concentrated around large ruminants or dairy animals in particular. The large majority of small holders and the landless livestock keepers rearing goat, sheep, pigs and backyard poultry are largely ignored under the technology transfer schemes of various agencies. The much discussed National Dairy Plan, which is currently under implementation, too would cover only dairy animals.

India's Planning Commission in its document, 'Agriculture Strategy for 11th Plan: Some critical issues' rightly observed that "unfortunately, extension advice is almost totally absent in animal husbandry and thus, special efforts need to be made in this area". There is no coordination and sharing of information and resources among multitude of agencies claiming to have extension component in their array of activities. The 12th Plan sub-group on Animal Husbandry constituted by the Planning Commission recently observed that extension services for livestock have so far been a non-starter severely hampering its growth (Planning Commission, 2012).

Though the State Animal Husbandry Department (SDAH) is the major stakeholder in livestock development (having its vast infrastructure like veterinary hospitals, dispensaries, personnel and budget), its primary focus is on diagnosis/treatment of animals and breeding services for which it has a clear mandate (Chander et al 2010). The veterinarians and other staff like Livestock Extension Officers/Livestock Inspectors of the SDAH hardly have any motivation, appreciation, support, equipment, budget as also the required training to take up extension educational efforts (Ravikumar, & Chander, 2011). The paravet initiatives taken up by some of the state governments also failed to bridge the gap since the paravets too often compete for treatment & breeding services with the veterinarians leading to conflicts, while lacking in proper training on knowledge delivery to the livestock owners.

The investment in terms of budget allocated as well as the expenditure incurred on livestock extension activities by most of the SDAH in general is very low (1% to 3% of total budget), while 10% is considered as optimum per cent of budget allocation in a developing country context. In spite of clear recommendation by various committees

including 10th and 11th plan working groups on Animal Husbandry Extension, only 8 states have created an exclusive extension wing within the SDAH. It is important for the SDAH to streamline its extension activities by ensuring well designed programmes, sufficient funds, infrastructure and human resources development strategy to train its manpower on delivery of extension support to livestock producers. Though the importance of extension policy has been sufficiently emphasized internationally and in Asian countries (Sulaiman and Hall, 2005), there is no policy for livestock extension in India.

In India too women face disproportionate challenges compared to men in accessing livestock services and information. Women account for 55% of livestock farming labour, whereas, their participation in works related to the care of animals is above 77%. Rural women make up for 93% of overall employment in dairying and their average contribution to the entire farm production is estimated around 45% to 56% of the total labour. Given the strong informal association of rural women with livestock, it is necessary to create matching programmes with sufficient funds so that their participation gets institutionalized. Several studies have shown that most of the conventional training and extension programmes are oriented at men. It would be effective, if women farmers are reached through women extension workers. Appreciably few dairy co-operatives have done some good work in this regard, but such initiatives need more encouragement and policy support.

In India, animal owners often do not follow scientific animal rearing methods and in most cases do not feed balance ration to their animals. Deworming and vaccination are not followed as prescribed and many take their sick animals to quacks ignoring veterinarians and all these have contributed to low productivity and high livestock mortality. Here lies the importance of veterinary/livestock extension professionals who can take up the responsibility to educate and motivate livestock owners to follow good livestock production practices. This would lead to increased demand for veterinary services, more number of livestock owners seeking professional advice including visiting veterinary hospitals. It's a challenging task and often more difficult than treating individual animals, since here we have to deal with humans having complexities of mind, attitudes, perceptions, socio-psychological barriers, level of literacy, level of knowledge etc. This underscores the need for closer interactions between field livestock personnel and veterinary faculty as also the need for refresher training on livestock extension for field extension personnel

and also the importance of specific livestock extension programmes.

Having said this, it would certainly help if qualified people in animal husbandry and veterinary sciences go for higher education in veterinary and livestock extension education provided they acquire skills good enough to change the behavioral complex of livestock owners, making them receptive to new ideas/practices. It is heartening to note that many veterinarians are currently coming forward for higher education in veterinary extension education. But they should have opportunities to practice their newly acquired skills once they go back to their respective organizations. The livestock sector in India therefore needs a serious rethinking on how to support livestock owners with new knowledge so that they can increase their productivity and income and thereby fully realizing livestock sector's huge untapped potential.

Some of the practical steps include:

- Working out an implementable National Livestock Extension Policy (NLEP) that would effectively systematize livestock extension interventions.
- Establishing a Directorate of Livestock Extension at central level within Department of Animal Husbandry, Dairying and Fisheries and it should be mandated with the responsibility to plan, implement, monitor and coordinate
- livestock extension activities across the country.
- Initiating a major program on livestock extension (including all livestock species) with specific focus on women and livestock development during the 12th Plan. There should also be a provision for training and deployment of women extension workers for livestock extension at the Panchayat level.
- Including more livestock extension activities under Krishi Vigyan Kendra (KVK) action plans and ATMA (Agricultural Technology Management Agency) activities.
- Developing collaborative programmes for livestock extension with private sector, NGOs, producer groups/co-operatives, women SHGs and para extension workers involved in the livestock sector.
- Creating an extension and training wing within SDAH at state headquarters with regional/local wings (staffed and equipped with trained livestock extension specialists and supporting infrastructure) and should allocate at least 10% of the departmental budget for extension activities covering all livestock species.
- Developing capacities among livestock development and extension personnel from all sectors through curricula reforms as well as through design and implementation of appropriate training programmes.

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INEFFICIENT EXTENSION SERVICES: LIVESTOCK OWNERS BEAR THE BRUNT

Today there is nothing like livestock extension in the country. Its necessity is neither recognized by the policy makers nor demanded by the livestock owners. The resultant knowledge gap has been leading to several serious consequences, not only for livestock owners but for the society at large, argue, SVN Rao and K Natchimuthu.

Livestock owners need three types of (integrated) support:

- Extension and advisory services (to enrich the knowledge and improve the skills of livestockowners)
- Availability and accessibility of input service such as semen, vaccines, medicines, equipments, instruments, feed etc and
- Delivery of the technical service by the veterinarian (Vet) or Para-Veterinarian (Para-Vet).



In general, the delivery of extension and advisory services cannot stand alone as it depends upon the other two i.e. input service and technical service. The livestock owners need the help of a vet or Para-Vet for getting their animals inseminated, diagnosed for pregnancy, dewormed, vaccinated, treated etc. As is well known, a field vet is supposed to perform all the three services but his focus is mainly on breeding and treatment of animals. His role as extension advisor is totally neglected as it is neither demanded by the livestock owners nor by his superiors. In India, the livestock owners as well as the information providers do not value information, whereas they prefer to receive services such as Artificial insemination, treatment etc. even on payment basis as these result in visible immediate benefits.

Livestock owners are ready to pay for door step delivery of breeding and treatment services (Ahuja et al, 2008) but not for extension and advisory services (Sangameswaran, 2014) . The net result is that the knowledge of the livestock owners on scientific management of livestock is very poor. Today there is nothing like livestock extension in the country. Its necessity is neither recognized by

the policy makers nor demanded by the livestock owners. A cursory glance at the Report of the Working Group on Animal Husbandry and Dairying for the 12th Five Year Plan (Planning Commission, 2012) and the website of the National Dairy Plan (<http://www.nddb.org/ndpi/English/Pages/NDPI.aspx>) will clearly reveal this. The irony is that many of our extension professionals have also failed to impress upon the policy makers on the significance of the livestock extension and advisory provision.

Several actors, but no Extension

Though several actors are present in the livestock sector, there is very little extension.

Department of Animal Husbandry (DAH), the main service provider in all the states is not practically involved in extension and advisory service delivery. It never considers it as its responsibility as evidenced by the meaning it attaches to extension (delivery of inputs) and the paltry sum allocated to the extension work (Ravikumar and Chander (2006); Chander, 2013). Even the breeding and health care services are focused largely on cattle and buffaloes (owners are also interested and willing to pay for these services), restricted only to vaccinations that too during outbreaks (in case of sheep and goat) and almost nil in case of backyard poultry, (except Ranikhet disease vaccination at the dispensary). Pigs are never on its agenda, except in Goa and north eastern states. Although DAH has a wider net work in the states, its effective reach is limited to only few villages around the veterinary dispensary/hospital. In many states the vet is losing his/her technical identity as he is being involved in non technical activities such as feed distribution, purchases of animals, identification of beneficiaries of various schemes, maintenance of several records etc.

Krishi Vigyan Kendra (KVK) is considered as a centre for transfer of technology in a district for all the agricultural technologies which include crops, livestock, horticulture etc.

More than half of the 641 KVKs do not have animal science Subject Matter Specialist (SMS). Even in KVKs where the SMS (Animal Science) is available, he/she doesn't have the support to conduct on-farm trials of different technologies in different species of animals. The focus thus remains on training of farmers (mostly on campus) with little impact on skill development.

Dairy cooperatives have been very successful in delivery of all the three services in few states, where the milk procurement is linked to a fleet of vets whose services are accessible to the dairy farmers (24 X7). Of late in many milk unions, these services are not available to the member producers (Chander and Sulaiman, 2014). With deterioration in finances, they are losing their market share to

private agencies. The private milk dairies also focus on milk procurement but not on extension and advisory service (Sangameswaran, 2014).

NGOs such as BAIF have been quite successful in delivery of services (mainly breeding and training) as they maintain a close contact with the livestock owners. Their success is attributed to the dedicated leaders and committed staff, but their impact is restricted to only few pockets.

Integrators, for instance in the "contract poultry farming" have made inroads especially in southern states mainly because of the integration of supply of inputs (chicks, feed, vaccines, extension advisory services, disease diagnosis, vaccinations, deworming, etc.) by the integrators with the labour and facilities provided by the poultry farmers (shed, electricity, water, litter etc). All the three services viz. supply of inputs, extension advisory and technical service are provided by one agency i.e. integrator. The integrator also collects the eggs, and or birds for marketing. The ability of the poultry farmers in rearing chicks with zero mortality is mainly due to the appropriate use of all the above services. At the end of the production period, the farmer is going to get a fixed amount as rearing charges.

Though considered exploitative, the integrated poultry farming is gaining more popularity as the farmers are free from investment, production and marketing risks (Rao *et al.*, 2011). The farmers are taking care of the disease risk as millions of birds are being reared in several locations and the chances of spread of diseases in all the locations is bare minimum when compared to rearing all the birds in one location by the integrator. This also facilitates the easy marketing of the product for the integrators in different locations.

Consequences of Poor Knowledge

With virtually no extension support, livestock owners lack knowledge to deal with a number of challenges they face and as a result they are incurring huge losses. This knowledge poverty is resulting in losses with far reaching consequences for the society.

Public health concerns: Livestock owners usually sell their sick or dead animals to butchers thus contributing to the spread of important zoonotic diseases, such as Anthrax, Brucellosis, TB, Salmonellosis etc. Most of the farmers are not aware that the animal suspected to be died of Anthrax must be disposed off through deep burial. Due to ignorance, the livestock owners either throw the carcass near the river beds or sell or consume the meat leading to serious public health concerns. The carcass should not be even opened as it results in spore formation leading to the exposed area becoming endemic to Anthrax which is of zoonotic importance.

Economic loss to the cattle owners: The dairy farmer has to take the cow in proper heat for better conception through AI and for this he or she must know the symptoms of heat in a cow and skill in identifying a cow in heat. If he takes the cow in early or late heat the chances of conception will be low and he has to wait for another 21 days for the next heat. Similarly, the cow which was inseminated 3 or 4 times and not conceived need to be examined by a Vet. The dairy farmers due to their poor knowledge keep on getting their cows inseminated to check their luck. In the absence of proper extension and advisory service, the dairy farmers will be losing because of the increased dry period (not in milk).

Low adoption of preventive services: Prevention is better than cure. But this is rarely followed. Preventive measures such as deworming and vaccination must be followed regularly to reduce avoidable losses through mortality and morbidity. As the impact or benefits of deworming and vaccination cannot be observed (even in future) by the livestock owners, they do not consider it necessary to know about the deworming and vaccination schedules. Both the livestock owners and vets plunge into action during disease outbreaks. Under normal situation, neither the livestock owners demand such preventive services nor does the DAH proactively deliver such cost effective services. The net result is that most of the animals are not under the protective vaccination umbrella.

Cash input vs non cash inputs: The livestock owners are reluctant to use cash inputs to improve the economy of their farms. The goat owners (resource poor) prefer grazing (non cash input) to feeding with concentrates (cash input) though the former practice requires more time to increase the body weight of the goats. Similarly, the dairy farmers also prefer to allow their animals for grazing to get 2 or 3 litres of milk rather than feeding with concentrates to get more milk, though the later is economically profitable to practice.

Exploitation by middlemen: The middlemen or brokers exploit the livestock owners whenever the livestock owners are interested to purchase or sell their animals due to their poor knowledge. Majority of the farmers do not know the characteristics they look for while purchasing animals or the market value of the live animal or product they wish to sell. This exploitation could be noticed especially during the implementation of Government schemes, namely, distribution of milch cows, goats, sheep, poultry, etc. In most cases, the purpose for which the animals are distributed (to create livestock assets for improving the livelihoods) is defeated as the

animals are sold before realizing their potential.

Lack of awareness about efficient and transparent marketing methods: The milk producers in most of the dairy co-operative societies know that testing of milk is not done transparently and thus is leading to several malpractices. The Automatic Milk Collection Unit (AMCU) which is a transparent system to assess the value of the milk is not used in many dairy co-operative societies. Unfortunately, majority of the member producers are also not aware that they are the owners of the dairy co-operative societies and their milk union is empowered to establish such AMCUs in the societies.

Ignorance about the negative consequences of technologies: Most often than not, these researchers highlight the advantages (known) of their technologies without explicitly indicating the negative consequences (known or unknown) of adoption of such technologies. The dairy farmers are usually given the information that crossbred cows give more milk than local cows but under what conditions is not revealed to them.

Crossbred animals (cows, goats, sheep, poultry etc) need quality feed and management for better performance. These animals being more susceptible to diseases need better health care. Superior technologies need quality inputs and services. The crossbred cow milk is quite often rejected in the societies as it contains less fat and SNF (Solids Not Fat) than the prescribed standards (Rao *et al.*, 2011).

Poor market information: The livestock owners must know when, where, whom and how to sell (or purchase) their animals or products. When they are ignorant about this vital market information, they may incur losses or gain less profits. They must know the source, availability, prices etc of both inputs and outputs which enable them to take appropriate decisions in purchase of inputs and sale of products. Wherever, the dairy coops are functioning efficiently, the dairy farmers are aware of the milk procurement and feed prices. Similarly, the National Egg Coordination Committee provides regular updates on the prices of eggs and chicken. But in all the other cases the livestock farmers are in dark. Likewise there are several critical areas where accurate, reliable and timely information plays an important role in enabling the farmers to take appropriate decisions leading to better economy of their farms.

Way Forward

1. The three important services, namely, education of farmers (extension advisory), supply of inputs and technical services must

be delivered by one agency as it facilitates better coordination.

2. The extension professionals need to conduct on-farm trials in different farming system locations. They also must keep abreast with the changing scenarios in livestock farming systems which need entirely different extension approaches. For instance, changes are taking place in types of feeding (extensive to intensive; grazing to stall feeding), type of farming (subsistence to commercial); product orientation (layers, broilers or mixed); market structure (co-operative to corporative; public sector to private sector); type of product (raw form to processed to ready to eat) and increasing demand for livestock products.
3. There is nothing like a standard package of practices suitable for all farming locations. It is the responsibility of the extension professionals to identify and advise the livestock owners based on field trials which must be conducted in a systematic way with the active involvement of the livestock owners. This requires adequate staff and appropriate budgetary allocations.
4. The DAH in most states face shortage of both vets and Para-Vets and this needs to be addressed. While giving utmost importance for performing deworming and vaccinations in protecting the livestock wealth, they should also educate the livestock owners through appropriate extension teaching methods to enhance their knowledge and skills on various aspects of livestock rearing.
5. The Veterinary Council of India (VCI), the apex body to regulate the minimum standards for Veterinary education in the country must assess the needs of the livestock owners, and ways and means to address these needs through appropriate curriculum development.
6. The academic centres (veterinary universities / colleges, ICAR institutes, KVKs, NGOs etc) can play an important role in improving the capacity of the faculty, vets, SMSs etc in conducting on farm trials on different technologies, the result of which form basis for making appropriate recommendations to the livestock owners for wider adoption (in their locations or regions) as well as to the concerned researchers to refine the technologies.
7. It is not enough to highlight the importance of extension in improving the livelihoods of the livestock dependent families. It must be supported with a clear cut policy with concomitant programmes and budgetary allocation. Unless the policy frame work is translated into the programmes of the concerned departments/ institutions, the policy sounds hollow.

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WHY COLLABORATION MATTERS FOR LIVESTOCK DEVELOPMENT?

Livestock sector's growth in India is constrained not due to lack of organizations or programs, but due to inability of organizations to collaborate with each other, argues SVN Rao.

It is a well known fact that every state in India has a number of organizations for the development of the livestock sector. The state Department of Animal Husbandry (DAH), Veterinary Colleges and Universities, Livestock Development Agencies and Milk Unions are the most notable among these. Though the approaches adopted by these organizations are different and there is a variation in availability of resources based on their mandate and the number of schemes each is implementing, the goal of all these organizations is the same and that is about supporting the livestock farmer. However, effective delivery of livestock services is lacking in most cases mainly due to lack of collaboration among the different organizations in the livestock sector.

Effective delivery of Livestock Services

Delivery of livestock services has three components viz.

- Providing technical services to the animals
- Supplying technical inputs and
- Educating the livestock farmers

Providing services to animals involves vaccination, deworming, breeding and disease management services. To do this, the needed technical inputs such as vaccines, medicines, semen, AI guns, syringes and needles etc., have to be supplied. The livestock farmers have no option but to depend on vets or paravets for all the above services and, to some extent, supply of technical inputs. Unfortunately, the third component, educating livestock farmers on various aspects of livestock management, (feeding, vaccination, disease management, breeding etc) is grossly neglected. Many a time supply of inputs and providing services are considered as an extension service ignoring the fact that "education of farmers is the core of livestock extension service" (Box 1).

Effective delivery of livestock services mostly depends on two factors:

- The number of veterinarians and animal health workers and their competence to address the contemporary challenges faced by livestock keepers, and
- Collaboration between Livestock Development Organizations (LDOs) and Veterinary Universities (VUs) is critical for betterment of the livestock sector.

Rajiv Gandhi College of Veterinary and Animal Sciences (RAGACOVAS) Pondicherry, India in collaboration with State Veterinary Universities, State Departments of Animal Husbandry and

Box 1: Delivery of livestock services: A reality check

It is well known that the vets and paravets focus their attention mainly on breeding and health care services that too in large ruminants. The owner of the large ruminants is also more concerned about the breeding and health care aspects as they have direct and immediate impact on the milk production. However, practices like vaccination, deworming, clean milk production, balanced feeding etc., (that have poor observability of results) which indirectly influence the milk production are ignored both by the livestock farmers and the veterinarians. Education aspect of farmers on these improved practices is largely ignored by the vet as it is neither considered as his responsibility nor listed in his job chart.

Small ruminants which are usually reared by the resource poor families, the contribution of which is not more than 20% of their total family income (and that too through sale of animals once or twice in a year), are often neglected by the vets and paravets. The minimum preventive measures like vaccination against two or three important diseases and regular deworming are not performed by the vets and paravets as they consider that the delivery of these services is not worth the effort. The goat/sheep owners being poor in education do not approach the vets for treatment (perceiving it as costly and time consuming) and rather approach butchers to sell the sick animals. Same is the case with pigs which are reared by the poorest of the poor in the society and there is nothing like delivery of services to these animals. Transfer of information on various aspects of management of these animals is almost non-existing.

With respect to back yard poultry neither the owners are worried nor are the vets concerned about the delivery of services as the contribution of back yard poultry to the family income is not more than 5%, which appears negligible to both the service providers and the service receivers. Hence, the mortality and morbidity is very high in small ruminants, pigs and back yard poultry, due to diseases as the bare minimum services such as vaccinations and deworming are never provided except during outbreaks.



Manpower

An analysis of manpower shortage in the 5 southern states of India revealed that there is a severe shortage of veterinarians (40%) and paraveterinarians (20%) in all the departments of AH that is affecting the delivery of services. The situation in veterinary universities/colleges in terms of shortage of faculty is equally bad affecting the quality of teaching.

Capacity

To meet the evolving challenges confronting the livestock sector, both veterinary faculty and field veterinarians need new capacities. The veterinary faculty would need to develop capacities in teaching methodology/extension approaches. Refresher courses in advanced clinical subjects, management of large scale livestock units, large scale marketing of milk and milk

products, animal welfare, public health issues, understanding effects of environmental pollution for livestock, livestock business management etc. The field veterinarians need to develop capacities in utilisation of livestock byproducts, value addition, import and export of livestock products, entrepreneurship, sanitary and phyto sanitary standards, addressing fodder crisis and super speciality in clinical subjects. (Rao et al 2008).

Collaboration

About the collaboration between the development agencies and the universities/ colleges, lot of scope for improvement exists. Both parties believe strongly that each can complement and support the work of the other. For instance, the universities/colleges expect the DAHs to support them in the following ways:

- Identification of field level problems for research and cases of disease outbreaks
- Support for validation, testing and refinement of technologies
- Sharing of field data and ITKs for R&D and
- Support to field level trials and validation of technologies

Similarly, the DAH expects the veterinary university/colleges to support it in terms of

- Skill upgradation in clinical subjects,
- Continuing veterinary education,
- Research on vaccines for emerging diseases, fodder and feeds, soil mapping for micro/mineral deficiencies
- Genetic mapping and conservation of native breeds and
- Consultancy support from the University on managing large commercial farms.

Box 2: Potential for Win-Win Collaboration

There are several areas for collaboration that can result in "Win-Win" outcomes. For instance, the Disease Investigation Lab under DAH will be having a large number of samples which will be screened at that level. But some samples need advanced equipments and expertise for further investigation which the DAH lacks. On the other hand the Veterinary College will be having few samples (inadequate exposure for students) but it has better equipments and expertise. An effective collaboration for sharing samples and expertise in this would benefit both and thereby contribute to the capacity of the system. Similarly, the DAH can provide its facilities at its farms and facilitate support to field level research of post-graduate students. The Universities/ colleges may acknowledge and use their field knowledge by including them in their Research Advisory Councils. Veterinary Universities/Colleges can in turn provide their subject matter specialists for mass contact programmes organized by the DAH (e.g.: vaccination, deworming and fertility campaigns etc.,) and also involve their students to ensure wider coverage of the activity and to provide exposure to them.

Way Forward

Increasing the number of faculty, field veterinarians, paravets and animal health workers and developing mechanisms for continuous upgradation of their capacity merits immediate attention. Considering the interdependence of each other, suitable mechanisms to promote better interaction, knowledge flows and collaboration between the veterinary universities/colleges and the DAH also needs to be institutionalized to improve the delivery of livestock services.

As a follow-up to the regional workshop at Pondicherry, a state-level workshop was organized at Hyderabad in September 2012 with top officials of the state animal husbandry sector in Andhra Pradesh to find potential ways to promote collaboration. Similar exercises in other states can initiate the much needed collaboration that is critical for livestock development.

Some of the practical steps include:

Manpower: Increased intake of students at UG level from 60 to 100; Encouraging private sector in setting up veterinary colleges and lifting the ban (that exists in some states) on recruitment of faculty positions and also field veterinarians (Rao et al 2011).

Capacity Development: Allocating adequate budgetary support for human resource development; establishing an academic staff college for livestock sector and developing partnership for capacity development with technical and management institutions in India and abroad.

Collaboration: Remandate the Directorate of Extension in Veterinary Universities to play a major role in developing collaboration (sharing information and facilitate joint planning) with the DAH; and create a policy working group at the state level comprising the heads of all agencies in the livestock sector to meet at regular intervals to share details of programmes and review collaborative arrangements.



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PRODUCTIVITY ENHANCEMENT OF SRI LANKAN DAIRY FARMERS THROUGH TRAINING

Extension faculty should help students gain sound practical experience so that they become good extension professionals. Extension Majors of University of Peradeniya, Kandy, Sri Lanka recently organized a training on 'Productivity Enhancement of Sri Lankan Dairy Farmers' as part of their course-work. Kumudu Ariyawanse shares this indelible experience!

Sri Lanka has an agriculture-based economy. Integrated crop and livestock production systems have been the backbone of country's economy, which also provides livelihoods to nearly 80% of its rural population. Apart from paddy and plantation crops, the dairy industry has potential to contribute considerably to Sri Lanka's economic development, while playing an important role in alleviating nutritional poverty. However, the progress in expansion of the dairy industry is not as satisfactory as compared to other sub-sectors of agriculture in Sri Lanka.

Aspirations and needs of communities change with the advancement of technology, economic transformation and commercialization. The rural dairy farmers in Sri Lanka do not seem to have benefited from the opportunity of adapting to these changes at an equal pace unlike the other sectors. Therefore, extension and advisory services (EAS) have to play a pivotal role to meet the new challenges by strengthening the capacity of the dairy sector. The public and private EAS needs to deliver a more prominent and effective service to underserved smallholder farmers.

Productivity Enhancement Training (PET) for Dairy Farmers

Realizing this context, the Department of Agricultural Extension of the Faculty of Agriculture, University of Peradeniya, Sri Lanka, conducted a two-day 'Productivity Enhancement Training' program for selected rural dairy farming communities in *Boraluwewa* and *Pannala*, the North Western Province of Sri Lanka. Four final year undergraduate students majoring in Agricultural Extension conducted the program under the guidance of the academic staff and in collaboration with 'Fonterra Brands Lanka Private Limited', a leading dairy firm in the country. Fonterra facilitated the identification and access to the target dairy farmer groups supplying milk to two collecting centers located in the North Western province. Fonterra training and demonstration farm at Pannala is equipped with proper housing units, shed management and animal welfare. This training center can accommodate around 400 farmers for training programmes and workshops. It also serves as a knowledge and technology distribution hub for dairy farmers by contributing towards improving the dairy production and with futuristic production technologies for the dairy farming communities.

Pre-training Activities

Capacity development of trainers

The students and trainers underwent a preparatory workshop. It provided the participants with insights on conducting farmer trainings, adult learning

principles, extension training methodology and dairy technologies. This helped them understand and address the prioritized needs of the dairy farmers with the ultimate goal of enhancing their productivity. In addition, the participants were exposed to the production and use of multimedia extension tools including an instructional video documentary on 'Silage production' depicting a success story of a local dairy farmer, supported by Fonterra.

Exposure visits to Saga University of Japan helped the participants explore new vistas of agricultural development. The productivity enhancement training program also included a visit to the Rural

Immersion Program in Madurai, India.

Design/development of training tools

Designing of training tools was done with the guidance of specialists from the Department of Agricultural Extension, Department of Animal Science of the University of Peradeniya and Fonterra. Guidance on developing training session plans comprising of simplified technical messages with the objective of enhancing the productivity of local small-scale farmers was provided. Other training tools developed included power-point slides, flip charts, live specimens of fodder & pasture and advisory leaflets.

Box 1: Use of participatory tools in training for need assessment

A familiarization visit to the area was initially undertaken to observe the existing situation of the communities. A two-day interactive session conducted using participatory methods such as transect walks and focus group discussions helped the participants identify the training needs of the selected communities. A short questionnaire helped test the level of knowledge levels and the attitude of the dairy farmers towards technology adoption.

Identification of problems and needs was followed by prioritizing the training needs based on four criteria viz. severity of the problem, long-term effect on sustainability of the production system, availability of resources and relevance of training as a solution to the particular issue. The topics selected for the training of four student participants are:

- a) Feeding and Balanced nutrition supply to dairy cattle
- b) Importance of roughage, drinking water and silage production
- c) Record keeping in a dairy farm and d. Dairy animal welfare

Training Programme

After elaborate preparations and a series of rehearsals, the PET program was conducted in two consecutive days covering two topics each. One was conducted in the village community center in remotely located 'Boraluwewa' and the other in Fonterra Training Center, Pannala. About 25 farmers participated at each location.

Each student (trainer) conducted individual sessions of approximately one hour in the presence of the technical experts who helped the trainers to handle difficult questions from the farmers.

My Session

Topic of my session was 'Importance of roughages and drinking water to improve milk production of dairy cattle, and silage production'. The training was divided into three parts:

- Importance of selecting, growing and providing quality fodder to dairy cows
- Importance of plenty of good quality drinking water
- Small scale silage production

An interactive Q&A session was also conducted at the end of the training programme. Farmer questions were answered by specialists from Fonterra and the academic staff from the Faculty of Agriculture, University of Peradeniya.

Farmers also provided suggestions on the improvement of the existing governmental extension services/schemes, which should be incorporated in order to facilitate the development of dairy industry. The support extended by Fonterra for uplifting rural dairy farming was greatly appreciated by the farmers.

Use of multimedia/video as a training tool proved successful, as farmers showed a keen interest in watching and understanding a video on silage production, successfully adopted by a farmer in similar conditions as themselves. This farmer was also present in the audience and shared his experiences which helped in convincing the participant farmers after the training.

A preliminary evaluation at the end of each training session was conducted by collecting feedback and analysis of this feedback revealed that the participants were highly satisfied with the learning from this event.

Lessons Learnt

This PET program enabled the students to gain an enriching experience of methodically disseminating knowledge and technology to rural agricultural communities. This has now enabled them to understand how to overcome challenges and barriers, mix and communicate with local communities, understand the real needs of communities and realize the responsibility of applying their knowledge to uplift the living standards of rural farmers.

The program was evaluated by a panel of

academic staff and resource persons from Fonterra and their feedback has proved to be very useful in understanding and addressing the challenges faced. We are also convinced that this unique experiential learning activity would immensely help us in our future careers as extension agents.

In addition, this was a rare opportunity to bring together the academia, students, public and private sector stakeholders and the local people to contribute for the transformation of 'rural dairy farmer' into an 'empowered, equipped dairy entrepreneur' through capacity building and productivity enhancement.



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INFORMAL EDUCATION NEEDS IN DAIRYING AND LIVESTOCK SECTOR

The formal extension institutions are unable to meet information and skill requirements of a vast segment of dairy and livestock farmers. Thus, there is an urgent need to think of alternate systems of information delivery to meet informal education needs of this target clientele, argue Mahesh Chander and Devesh Thakur

Indian livestock sector has huge opportunities for growth and expansion owing to increased domestic and global demand for livestock products. Milk demand in India is set to touch 200-210 million tons by 2021-2022 (GOI, 2012). Unless full potential of livestock wealth is harnessed, increasing quantity and quality of livestock products would remain a challenge. The per capita availability of milk, meat and eggs remains much lower than the desired levels, especially amidst the huge regional variations in consumption patterns across the country. Milk and meat productivity per animal is still much lower than the world averages. Most of the livestock owners in India lack required information on practices which could enhance livestock productivity and product quality. The latest report based on the situation assessment survey of agricultural households in India suggests that over 90% of the small-scale farmers (owning <2 hectares of land) continue to be isolated from new technologies and guidance of public research institutes (<http://mail.mospi.gov.in/index.php/catalog/157>).

The National Skill Development Council (NSDC) has pointed out several skill gaps and requirements, many of them pertain to extension-based soft skills (NSDC, 2009). The presence of unskilled professionals with inadequate knowledge in dairying is one of the serious constraints with respect to dairy development in India (ASCI, 2015). The problem exists in both the unorganized and organized sectors. In the organized sector, only some dairy cooperatives and a few bigger dairy companies have skilled manpower to limited extent to perform dairy operations. The Tamil Nadu Veterinary and Animal Sciences University (TANUVAS) has identified a total of 173 courses in the areas of livestock, poultry and fisheries sectors for training and skill development (Express News Service, 2013). The courses that range from one week to three months have been identified by TANUVAS in the context of the growing demand for manpower in these industries. However, the existing capacity with TANUVAS and also at other livestock training institutions like veterinary colleges, SAUs etc is not good enough for skilling the huge manpower engaged in the sector.

Lack of information has been cited as the most important factor for dairy product quality vis-a-vis prescribed standards in India (Jagadish, 2013). Formal extension institutions currently seem unable to meet the information and skill requirements of vast segment of dairy workers. Dispersed rural populations; high cost of delivering information in person and a lack of accountability have limited the efficacy of traditional extension systems in India (Cole and Fernando, 2012). This situation demands creation of alternate systems of

information delivery to meet informal education needs of the Indian dairy farmers. Before that we may have to answer following questions?

1. What is the existing situation of information and skills of workers in this sector?
2. What are the priority areas of information requirements in dairying and animal husbandry?
3. What are the possible ways to improve the situation?

Extension Information and Skill Requirements in Dairying and Animal Husbandry

According to NSDC, to participate in organized milk marketing, milk producer is expected to have access to certain basic extension information. These requirements may vary from identifying a loyal consumer locally, to becoming a member of village level cooperative for getting the best prices

for the produce. The grassroots extension workers are found to be lacking essential skills. Dairy personnel working at procurement level have poor extension networking skills for maintaining good relationship with the farmers and milk producers or village cooperatives. In addition, inadequate communication skills, especially in local language because of diversity of dialects, are also observed among them (NSDC, 2009). Similarly, basic quality requirements and ways to maintain hygienic conditions, implementing basic value addition in terms of pre-heating, etc. for minimizing wastage are also needed. Women constitute major proportion of workforce in dairying (Box 1) and they do not possess formal training or skills to manage dairy enterprises. In fact, many of them have a low perception of information needs on dairying. Low level of education and weaker socio-economic status are one of the most common reasons for poor perception about information requirements (Devaki and Senthil kumar 2013).

Box 1: Workforce in dairying and animal husbandry in India

A sizeable proportion (80%) of India's milk production is contributed by small and marginal farmers. Nearly eighty percent of the Indian dairy industry is still unorganized (Jagadish, 2013). 8.47 million people on a yearly basis are employed in dairy sector, out of which 71% are women (ASCI, 2015). There are 800 dairy plants in the country, but only 18% milk is handled by the organized sector. 95 percent of workers in the dairy sector in rural areas are engaged in production-related activities and only one percent are in the processing. Only 1.2% of dairy workers are engaged in processing including manufacturing of different dairy products in both the formal and traditional informal sectors. In urban areas, there is a slight change in workforce engaged in dairying. 31% of the dairy workers in urban areas are engaged in selling of milk and milk products (Staal et. al., 2008). A little over 6% of workers in the dairy sub-sector are engaged in selling of milk and milk products, including both wholesale as well as retail.

The estimated share of persons who have attended some kind of formal training in agriculture is found to be very low at 1.1 per cent at all India level. The proportion of female workers receiving any training in agriculture is even lower (NSSO, 2013). Public extension systems currently seem to be unable to meet information needs and skill requirements of dairy and livestock owners. Of the 40.6% households who received extension assistance, only 11% of the services came from physical government machinery -- extension agents, Krishi Vigyan Kendras (KVKs) and agricultural universities. More farmers depended on other progressive farmers (20%), media including radio, TV, newspaper (19.6%) and private commercial agents (7.4%) (<http://mail.mospi.gov.in/index.php/catalog/157>).

Problems in Prioritizing Livestock based Information Delivery

International Dairy Federation recommends that dairy producers need to have information about good dairy farming practices to support the production and marketing of safe, quality-assured milk and dairy products. These include broad areas of animal nutrition, animal health, animal welfare, milking hygiene and environment. Studies in India (Subashet al, 2015) have also emphasized that information on animal nutrition, animal health, animal welfare, milking hygiene and environment is needed the most by farmers (Box 2). Among these, information about animal healthcare remains a

major concern among livestock rearers. Further, in animal health, information about symptoms and diseases management has been most sought after by farmers as the studies have reported (Phand et al, 2009).

Not surprisingly, the current dairy information delivery remains skewed towards information provision on areas of animal health; feeding and breeding (Ali, 2011) and lays less emphasis on processing and marketing. Whereas, it is now recognized that information on marketing aspects of livestock and products have become increasingly important. Even the women dairy owners have prioritized livestock marketing aspects as their most important information need.

Box 2: Areas of Information needs of livestock and dairy farms

According to FAO and IDF (2011), dairy farmers, as the primary producers in the supply chain, should also be given the opportunity to add value to their product by adopting methods of production that satisfy the demands of processors and customers. They need to adopt Good Dairy Farming Practices in the following broad areas: Animal health, Milking hygiene, Nutrition (feed and water), Animal welfare and Environment. These practices ensure that safe quality milk is produced from healthy animals using management practices that are sustainable from an animal welfare, social, economic and environmental perspective. Subash et al (2015) prioritized informational needs of dairy farmers in Karnal district of Haryana based on the weighted mean score of each subject area. According to the study, most sought after information by the farmers was in the areas of nutrition and feeding, breeding and reproduction, general management, health care management and fodder production respectively.

A. Animal Nutrition

- i. Feeding schedule for milk animals
- ii. Information on mineral mixtures
- iii. Formulation of ration
- iv. Information on calf starter
- v. Complete feed block
- vi. Complete feed for dairy animals
- vii. Bypass nutrient technology
- viii. Colostrum feeding to new born calf

B. Dairy Breeding and Reproduction

- i. Detection of heat
- ii. Time of service
- iii. Pregnancy diagnosis
- iv. Artificial insemination
- v. Selection of milch animals
- vi. High yielding breeds of animals
- vii. Gestation period
- viii. Breeding heifer
- ix. Suitable to the region
- x. Castration of scrub bulls

C. General Livestock Management

- i. Clean milk production
- ii. Care & management of milch animals
- iii. Housing & sanitation management
- iv. Care & management of new born calf
- v. Record keeping
- vi. Milking methods were regarded as important areas

D. Livestock Health Care Management

- i. Vaccination schedule

- ii. Knowledge about diseases
- iii. Control of external parasite
- iv. Deworming practices
- v. Disinfection of shed
- vi. Disposal of dead animals
- vii. Isolation of sick animals

E. Fodder Production

- i. Fodder crops and its cultivation
- ii. Conservation of fodder
- iii. Chaffing fodder
- iv. Making of urea treat straw

Raksha (2014) in her study assessed information needs of the women livestock owners of Jharkhand. In her study, it was found that 100% farm women wanted information on

- i. Credit/subsidy schemes.
- ii. Milk products and their preparation.
- iii. Marketing of milk and milk products.
- iv. Marketing of sheep/goat/pig/poultry.

According to her, all women respondents were always depending on relatives and neighbours for information on livestock matters. Also, cent per cent had never asked any matter related to livestock to any KVK specialist. She also reported that information on the issues like, production and marketing of the livestock products and its value addition is also a very crucial area where information provision and trainings are required by the women.

Limited Role of Formal Livestock Extension Institutions

Major agencies involved in livestock extension information delivery are state animal husbandry departments, dairy co-operatives, input dealers, *Krishi Vigyan Kendras* (KVKs) and Non-Governmental Organizations (Hegde, 2012).

These agencies use different forms of extension information delivery (individual, group and mass contact methods) to the target clientele. Unfortunately, these agencies suffer from one or the other limitation in their livestock extension activities. The state animal husbandry departments are inadequately staffed, poorly budgeted and ill equipped with major emphasis on clinical

healthcare and have little orientation for livestock extension activities (Chander et al, 2010). The activity of dairy co-operatives are restricted to milch cattle of co-operative farmers. Access, satisfaction level and willingness to receive extension information have been found to be low even among dairy co-operative members (Chander and Sulaiman, 2014).

The veterinary pharmaceutical and feed companies are concerned more with their product development and promotion. The activities of KVKs are inclined clearly towards agriculture extension focusing little on livestock extension (Chander et al, 2010). NGOs too, need to improve the professional competence of animal husbandry information providers (Hegde, 2012). Referring to animal husbandry information services in Uttar Pradesh, Ali (2011) reported the services were of average quality due to the paucity of information emanating from organized extension services. He further added that lot needs to be done in the quality, reliability, and timeliness of animal husbandry based information delivery. Mobile based applications can support delivery of information in this context and its potential needs to be exploited fully.

Exploring the Potential of Mobile Phones in Livestock Extension

Mobile based applications in agriculture are also now gaining ground (Box 3). The National Dairy Development Board (NDDB) in 2015 launched one such mobile based application. This application (app) named 'PashuPoshan' advises farmers about balanced diets for dairy cows and buffaloes (PTI, 2015).

Government of India has also launched two apps for animal husbandry which are available in M Kisan Portal. One of the applications is used for making request for allotment of breeding bull under Animal Husbandry department of government of Sikkim. Similarly, another app is about registration of applicant who wants to obtain assistance under poultry chick and backyard poultry Schemes by animal husbandry department of Himachal Pradesh. Both have been developed by CDAC, Mumbai (<http://mkisan.gov.in/downloadmobileapps.aspx>).

Mobile based applications on agriculture have not been popular yet because of lack of awareness as also farmers are not comfortable to use them (http://www.business-standard.com/article/current-affairs/few-takers-for-mobile-based-applications-for-farmers-in-gujarat-114060800640_1.html).

Box 3: Mobile based Applications in animal husbandry in Africa

iCow is an SMS (text message) and voice-based mobile phone application for small-scale dairy farmers in Kenya. It is designed to run on both low-end and high-end mobile phones. It's something of a virtual veterinary midwife, helping farmers track the oestrus stages of their cows, while giving them valuable tips on cow breeding, animal nutrition, milk production efficiency and gestation. The app prompts farmers on vital days of cows gestation period; helps farmers find the nearest vet and AI providers; collects and stores farmer milk and breeding records and sends farmers best dairy practices. The text messages and voice prompts are sent to customers within the 365-day cow cycle (Forbes, 2011). Another smart-phone based mobile app is Vet Africa designed for farmers and vets in Africa. This has been found to be effective in supporting the diagnosis of cattle diseases in a range of settings in sub-Saharan Africa (CVER, 2015).



Way Forward

1. Strengthening livestock extension through pluralism

Current livestock extension activities are sporadic and irregular in nature. There is definitely a paucity of co-ordination among different stakeholders. Farmer organizations and NGOs have advantages of having more flexible approach and have greater farmer networking. Private livestock based organizations can potentially improve efficiency of service delivery. They could also contribute through corporate social responsibility (CSR) activities (Chander, Thakur and Verma, 2015). The state animal husbandry departments should cater to services aimed at public goods. The universities and research institutions should be able to highlight innovations in extension service delivery mechanisms. All these actors need to work in co-ordination to meet information and skill needs of livestock owners.

2. Farmer assessment in technology generation and transfer

Most of the livestock technologies have poor rate of dissemination. This is because they primarily begin at laboratories and view farm clientele as passive adopters of such technologies. This necessitates the need to incorporate farmer assessment in livestock technologies through on farm trials.

3. Use of Digital Interventions

Government of India has initiated several digital interventions such as virtual KVKs through which they are able to communicate with their large set of registered farmers via three kinds of medium i.e. voice, SMS and email. Livestock owners face several problems which are unforeseen and non-routine in nature such as animals falling ill and disease outbreaks etc. Thus, question answer segment specifically for livestock owners may be added in this futuristic extension delivery mechanism.

4. ICT enabled animal extension workers

Newer ICT tools such as personal digital assistants, mobile applications, information kiosks, and social media tools can be extremely useful in improving access of information to the livestock owners. Initially the first line extension workers and moderately skilled farmers may be trained to use these tools. Mediation through such IT enabled extension workers can help in using the knowledge from expert systems and apps in dairy and husbandry for farmers to boost their livestock output and income. For instance, a

Mobile phone based audio module on scientific calf management developed at ICAR- Indian Veterinary Research Institute, was perceived by the farmers as highly informative, useful, ready to use and handy which covered entire information on calf management. It was also found helpful in increasing the knowledge level of the farmers on calf management.

5. Promote Farmer to Farmer Extension

Farmer to Farmer extension is appropriate for a wide range of target groups, including women, youth, and the poor. It has been used by dairy co-operatives among their members for horizontal dissemination of information (Chander and Sulaiman, 2014). Farmer to Farmer extension can be useful for spread of simple dairy innovations such as mineral mixture feeding and for becoming a member of producer organization etc. It should however not be used for complex, high-risk, technical enterprises and practices, where cost of an error might be very high e.g. treatment of livestock diseases.

6. Focus on Information needs of Women dairy farmers

Mobile telephony offers newer opportunities to reach women farmers and women in male headed farming households (Mittal and Hariharan, 2015). Voice messages as regular reminders on deworming, mineral mixture feeding to pregnant, lactating animals and heifers etc. can improve adherence to these dairy practices by women who most commonly perform livestock management activities.

7. Focus on emerging information needs of dairy producers

Although, information delivery in areas of animal health and production is vital, marketing information in today's market-driven, high-value food economy has become even more important e.g. one of the initial information required in establishing livestock enterprise is knowing about quality animal source market. Also, the owner needs to know about marketing opportunities to run the enterprise profitably such as linking his produce to the market through co-operatives and other organizations. The situation therefore, warrants moving beyond production related information delivery to information on marketing of livestock and livestock products as well.

8. Use of Social Media

Social media has the ability to generate online discussions and interactions on farm based topics. Reports indicate increased use of social media



(Facebook and WhatsApp) by farming community in India. Public extension systems currently have not yet started using these tools for information sharing and feedback on animal husbandry

among the farmers. It is high time that these tools are used to share information which is reliable and authentic as well as demand driven and engaging with the farmer clientele.

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CAN CSR FUNDS STRENGTHEN INDIAN LIVESTOCK SECTOR?

Indian Animal Husbandry Sector is under-resourced. Increased investments from the Corporate Social Responsibility (CSR) funds can improve the performance of this sector, argue Mahesh Chander, Devesh Thakur and Adesh Kumar Verma

Livestock sector can be considered as a future engine of agricultural growth. Unfortunately, low investment and insufficient funding has resulted in underperformance of the sector. Since government funding for several livestock development schemes remains limited (GOI, 2012), new opportunities need to be explored to meet the requirements. To this end, the recent notable development i.e., Companies Act 2013 (CII, 2013; Afsharipour and Rana, 2014) could be one important avenue. This Act makes it mandatory for companies to spend 2 percent of their profit to social development activities. A Corporate Social Responsibility (CSR) activity is defined as any intervention by a company directed towards the community development (NFCG, 2013). CSR endeavours of companies range from livelihood promotion, health, environment, education, rural infrastructure and women's empowerment (Hussain, 2014). Thus, funds available under CSR can be tapped for use in animal husbandry projects through concerted efforts. Furthermore, CSR initiatives can help exploring possibilities of newer and much needed public private partnership in the livestock development.

Despite the fact that India possesses vast livestock resources (512.05 million), besides 729.2 million poultry (GOI, 2014), a sizeable proportion of livestock suffer from poor production and productivity. The average milk productivity, for instance, hovers around 2.5 kg/day for indigenous cows, 4.91 kg/day for buffalo, 6.78 kg/day for crossbred cows and 0.45kg/day for goat (DAHD&F, 2015). The productivity is thus far less than the average daily yield of cattle in the developed nations. Furthermore, average meat yields in different species remains abysmally low. Meat yield of most species in India is 20-60% lower than that of the world average. Future growth of Indian agriculture lies in paying more attention to livestock sectors as returns on investment are higher in this sector. The contribution of livestock sector to overall agricultural sector is rising over the years. The sector shows high potential for contribution to GDP. Yet, the allocation of funds to this sector is incommensurate with its contribution to agricultural GDP (Box 1).

There is a need for greater resource mobilization from other sources to support the development of animal husbandry in India. Enhancing investments in this sector through CSR funds offers one good opportunity to address this issue. Moreover, the Government of India has already emphasized public-private partnership in livestock extension services (GOI, 2012). The Government has suggested making concerted efforts to tap

Box 1: Public Funding for Animal Husbandry Development

The Animal Husbandry sector receives 12 percent of the total public expenditure on agriculture and allied sector (GOI, 2012), resulting in the underperformance of the sector. Majority of the 29 sub- schemes in animal husbandry through the Eleventh plan could not perform well due to meagre financial outlay (GOI, 2012). Even in the current five-year plan, allocation of budget (Rs. 116.36 billion) to animal husbandry (excluding fisheries) seems to be far less than recommended budget of Rs 31,560 crores by the Twelfth Plan Working Group. The paucity of adequate funds may make it difficult to achieve targeted growth rate of 6% in this sector. Even the current flagship livestock schemes seem to be insufficiently funded by the Central Government. The share of GOI in the National Dairy Plan (NDP) remains less at a meagre 7.8 percent as most of the funding comes as the International Development Association credit. The budgetary allocation for National Livestock Mission too is an insufficient amount (Rs. 28 billion) considering the fact that the allocation is for the entire XII Five Year Plan period (2012-17). Hence, it is clear that government funding to this sector remains limited.

funds available under CSR for implementing animal husbandry projects (GOI, 2015).

Corporate Social Responsibility (CSR)

The concept of Corporate Social Responsibility (CSR) has emerged from philanthropic activities (charities and donations) of corporations. CSR can be defined as continuing commitment by businesses to behave ethically and contribute to the economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large (WBCSD, 2015). A CSR activity is defined as any intervention by a company directed towards community development (NFCG, 2013). CSR in India has gone beyond merely philanthropy and it has more strategic role in the overall organizational development (Gupta and Kaur, 2013). By incorporating CSR in their business portfolio, companies have made significant achievements in areas such as education, healthcare, livelihoods, rural development and urban development (NFCG, 2013).

As per the Indian Companies Act 2013, it is mandatory for certain class of enterprises

to spend 2 percent of their profit to social development activities such as education, health, agriculture, animal husbandry and rural livelihood generation (CII, 2013). The move toward mandatory CSR is driven by the belief that the private sector has to assist the government in furthering economic growth that is inclusive. In fact, India is one of the fewest countries in the world who have chosen to mandatory approach to CSR unlike the west (US and Europe), where emphasis is more on voluntary contribution (Afsharipour and Rana, 2014). CSR benefits corporate organizations too in multiple ways like building image and reputation, enhancing livelihood of communities by incorporating them into their supply chain, building trust among their target communities etc (CII, 2013).

CSR interventions in animal husbandry development in India

Most of the livestock development activities under CSR interventions by corporates involve partnership with NGOs and government bodies. For instance, BAIF is one prominent NGO working for livestock development by fostering partnerships with several corporates across



states of Maharashtra, Madhya Pradesh, Andhra Pradesh, Rajasthan, Gujarat, Karnataka, Bihar and Uttar Pradesh (BAIF, 2015). Such linkages and partnership through CSR activities also help corporates in enhancing the relationship with stakeholders such as customers, regulatory authorities, local communities and NGOs (LojPur and Draskovic, 2013).

Some of the prominent agro-based organisations that have undertaken livestock development as a CSR activity are Nestle, ITC, Chambal Fertilizers, Indian Immunologicals (IIL), Godrej and

Rashtriya Chemicals and Fertilizers. In addition, many other corporates such as Tata Chemicals, Ambuja Cement Foundation, Bharat Petroleum, Raymond India have also involved themselves in the CSR activities focusing on animal husbandry (Box 2). Animal health through animal health camps, animal sterility camps, vaccination and deworming camps are the most common activities organized under CSR interventions. Some of the corporates appreciably have also made efforts on enhancing the capacities of livestock owners.

Box 2: CSR Interventions in Livestock Sector: Experiences

- The responsible business practices of Nestle started in 1962 in Mogha district, Punjab. The company focused on provision of veterinary services, input and training support to dairy farmers leading to improvement in dairying, economic and social development in the region and at the same time brought more profits to the business (IICA, 2011). Nestlé's approach towards CSR seems to be aimed towards creating shared value instead on philanthropy (Sharma and Kiran, 2012).
- Since 1980s, IIL as part of CSR initiatives has been providing free vaccinations to gaushalas and ring vaccinations free of cost to farmers (IIL (2015)). Awareness activities such as zoonoses day celebrations and Rabies-Quit India campaign also form part of CSR activity of IIL.
- Tata Chemicals Society for Rural Development (TCSR) started the animal husbandry project in 1994 with the aim to improve the household income through animal health care, breed improvement and green fodder programme.
- In 1997, Raymond India established J.K. Trust Gram Vikas Yojana to improve the quality of life in rural areas through cattle breeding programme (Raymond, 2015).
- ITC has one of the largest and most effective CSR programs in India (Mukherjee, 2015). It has established 256 cattle development centres, covering more than 10,550 villages, resulting in over 150,000 artificial inseminations, 500,000 vaccinations and a sizeable livestock nutritional support over the period. The CSR interventions of ITC, mostly for milk procurement and processing, benefitted nearly 450,000 farmers (ITC, 2015).
- Godrej Agro vet has initiated Swadheen, a vocational training in animal husbandry and agriculture across 41 rural schools under its Godrej good and green - a CSR program to increase employability skills.
- ACC India has encouraged women to form Self Help Groups for undertaking goat enterprises and backyard poultry production. It has also facilitated the creation of Joint liability group of livestock owners. This enables the farmers for better linkage with banks for receiving loan to purchase cows.
- TCSR has focused on training of local youth to work as Para vets or Pashu Palak Mitras in order to provide first aid at the door step. TCSR is trying to provide interest-free loans to purchase animals. It also aims to ensure livestock insurance coverage benefitting the farmers as a CSR activity.
- Digital Extension by dissemination of agricultural information through locally produced videos have also been undertaken as a CSR activity (Dr Reddy Foundation, 2014).
- Capacity building of women livestock owners of Alwar district, Rajasthan, has received attention by Tata Trust. The Trust working with an NGO (Heifer International) is able to create dedicated village women livestock entrepreneurs. These women entrepreneurs now sell livestock feed and medicines and provide basic animal health care. This has benefitted them as well as the local livestock owners (The Hindu, 2015).
- Biogas Plant scheme is successfully revived by Bajaj Foundation (the CSR arm of Bajaj Hindustan Company) in the Wardha district of Maharashtra. The scheme is funded by Bajaj foundation, local panchayat and community. The foundation is responsible for technical support such as awareness building, construction, training workshops, and after-care services (NFCG, 2013).

Challenges in using CSR funds in animal husbandry development

The Companies Act 2013 specifies the list of activities under Schedule VII, which can be included by the companies in their CSR policies.

The list of activities, however, seems to be heavily skewed towards health and education. These sectors are already high priority sectors for government funding. Agriculture development per se does not find a mention in the list of activities included in the Companies Act (2013).

Animal Welfare has been grouped with activities like ensuring environmental sustainability, ecological balance, protection of flora and fauna, agroforestry, conservation of natural resources and maintaining quality of soil, air and water, including contribution to the Clean Ganga Fund setup by the Central Government for rejuvenation of river Ganga. However, the Ministry of Corporate Affairs clarified that items enlisted are broad-based and cover a wide range of activities. For instance, capacity building for farmers and training agriculture labour has been covered under voluntary skill livelihood enhancement project activity under the Act. Apparently, CSR activities for animal husbandry under the new Companies Act have received minimal attention as necessary elaborations on the livestock development are currently unavailable. The provisions of the Act allow a company to pursue any single activity listed in Schedule VII such as donations to Prime Minister Relief Fund. To conform to mandatory CSR disclosures under the new CSR Act, companies might waste the funds or siphon them off unless they are fully committed (DNA, 2015).

Even more, dearth of appropriate and effective delivering institutions can be an implementation bottleneck for firms to initiate the CSR activities (Parwez, 2014). One can find sufficient number of NGOs and input supply agencies engaged in providing animal husbandry extension services. Yet, they often lack credibility and linkages. On the other hand, animal husbandry departments are often not keen to avail the services of NGOs mainly due to resources constraints. Lack of clarity on the extension work remains a major issue as even the meagre allocation of funds i.e. 0.4-1% remained unspent by the State Animal Husbandry departments (Chander and Rathod, 2013; Hegde, 2012). Further, meaningful co-ordination between several animal husbandry organisations with dairy organisations and people's organisations remains absent (Hegde, 2012). Due to lack of co-ordination among state animal husbandry departments, dairy cooperatives and NGOs, duplication of livestock development efforts may happen through CSR activities especially in the matter of routine delivery of services by livestock development agencies.

Way Forward

1. Prioritizing CSR activities on animal husbandry

CSR funding can potentially add resources to an otherwise financially neglected animal husbandry sector. Some of the areas that deserve attention are as follows: feed and fodder

research and development, *Gosadhan* and *Gaushala* development, expansion of cold chain infrastructure for milk collection, setting up of abattoirs, small ruminant development, managing government livestock farms, strengthening of extension educational infrastructure as well as increasing the livestock insurance coverage. In some instances, the companies can also provide human resource and expertise, such as in managing Government livestock and poultry farms, formation and functioning of dairy self-help groups, microfinance support for livestock based livelihood activities, value chain development and market linkages.

2. Sensitization of government machinery towards public private partnership through CSR

Much of the CSR interventions in livestock development are delivered through partnerships of corporates and NGOs. The State Agricultural Universities and animal husbandry departments possess large amount of trained technical staff and infrastructure to carry out livestock development activities. CSR gives a good opportunity for these institutions to foster institutional pluralism and public private partnership. However, often government animal husbandry institutions work with hierarchical approach and the institutions are reluctant to accept such innovations. Hence, there is an urgent need to sensitize and create awareness among the authorities about the potential importance and the role of CSR for overall livestock development. This not only improves the delivery of services but also minimizes the chances of redundant activities and red tape.

3. Long term approach for animal husbandry development

Often the private extension efforts are profit oriented and short term. These endeavours are concentrated on big farmers, more accessible regions and specific livestock species to earn maximum effort. Privatization may hamper free flow of information and create more inequalities among livestock owners. Also, eco-friendly and sustainable farming practices are not favored. The same can occur with the CSR interventions as well. The support of veterinary institutions to CSR in livestock development at present is limited to the sporadic delivery of technical services initiated by private agencies. The government veterinary institutions and private companies need to work for long term holistic livestock development through CSR. Most of the

current activities are limited to organizing animal health camps and distribution of free medicines and health additives only.

4. Effective Monitoring and Evaluation of CSR activities

Though some of the past CSR initiatives are commendable, yet one cannot deny the fact that companies also perform these activities to build their reputation as well as business expansion. This may also be the case for NGOs who often seek funds on the basis of credibility and reputation. Therefore, these organisations may misrepresent and exaggerate their CSR efforts. Appropriate independent agency must monitor the funds utilized as well activities performed. Impact analysis of livestock development is a specialized job and often has to

be undertaken after providing sufficient time.

Epilogue

Looking at the bright prospects of livestock sector to further enhance its contribution to National GDP, it is imperative that more funds should flow in this sector. But this seems not likely from the conventional funding sources. The CSR interventions under the Companies Act 2013, therefore, may be seen as one good opportunity to be cashed upon to fund developmental activities in livestock sector. This, however, calls for better coordination among different agencies viz State Departments of Animal Husbandry, cooperatives and NGOs involved in livestock sector to make good use of the available funds. We are of the firm view that the CSR funds can strengthen the livestock sector.

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EXTENSION FOR PROMOTION OF IMPROVED BACKYARD POULTRY

Promotion of improved strains of backyard poultry can potentially improve nutritional status and income of rural communities, if adequate extension support could be provided. However the focus has been more on the provision of subsidies than on the knowledge and skills, opines M Rajalakshmi, SVN Rao and K Natchimuthu.

Poultry Sector, besides providing direct or indirect employment to nearly 3 million people, is a potent tool for subsidiary income generation for many landless and marginal farmers. The sector also provides nutritional security to the rural poor (DAHD, 2011). The rural backyard poultry in India is contributing to about 30% to the national egg production (about 70 billion). Though losing its importance under the impact of commercial and contract poultry farming, modernization and industrialization, poultry farming is prevalent in the rural and tribal areas of the country (Ahlawat, 2013).

The main objective of the extension and advisory services (EAS) is to improve the decision-making capability of the farming community. The quality of decision-making depends upon the quality of information provided through the extension and the way the information is disseminated. Every technology needs certain conditions to show its worth. The weakest link in the promotion of livestock production technologies is poor delivery of technical inputs as well as EAS. The department of animal husbandry have monopoly on these services in all the states.

In association with ICAR, the Department of Animal Husbandry, Dairying and Fisheries (Government of India) has taken up a targeted programme to upgrade the traditional backyard poultry (Box 1). This programme is intended to give a fillip to the rural backyard poultry with an eye on improving the nutritional status and to supplement the income of the rural households. These initiatives resulted in the development and release of improved strains like Vanaraja, Krishibro, Krishilayer, Caribro, Carired, Gramapria, Naked neck broiler, Dwarf broiler, Swarnadhara etc.

These improved strains are currently multiplied and distributed among farmers through several programmes. The ICAR has also taken up initiative in propagating these strains under All India Coordinated Research Projects (AICRPs). The Directorate of Poultry Research Hyderabad, and the Central Avian Research Institute (CARI), Bareilly, are actively involved in these activities. Agricultural and veterinary universities in different states are also engaged in promoting the improved strains of backyard poultry.

While farmers adopting improved strains of backyard poultry need strong EAS support, they are often left in the lurch and there is nothing like EAS and Veterinary health care support for them (Box 2).

The growth of commercial poultry production in the last three decades is phenomenal mainly due to the effective delivery of all inputs and EAS. The

development of commercial poultry is confined to rich entrepreneurs concentrated in few districts. The per capita egg and chicken consumption are very high in urban and semi urban areas compared to rural areas. Although the annual egg production in India has gone up to 70 billion, the per capita

consumption of eggs in rural areas (15 eggs per annum) did not go up mainly because of the low purchasing capacity. Reports showed that the consumption of eggs and chicken was high in families rearing improved backyard poultry strains (Sasidhar, 2009; Athilakshmy and Rao, 2013).

Box 1: Promoting Rural Backyard Poultry

Promoting backyard poultry in rural areas is an activity under the National Livestock Mission, implemented by the Department of Animal Husbandry, Dairying and Fisheries (DAHDF). The Rural Backyard Poultry Development component covers beneficiaries from the BPL families. Chicks reared up to the age (6 to 8 weeks) where they can survive at the farmers' backyard are distributed to the beneficiaries, the cost of ceiling for which is Rs. 50 per chick during the first year. The beneficiary is also provided with a lump sum amount towards cages, night shelter, feeders, etc., for 20 birds (ceiling Rs. 1500/- during the first year). Establishment of mother units are allowed at State Poultry establishments as well as for beneficiaries with a revised Outlay of Mother Unit (fixed/ infrastructure) ceiling at Rs. 1,50,000 and subsidy 40% during the first year (The ceiling and subsidy may be reviewed if required in future). Operational credit-cum-subsidy may be availed under the Central Grower Unit component of Poultry Venture Capital Fund. Only low-input technology birds are propagated, the varieties of which are circulated by the Department from time to time".

Box 2: EAS in the Poultry Sector

There are three types of poultry farming in India:

1. Commercial layer or broiler farming: A large number of birds are maintained under intensive system owned by a single or group of farmers. As the stakes are very high, emphasis is on quality inputs including EAS which are always available on the farm.
2. Contract layer or broiler farming: In this type, the contractor owns lakhs of birds reared by several thousands of small farmers under intensive system in different locations. The contractor provides all the technical inputs and EAS free of cost to these farmers. The farmers are paid for their labour as rearing charges at the end of the production period.
3. Backyard Poultry farming: The farmers maintain few dual purpose birds (both for egg and meat) mostly local/desi under semi-intensive or scavenging system. Being a low-input and low output system, neither the Veterinarian provides nor the farmers demand technical inputs and EAS. These birds are not even protected against the most important Ranikhet disease, which accounts for high mortality of birds in rural areas. The contribution of the BYP to the total family income is not more than 5% which appears negligible to both the service provider and the service receiver (Rao and Natchimuthu, 2012).

Rearing of improved BYP strains has potential to supply much needed animal protein and supplementary income to the rural poultry farmers. These birds are genetically superior in producing more eggs. The birds gain weight quickly and hence need extra care in their management which obviously demand effective EAS (Ahuja and Sen, 2007). KVKs in Northeastern states had good success in popularising improved strains like Vanaraja and Gramapriya (layer). But the success is limited to a few areas and that too depends upon the provision of EAS support.

The practice changes required to rear these strains are discussed in Box 3.

Backyard Poultry in Puducherry

In Puducherry Union Territory, the distribution of Giriraja, an improved dual-purpose strain to the poultry farmers under the centrally sponsored scheme at a subsidised price is an ongoing

programme for the past several years. Surveys conducted in two regions of Puducherry UT (Karaikal and Puducherry) revealed that almost all the poultry farmers who received Giriraja birds either sold or consumed before the birds reached the stage of egg production. Although they were distributed for betterment of the rural people, these birds were either sold or consumed before the birds reached the stage of egg production (Athilakshmi and Rao, 2013).

The Problem

The government departments or NGOs usually distribute 6 to 8 week old chicks of improved strains at 50–75% subsidy to the backyard poultry farmers. Many of these farmers sell these birds in the market for realising short-term benefits and thus compromising on the long-term benefits of eggs for household consumption and sale of adult birds for generating income. The subsidy itself is

considered as a gain by these farmers. Moreover, these farmers are neither given training on rearing of these birds nor provided with extension advice. The distribution of the birds

is seen as an end rather than as a means to improve nutritional status and the source of supplementary income to the rural farmers.

Box 3: From local birds to improved strains: What it means in practice?

In case of local or desi birds the brooding hen

-serves as a natural brooder,

-protects the chicks from predators, and

-induces the chicks to learn feeding on worms, seeds, insects, grains, vegetable waste etc. while scavenging and also drinking water, skill to escape from predators etc. The farmers who practice rearing of local birds need not depend upon other agencies for procurement of chicks (natural brooding and hatching), commercial feed, feeders, waterers etc., hence, this is considered as self-generating system.

When it comes to rearing of improved strains of BYP, the farmers have to acquire knowledge and skills necessary for taking appropriate decisions to exploit their production potential. These include aspects like artificial heating/brooding (readymade or improvised, temperature adjustments), medication (medicines, dosage and route of administration); feeding (completely on chick mash, completely scavenging or both (period of scavenging)); watering (readymade waterers or improvised), housing (type of housing, night shelter), Identification of poor growth or weak chicks and their management, regular vaccination (for which diseases and when), control of mortality (reasons for mortality – disease, predator attacks, poor management) post mortem of dead birds for proper diagnosis and control (whether to take the dead birds for post mortem or not, if yes where and how to get it done), weighing the birds at different stages (how to weigh, approximate required weights at different ages), recording of feed consumption and egg production etc. Different poultry farmers need different advice and also the knowledge or skill to practice.

This leads to what is referred to as practice change (Bennett, 1979) which is necessary to rear the improved strains of poultry. How to bring the changes in these practices? EAS should support farmers in taking good decisions related to all these practices, if the farmers have to benefit from this shift to improved strains.



The agencies which distribute these chicks depend on the field veterinarians and para-veterinarians for delivery of EAS and veterinary services. Although they are expected to provide these services, in reality, it does not happen leading to heavy mortality of birds (mostly unreported) inflicting severe losses to the BYP farmers as well as to the national exchequer. Compared to local birds, improved strains (for that matter any improved technology or practice) demand quality EAS and veterinary services for better performance. The improved strains require at least five vaccinations (five visits of a veterinarian) at different ages to protect the birds from Ranikhet, Fowl pox, etc. in addition to deworming and health care services. This is scrupulously followed in the contract and commercial poultry farms but not in BYP.

The institutions which are selling these chicks of improved strains usually have a high demand because these birds with coloured plumage were considered similar to desi birds and fetch better price than broilers. This is partly also due to the increasing health consciousness of the urban consumers who of late have started preferring coloured birds normally reared under traditional system.

Some of the pilot studies have shown that those farmers who purchased (not on subsidy) day-old chicks continue to rear up to the end of egg production period mainly because their family members developed attachment to the chicks and disliked slaughter of these birds for home consumption. In addition they could observe the potential of the birds to produce more number and large-size eggs compared to that of the desi birds.

Action Research

A study was undertaken to assess the impact of rearing Swarnadhara chicks (improved backyard poultry strain) on the rural households of Puducherry. The BYP farmers were provided with timely and reliable EAS to help them take appropriate decisions. The following steps were adopted in the research.

Selection of interested BYP farmers: The investigator (a woman veterinarian) had a series of group meetings in three selected villages with BYP farmers. In rural areas, BYP rearing is the domain of women folk. They were given information on comparison between desi birds and improved birds. The group meetings helped 137 farmers to take a strategic decision on rearing improved birds. Out of these, 65 farmers participated in the on campus training programme on their own cost. The

training methods included direct exposure to different strains of improved breeds, method demonstration on artificial heating (as the improved strains of chicks will be without the brooding hen), litter management, feeding of chick mash etc. Printed literature in local language was also distributed to the trainees as reference material.

Procurement of Swarnadhara chicks: Fifty trainees paid the entire expenditure towards the cost of chicks, transportation and medicines (contrary to the usual practice of getting all the inputs free of cost or on subsidy). The investigator accompanied two group leaders who had an opportunity to see the hatchery and the activities associated with chick production at Bengaluru. The day-old chicks were transported to Puducherry by rail and road and 1863 chicks were distributed to the farmers as per their demand. This exposure enabled the farmers to understand the process of procurement and transportation of chicks to Puducherry. In this process the farmers acquired the skills of taking tactical decisions.

Monitoring the management of chicks: The investigator monitored the development of rearing chicks through personal contacts over phone and weekly visits to the poultry farms. During these visits, advice on various aspects (technology management) which are essential to help them take operational decisions on managing the chicks were provided. This technology management involves operational decisions – day to day activities. Most of these practices are not necessary when the farmers are rearing local chicks. Effective monitoring helped the poultry farmers in getting the right advice at right time necessary to reduce the mortality and improving the efficiency of the birds. The investigator being a veterinarian not only provided the advice (information) but also the technical service (vaccinations, deworming, disease diagnosis, treatment etc.)

Marketing decisions: These birds being dual purpose could be used for both egg and meat production. The sample farmers of the study included those who purchased more number of chicks (ranging from 50 to 200) for sale at the age of 8 to 16 weeks for meat purpose and those who purchased in small numbers (less than 20) for egg production. All the farmers were advised to maintain records of feed consumption, vaccination and deworming mortality, egg production and other cost parameters. These records were checked by the investigator during her weekly visits. Economics of rearing birds for sale was also worked out at different stages to guide the farmers on the appropriate time to sell

the birds in the market, which usually fluctuates depending upon the season and supply of the birds from neighbouring states (Tamil Nadu and Andhra Pradesh).

Impact

Though this research started with 50 households in eight villages, in a span of one year, 97 households spread over 24 villages in Puducherry started rearing Swarnadhara birds. Out of these, 29 households were purchasing chicks in multiples of hundreds. These farmers sold their birds at an average price of Rs. 225 per bird with a range of Rs 150 (8th week) to Rs.450 (40th week). These farmers were purchasing the chicks regularly (once in a month) from Bengaluru and over a period of time their dependency on the investigator was almost negligible.

Thirty-seven households purchased chicks (less than 20) for egg production that too for household consumption. The farmers who purchased chicks for egg production realised the potential of the birds in producing big brown eggs which usually are sold as desi egg in the market for Rs.10 per egg. Only one farmer sold the eggs to her neighbours, whereas the rest either consumed the eggs or gifted to their neighbours and or friends. These households consumed a total of 3,978 eggs produced during 10 months period (August 2014 to May 2015).

Through effective EAS, the poultry farmers acquired the knowledge and skills necessary for rearing the chicks from day one. The farmers are continuously purchasing day old chicks (without any subsidy) and seeking EAS suggestive of the positive and sustainable impact of rearing improved strains of BYP. The entire expenditure on these inputs and services are met by them that too in a place like Puducherry, where the people are tuned for subsidies and freebies.

The egg production and consumption of eggs at household level has gone up among the BYP households. Almost all the farmers used eggs for household consumption confirming thereby that the farmers tend to consume eggs produced in their farms (backyard) rather than purchasing and consuming eggs. Except few, most of the farmers did not slaughter the birds and reared them for egg production.

The spin offs of such initiatives have a major

impact on the diffusion of technology in several villages with more and more BYP farmers started rearing improved strains of poultry. The investigator and the students of veterinary college are providing the EAS including veterinary health care to the BYP farmers who are purchasing these chicks. To sustain the gains and to enlarge the area of operation it is contemplated to train the BYP farmers or SHG leaders or barefoot doctors to provide these services.

Way Forward

Supply of day-old chicks rather than 6- to 8-week old chicks to the interested and trained farmers helps to improve the nutritional status through consumption of eggs in the rural areas. There is no point in wasting resources on subsidies as the BYP farmers are ready to pay for the supply of inputs and services provided supply of inputs and services is regular.

Effective extension and advisory support, is critical for the successful rearing of improved strains of BYP. Hence, it is necessary to ensure the supply of inputs and EAS before embarking on any BYP development programme. The conditions identified as essential for the successful rearing of improved strains are as follows:

1. Selection of interested BYP farmers
2. Regular supply of quality chicks and feed
3. Prompt delivery of inputs (training, vaccines and medicines) and technical services
4. Effective delivery of EAS and proper monitoring of the birds
5. Remunerative market for improved birds (similar to that of desi birds)
6. Sufficient backyard area with good food base for scavenging
7. Capacity and willingness of farmers to purchase and feed chick mash for the first six weeks and
8. Good neighbours (as these birds quite often soil the neighbours' premises with droppings).

The present investigation serves as a guideline for all those involved in promoting BYP for improving the nutritional status and to supplement the income of the rural poor.

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ARE WE GENERATING NEED BASED AND RELEVANT LIVESTOCK TECHNOLOGIES?

Dissemination of improved livestock technologies is important to enhance livestock productivity. But investigating the relevance of these technologies and the process of technology generation is equally or more important argues Prakash kumar Rathod and Mahesh Chander.

Poor productivity as well as the quality of production and products remains a cause of concern in Indian livestock sector (Chander *et al.*, 2010). Various efforts, therefore, are underway to generate and disseminate improved livestock technologies to improve the productivity. However, till date, most of the technologies or processes concerning livestock sector have recorded poor adoption at the field level, which might be due to various factors like attributes of technologies developed, socio-psychological and personal aspects related to users of the technology, availability and quality of support mechanism etc (Box 1). Only a very few studies have focused on the type of research being undertaken in the livestock sector. Many believe that "researchers know better than the farmers and extension personnel" who are considered mostly as clients of research outputs.

Rao et al (1995), pointed out that researchers and extension agencies are often unaware of farmers' priorities. This leads to development and promotion of technologies that are seldom relevant for them. Hence, there is a need to analyse the technologies developed at research institutions as well as the process adopted for technology development by addressing few questions. Are the research institutions generating appropriate technologies? Do we need more farmers' involvement in technology generation? Or is there a missing link among research, extension and farmers?

Status of Livestock/Animal Science Research in India

Public funded research agencies under the National Agricultural Research System (NARS) lead livestock/animal science research in India. The Animal Science Division of Indian Council of Agricultural Research, (ICAR), New Delhi (<http://www.icar.org.in/en/animal-science.htm>) coordinates and monitors research activities in its 19 Research Institutes and their Regional Centres. The Division has two Deemed Universities, seven National/Central Research Institutes, one Bureau, one Directorate, one Project Directorate and six National Research Centres. The Division coordinates seven All India Coordinated Research Projects (AICRPs) and six Network Research Programmes. In addition, four Outreach programmes and three Mega seed projects (poultry, sheep and pig) are also being operated in different parts of the country at different ICAR institutes, State Agricultural / Veterinary Universities/ State Animal Husbandry Departments and Non-Governmental Organizations.

Though the veterinary universities have greatly expanded in number with funding support from

state governments but their research capacity has weakened (Pal *et al.*, 2012) leading to poor interface of research, extension and education. There has been no parallel increase in the number of scientists. This implies inadequate research staff at the universities and increased overhead costs due to the proportionally larger

administrative burden of more institutes. Further, the investments for commodity-wise public Research & Development indicates that crop science has received highest focus followed by livestock, natural resources, fishery-related issues, and forestry related issues in India.

Box 1: India's livestock sector: Some concerns

India boasts largest livestock population (512.05 million) in the world but the productivity is one among the lowest in the world with that of the world average. For instance, the average annual milk yield of Indian cattle is 1172 kg which is only about 50 percent of the global average (FAOSTAT, 2014), and much less than New Zealand (3343 kg), Australia (5600 kg), UK (7101 kg), US (9332 kg) and Israel (10214 kg). Likewise, despite significant increase in livestock production, per capita consumption of milk (69 kg) and meat (3.7 kg) is much lower against corresponding world averages of 85 and 40 kg, respectively (GOI, 2012). The livestock sector in India is solely dependent on small and marginal farmers who are mostly traditional in nature and rarely follow scientifically recommended practices. Most of the livestock producers being small and marginal farmers, their capacity to mobilize resources required to absorb the latest technologies developed by research institutions is limited. Absence of an effective extension machinery and lack of access to institutional finance or inputs is a major constraint in improving productivity by adopting latest technologies (GOI, 2013). Further, only 5 percent of the households access any information on animal husbandry against 40 percent of households accessing information on modern technology for crop farming (GOI, 2005). Moreover, livestock farmers sought information largely from private rather than public sources. Although animal husbandry sector is feminized in India, most of the conventional training and extension programmes are men oriented and do not suit women. The youth in India has to be promoted to take-up livestock farming on commercial basis. All such issues have been great challenges and concerns for Indian livestock sector.

Issues in Livestock Technology Generation

Organizational Mandates and Personal Motives Vs farmer needs

Livestock technologies are generated and developed as per the mandates of the organization or personal motives but apparently not as per the needs and demands of the farmers or their field situations. The research activities that are conducted seem to be based on the review of global literature on livestock research

which might not be relevant to local situations. Further, the professional competency of a scientist is deemed to be governed by the number of research publications produced than the technologies he has transferred effectively (Rathore *et al.*, 2008). Most often, the researchers highlight the advantages of their technologies without explicitly indicating the negative consequences of such technologies (Rao and Natchimuthu, 2015). Such scenario leads to generation and transfer of irrelevant livestock technologies to farmers as depicted in Box 2.



Box 2: Poor diffusion and adoption of Azolla and Urea treatment of straw

Azolla as animal feed

- Experts state that it is an excellent feed, rich in protein, vitamins and other nutrients required by animals
- It is promoted by government agencies, dairy cooperatives, NGOs and KVKs and there are subsidies (financial incentives) to establish Azolla units
- Farmers argue that the practice of cultivating and feeding azolla to animals is not practically feasible and the adoption is built around the subsidies. The animals do not accept *Azolla* as a sole feed and therefore it needs to be mixed with concentrates or jaggery water
- Extension functionaries too concur with the views of farmers and believe that this technology is impractical at the field level. Adoption of azolla as a livestock feed has failed in many of the South Asian countries
- Yet, articles in praise of azolla are piling up, without any horizontal diffusion of this technology among farmers!

Urea treatment of straw

- Experts recommend it as an excellent technology for improving the nutritive value of straw
- Millions spent on research, development & promotion of this technology among farmers across the country, since the 1980's. This goes on even today. Farmers hardly use this technology, even in places where it is intensively promoted by researchers and extension workers
- Farmers find the treatment too technical and cumbersome to follow
- No horizontal diffusion of this technology among farmers
- It is also promoted under government schemes
- Yet, papers are still being published in praise of this technology

Source: Chander, M. 2011 a&b; Tamizhkumaran and Rao, 2012

Varying perceptions on promoted livestock technologies

Rathod and Chander (2015) pointed out that perception of researchers and farmers on the appropriateness and usability of livestock technologies vary significantly. For instance,

farmers have poor favourable opinion on some of the technologies which researchers perceive as important and have recommended for adoption. Rathod and Chander (2014) through a Delphi study in India also depicted that only few of the technologies were field relevant and need based (Table 1).

Table 1: Perception of farmers about few selected livestock technologies

S. no.	Livestock Technology/Innovation	Observations of farmers about the technology
1	Concentrate feeding	<ul style="list-style-type: none"> • Costly at field conditions and hence, small and marginal farmers cannot afford the same. • Feed is perceived as non-palatable by few farmers.
2	Artificial Insemination (AI)	<ul style="list-style-type: none"> • AI has poor conception rate • Higher chance of getting male calf • Calves susceptible to diseases
3	Clean milk production	<ul style="list-style-type: none"> • Impossible to practice at field conditions • Price of milk is based on fat and SNF. So, microbial count or milk quality is not a priority.
4	Milking/milching machines	<ul style="list-style-type: none"> • Not suitable for small dairy herd • Higher cost of machine for small and poor farmers.

Source: Rathod (2015)

Missing links among research, extension and farmers

Research-extension linkages are very important for transferring developed technologies from researchers to the end users. Very often, the livestock related technologies developed or

modified in the research institutes do not reach the end-users for want of efficient and effective extension mechanisms and procedures (GOI 2013). The research and extension experts do not absorb or use feedback from farmers due to passive nature and limited exposure to field realities. The researchers and extensionists generally contact

farmers only for their capacity building and consultation programmes as per the mandates of their organization. Some of the suggestions

of farmers on selected technologies are given in Table 2.

Table 2: Suggestions of farmers about selected livestock technologies

S. no.	Livestock Technology/Innovation	Observations of farmers about the technology
1	Concentrate feeding	<ul style="list-style-type: none"> Locally available inputs/raw materials must be used to prepare concentrates at home and demonstrate the same at field conditions Need to add few components/sweeteners to make concentrate feeds palatable
2	Artificial Insemination	<ul style="list-style-type: none"> Researchers need to study and confirm why there is more chance of getting male calf from AI Research is necessary to improve conception rate of AI
3	Clean milk production	<ul style="list-style-type: none"> Good quality milk having less microbial count must be promoted and such farmers must be given incentives or higher price Fat and SNF should not be continued as sole criteria for pricing but also should include microbial count Simple tests must be developed by scientists so that farmers can test milk at their farm before selling it in the market

Source: Rathod (2015)

Administrative and operational constraints include lack of infrastructure and resources in the process of technology generation. Under varying conditions, the research objectives are modified to fit- in the existing infrastructure and logistic support which ultimately affects the quality of the research and its output/outcome. The budget allocation and expenditure process is perceived to be complicated in majority of the organizations which creates stress on the researchers and extensionists. Under such circumstances, creation of congenial research environment including improving the number and quality of human resource would go a long way towards improving the process of livestock technology generation in India.

The rate of adoption of livestock-related technologies in smallholder crop-livestock systems worldwide is consistently low. In order to resolve this problem, approaches that guarantee effective linkages among researchers, extension workers, decision-makers and farmers, who have a complex knowledge base and widely dispersed expertise are needed. (Francis et al 1997; Conner et al 1998).

Way Forward

Promote field trials

Livestock research must consider realistic advantages and disadvantages of traditional/conventional and modern methods of livestock production based on the field trials. As it is difficult

to have standard package of practices suitable for all farming locations, the extension professionals must identify and advise the livestock owners based on field trials and also communicate the findings to the researchers as well. The feedback mechanism is inherently weak, which needs to be strengthened.

Strengthen linkages

The linkage workshops and brainstorming sessions among multi-stakeholders must be undertaken on priority basis to generate need-based and field relevant technologies (IVRI, 2014).

Include farmers as partners in research and extension

Farmers are no more mere passive recipients of technology. They should be encouraged to share their feedback and also their indigenous technical knowledge and other grassroots level innovations. Their demands and suggestions can help the research system in developing need based and relevant technologies.

Provide Infrastructure, resources and recognition for testing and adaptation of technologies

The research related to field level testing and adaptation of livestock technologies must be promoted and should be given equal importance like any other research in the form of necessary infrastructure and resources. This should also be one of the yardsticks for judging the researchers.

Reorient veterinary education

Orientation of graduate and post-graduate students towards fieldrealities by having more field exposure visits is important to empower them

with the right research orientation and to have appropriate skills for field extension. However, the current curricula provides only very negligible field exposure and this needs to change.

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QUANTITY VS QUALITY: THE GREAT DILEMMA OF LIVESTOCK RESEARCH

Extension is not merely about promoting research based knowledge among farmers. Providing feedback on knowledge use and raising new and relevant research questions are equally important. SVN Rao and K Natchimuthu take a critical look at the contribution of livestock research in India in this blog and suggest a shift in emphasis in livestock research from increasing quantity to improving quality of livestock products.

Livestock Research is considered as an inevitable tool for livestock development. Application of livestock research has demonstrated its impact on increased production of milk, meat and eggs, reduction in losses in livestock production. Many research articles contain the gains accrued through livestock research, but rarely delve into the losses of research application (all scientists have pro-innovation approach). One potential reason is that the negative consequences of research application will be known only after several decades of its wider adoption in the field. This blog focuses on what we paid or lost to gain the advantages from application of livestock research with special focus on breed improvement.

Crossbreeding

Crossbreeding of native livestock with exotic livestock is an accepted technology to improve the genetic potential of livestock and thereby enhancing livestock output. Crossbreeding of cattle has been recommended and vigorously pursued for wider application since 1970s in India. As a consequence we could produce different varieties of crosses in livestock species including poultry. Efforts are still on to stabilize the crosses to produce higher yields and at the same time retain the resistance to diseases which many of our native breeds of livestock possess in abundance. The negative consequences of the crossbreeding which by now are very well discernible include:

- 1. Loss of native germplasm:** This has been noticed in all livestock species. Some breeds are already on the verge of extinction. Realizing this damage to our indigenous breeds, the Indian Government has initiated programmes to conserve threatened breeds which are likely to be lost. A stage has come that we need to search for our native germplasm outside the country (Ongole cattle in Brazil and Murrah buffaloes in Israel). In institutes like National Dairy Research Institute (NDRI) which has been associated with research on crossbreeding of cattle succeeded in developing new breeds like Karan Fries, Karan Swiss at the cost of disappearance of Tharparkar and Sahiwal cows from the institute's farm (Rao et al, 1995).
- 2. Increased dependence on purchased inputs and resultant increase in costs:** Increased production (output) requires increased feed and management (inputs) leading to increased cost of production and many times increased competition for food grains (Humans Vs livestock) which suits to western countries that consume more animal protein than India. Availability of land for production of grains and fodder in addition to grazing of animals is an indispensable factor in sustaining

higher productivity. Land being limited and fixed in nature is already showing its limitation in sustaining livestock production. The dependency of the livestock farmer on researchers, technical personnel and other input providers is increasing with increase in the application of research that focus on increasing production. We converted many of our time tested sustainable farming systems which are "low input and low output" to "high input and high output" systems leading to commercialization of livestock farming and marginalization of small farmers who are finding it difficult to rear their livestock on purchased inputs. Take the case of improved backyard poultry in India (Box 1).

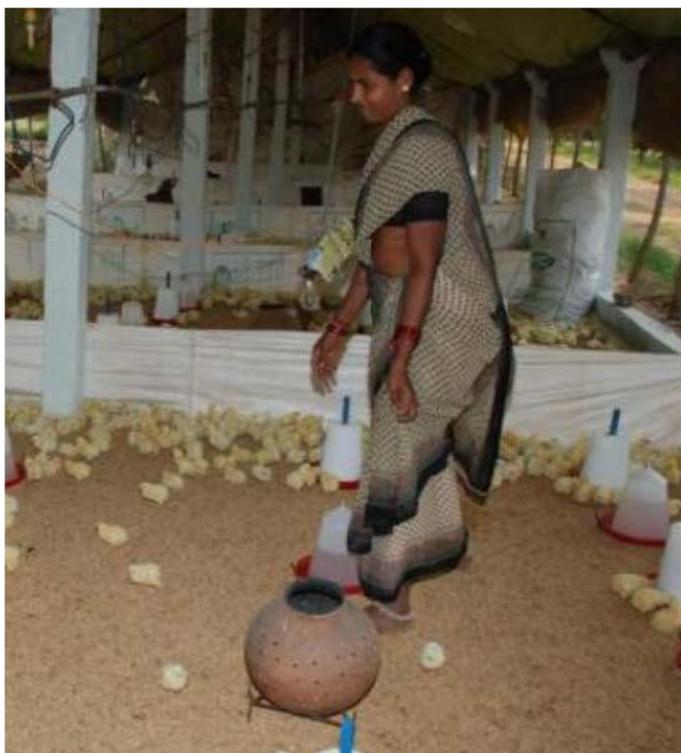
The livestock rearing in the past was based on

crop by-products with minimal purchased inputs like oil cakes and less dependency on veterinary medicines and veterinary services. Although the research has come out with very good vaccines to protect the animals from various infectious diseases, the causative agents are also actively getting mutated posing serious challenges to the researchers. The net result is development of polyvalent vaccines which protects the animals only from those strains incorporated in the vaccine. Foot and mouth disease occurs in cattle, buffaloes, sheep, goats and pigs, and protecting all these species of animals against several strains of FMD virus remains a utopian thinking. By now it is well known that the crossbreds require more attention from the vets compared to our local animals which are far superior in resisting the diseases.

Box 1: Promotion of Backyard Poultry Strains

Improved Backyard Poultry (BYP) strains (Giriraja, Vanaraja, Gramapriya, Swarnadhara, Krishibro, Krishilayer, Caribro, Carired, Naked neck broiler, Dwarf broiler, Krishna J, Namakkal chicken¹, etc) were developed through research for increased production of eggs and meat. These strains have been released and promoted to improve the nutrition and supplementary income of farm households. However there are several issues which remain unaddressed (Rao and Natchimuthu, 2012; Athilakshmy and Rao, 2012). These include:

- No brooding ability and less mothering instinct among improved strains to protect from natural predators which makes the BYP farmers dependent on hatcheries for chick supply continuously.
- Improved strains cannot thrive on scavenging alone and they need feed supplementation to get the expected body weight gain in time and to support the increased egg production.
- BYP may not be suitable in places where farm mechanization is very high (reduces the availability of grain waste), lack or low availability of backyard area for rearing chicks etc. It is ideal in places where there is abundant food base for scavenging.
- Though, most of the farmers are interested to rear day old chicks of improved strain (few chicks), the difficulties in transporting chicks from the production unit, lack of training, poor delivery of vaccination and de-worming services, are the barriers preventing them to adopt this technology.



3. Perceptions on quality: Despite all the advancements in livestock research, the consumers of livestock products still perceive the products of local animals (desi cow milk, desi chicken, desi chicken egg, desi goat meat) superior in terms of taste, minor nutrients and energy and this perception is reflected on their premium prices. With the realization that organic farm products are better than the products obtained by the conventional farming (which uses synthetic fertilizers, pesticides and growth promoters) the researchers have been recommending organic farming, akin to good old traditional Indian farming system which sustained over centuries. Now a stage has come that the consumer does not know what is he consuming and the health conscious people are looking for healthy food, free from chemicals and pesticides.

4. Implications on human health and environment: No doubt the research has

contributed for increased production but with decreased focus on healthy food. "Chickens raised for their flesh (broilers) are fed large amounts of antibiotics and drugs to keep them alive in conditions that would otherwise kill them. The antibiotics/probiotics make chickens grow so large, so fast that they often become crippled under their own weight. This reckless use of antibiotics also makes drugs less effective for treating humans by speeding up the development of drug-resistant bacteria. Because chickens are fed massive amounts of drugs and pesticides, these chemicals are also found in high concentrations in their feces, and this fecal pollution from chicken farms is especially disastrous for the environment (<http://www.peta.org/living/food/top-10-reasons-eat-chickens/>). The scope of recycling or reuse of outputs is becoming narrowed down leading to the issues like pollution of air, water and soil, with high degree of potentiality to generate carcinogens which are difficult to identify.

Box 2: Indiscriminate use of antibiotics in Poultry industry and Antibiotic resistance in human beings

A study conducted by the Centre for Science and Environment (CSE), New Delhi revealed that 40 % of the 70 chicken samples collected from Delhi, Noida, Gurgaon and Ghaziabad contained residues of six commonly used antibiotics - oxytetracycline, chlortetracycline, doxycycline, enrofloxacin, ciprofloxacin and neomycin. The study also revealed that large scale and indiscriminate use of antibiotics in the poultry industry has led to antibiotic resistance in Indians who are falling prey to many ailments that are otherwise curable.

The poultry sector has been growing at around 8 to 10 percent annually and poultry constitutes of more than 50% of all the meat consumed in India. In order to meet the growing demand and competition, poultry breeders resort to the use of antibiotics to make chickens plump quicker and ensure a steady supply (See also <http://cooks.ndtv.com/article/show/do-you-know-your-chicken-403100>). Since there are no restrictions or limits on the use of antibiotics, the poultry industry has been rampantly using them as growth promoters. The residues of these antibiotics are being transmitted to humans on consumption.

In India, there is growing evidence that resistance to fluoroquinolones is rapidly increasing," says Sunita Narain, Director, CSE. Antibiotics are becoming ineffective due to increased resistance and treating fatal diseases like sepsis, pneumonia and tuberculosis (TB) with fluoroquinolones is becoming tough because microbes that cause these diseases are increasingly becoming resistant to fluoroquinolones, says the report. Source: Report from Centre for Science and Environment's (CSE).

(http://www.livemint.com/Politics/zC3RHtP3iEeNLxnJgZXTJK/Antibiotics-critical-to-humans-used-as-growth-promoters-in-p.html?utm_source=copy)

It appears that we are caught in a situation where we have been compromising quality for quantity and it is high time that we do a review of our livestock research and reverse this trend.

Way Forward

1. Livestock research must come out with a position paper on the realistic advantages and disadvantages of traditional/conventional and modern methods of livestock production and its other implications for wider discussion among various stakeholders, including farmers. Wherever, traditional methods of

farming predominate (tribal areas, interior or remote areas, virgin areas, etc), ways should be found to improve these methods, instead of promoting new types of livestock farming. Wherever intensive methods are followed, there is a need to educate the farmers/entrepreneurs on input use and its health and environmental implications and support options that focus on quality livestock production. Indian Council of Agricultural Research (ICAR) may take a lead in developing this position paper and in framing policies on livestock research that focus on quality.

2. Consumers and farmers should be made aware about the different methods of livestock production and their implications so that they could better decide on what they are consuming. For instance, the consumers must know what price they are paying for consuming the low priced broiler chicken. A very small population (health conscious and having high purchasing power) of consumers have started paying premium prices for organic products which are considered comparatively less harmful to human health. This could be one of the reasons for the consumer demand for poultry tapering off in the US, pushing local companies to increasingly depend on exports (Indian Ban on Imports of US Poultry Sparks WTO Dispute, 7 March 2012, <http://www.ictsd.org/bridges>).
3. Organic livestock production: The methods adopted in organic farming ensure the quality of products without chemical residues. Hence, there should be a policy to promote organic or natural farming which preserves the resources for our future generation (sustainability) by reducing the air and water pollution. Fortunately, the demand for organic farm products is increasing with increasing awareness about the negative consequences of the products of modern farming and perceived advantages of organic farming as well as increased purchasing capacity.
4. Initiate new research focusing on quality (again use science or the scientific principles) and develop breeds/strains which are sturdier and fit into the low input traditional livestock farming system.
5. Conservation of threatened breeds of livestock: Realizing the potentiality of the local breeds and negative consequences of crossbreds, the Government of India is encouraging conservation of local breeds with 100 % Central assistance (Annual report 2012-13, DAHD& Fisheries, GOI). This needs to be promoted vigorously by involving farming communities and NGOs.
6. Document and learn from use of Indigenous technical knowledge: It is also equally important to encourage and promote indigenous technical knowledge to enable the livestock farmers to take advantage of the approved practices in prevention and treatment of diseases in animals. The efforts being taken by the National Innovation Foundation (NIF) in documenting, validating, field testing and facilitating product preparations by using local resources are laudable (www.nif.org.in) It is time for us to learn from our mistakes and move forward for the betterment of human welfare.

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ITK IN ANIMAL HUSBANDRY: THE TREASURE THAT DEMANDS OUR ATTENTION

ITK (Indigenous Technical Knowledge) plays an important role in the day-to-day life of rural people. But with every passing day – as we head towards greater modernization – ITK is losing its importance and relevance, getting slowly confined within a small segment of the population. We need to address this issue, argues Sheikh Shubeena.

Indigenous Technical Knowledge (ITK) is the knowledge that an indigenous community holds collectively in their minds, which is then manifested through their practices and beliefs; as well as used by them in day-to-day life while addressing/solving some of their practical problems. This is the knowledge that is accumulated through generations of trial and error by the people. ITK forms an important component of the life of rural people, especially in the farming community. The farming community, in spite of the latest technologies and advancements, still has strong faith in their traditional knowledge. But with the passing of time the younger generation is showing less faith in ITK as scientific methods are far more 'tested and true' in terms of credibility. The beliefs of this generation, along with the modernization effect, have led to a negative impact on ITK and its use. This has, therefore, led to a diminishing of this knowledge from traditional cultures, over which hangs the threat of eventual, permanent loss.

Box 1: Indigenous Technical Knowledge (ITK)

It is a community-based functional knowledge system developed, preserved and refined by generations of people through continuous interaction, observation and experimentation with their surrounding environment (Pushpangadanet. al. 2002). This traditional knowledge is based on the necessities, instinct, observation, trial and error and long experience of the indigenous societies of different regions (Majhi 2008).

Role of ITK in Livestock Rearing

ITK plays a crucial role in both agriculture and livestock rearing in risk prone and poorly developed areas. ITK acts as a first aid or emergency prescription to people who have no immediate access to formal veterinary facilities. Moreover these locally available, home-made preparations make them cost effective and easy to administer. ITK is also a god send for these small and marginal farmers who are not able to afford formal drugs for their animals due to its prohibitive cost. Many people living in rural-urban fringes are giving up livestock rearing due to high risk of animal diseases and the cost of treatment thereafter. ITK provides an edge to these resource-poor farmers in terms of animal rearing. These indigenous practices are considered as a holistic approach to livestock management and are adopted by non-literate cultures. For local communities indigenous knowledge is an inseparable part of their culture and history (Ghosh and Sahoo 2011).With regard to the

principle of adaptability, ITK are time tested and reliable to the farmers using them, and hence adaptable to their local conditions and socially acceptable. There is no threat of side effects, withdrawal effects, or the presence of undesirable residues in livestock products.

Threat to ITK

As the world is moving fast modern and quick-fix approaches appeal to the eye. ITK being slow in bringing relief is losing its importance. Animal rearing patterns are also changing; today's farmers are generally rearing crossbred animals. In this situation ITK is less effective; moreover livestock farmers are also not ready to risk the lives of their costly animals by treating them with indigenous practices.

ITK is slow in bringing the desired effect, and this is further compounded by the vague diagnosis of diseases by farmers themselves, that can then prove life threatening to the animal. Moreover there is decreasing availability of the plants or herbs used in ITK. The tracts of land where these herbs are grown are dwindling due to urbanization and deforestation, leading to the extinction of these valuable resources in time. ITK, once a practice known to every livestock farmer, is fading from the memories of farmers and is now confined to certain old individuals in the communities or to certain migratory tribes of the country. There is continuous uprooting of untapped resources from their native habitats due to social, economic and political factors that can lead to loss of indigenous knowledge (Girach 2007).

The people who still use and practice ITK for the daily needs of their livestock can be counted on one's fingers and the passing of this knowledge to the next generation is stagnant as the younger generation is least interested in knowing and applying these ancient practices.

ITK, an important component of Livestock Rearing for Shepherds

In some of the northern states of India, such as Jammu and Kashmir, and Himachal Pradesh,

livestock herders pasture their animals in the higher reaches of mountainous areas far away from human habitations for certain months of the year and it is then that ITK becomes the savior of the livestock. Shepherds are the mobile treasure houses of ITK who are able to treat and rear livestock in these months wholly by depending on their knowledge of this traditional method. They also discover and re-discover the traditional treatments and modify them on a 'trial and error' basis. These areas are generally inaccessible and the presence of formal veterinary facilities is almost nil. These regions are also rich in the herbs that are the ingredients for self-treatment. Again with the intensive rearing of livestock the migration of livestock is decreasing and remains confined again to certain Bakarwal tribes. Seeing a diminishing trend in the use of ITK efforts are needed to document and preserve these precious resources which can have far more benefits than just relief for animal ailments. Research on these ITK preparations is the need of the hour as harm arising from drug resistance and side effects of formal medicines is increasing.

Need to Document and Preserve ITK

Modern medicine that was once thought to solve all the problems related to human and animal health is presently facing many challenges. Side effects, drug resistance and other problems has raised many questions on its use (Devaki and Mathialagan 2015). There is certainly no doubt that modern medicine has revolutionized medical treatment but it is important to take the traditional healing system along with it. By integrating traditional and modern scientific knowledge an extensive range of new ideas and practices can be generated for the betterment of mankind (Mishra et. al. 2011). But this correlation and integration can only be achieved once documented information about ITK is available.

Documentation of ITK will help to improve the livelihood of ITK holders who are frequently poor and marginalized by society; and it will also contribute towards improving the national economy. There is continuous uprooting of untapped resources from their native habitats



due to social, economic and political factors that can lead to loss of this indigenous knowledge (Girach 2007). The recognition, preservation and protection of traditional knowledge can play a great role in safeguarding biodiversity, intellectual diversity, and environment on the one hand, and will prevent bio-piracy on the other (Jena 2007; Gupta 2008).

Way Forward

ITK is the heritage of any local community that practices it. The use of ITK has decreased and has remained confined to just a small

section of tribals and pastoralists. With growing negligence a part of this treasure is getting buried under the name of modernization. There is an immediate need to recognize the importance of ITK, and serious steps need to be taken for its documentation, preservation, and validation.

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ANTIMICROBIAL RESISTANCE (AMR): A GLOBAL THREAT TO LIVESTOCK AND HUMAN HEALTH

There is a need to enhance understanding and awareness of AMR through effective communication, education and training. Therefore livestock extensionists should focus their efforts in this area. In this blog, Nukala Ramesh, HemaTripathi, RekhaYadav, and BN Tripathi discuss the issue of AMR and how it could be addressed.

Use of antimicrobial drugs in animals is essential for their good health and productivity, which in turn will ensure better food security, food safety and animal welfare. In the recent past there has been growing concern about antimicrobial resistance (AMR), which threatens to reverse these benefits. Resistance, arising in one geographical location or species can easily spread to other geographical locations or spill over into other species, and thus impact both developed and developing countries. The subject of antimicrobial resistance has not received adequate focus and attention in South Asia, including India. Surprisingly, very little is known about the use of antibiotics in animal husbandry. At present AMR is a global concern and immediate attention is called for to address it. Attention has to be focused on optimum use of antimicrobials with regard to the prescribed guidelines and action plans.

Introduction

India's greatest challenge lies in providing adequate, nutritious, healthy and safe food to more than 132 crores of its human population. But this is getting to be a problem due to shrinking land, decreased labour, dwindling natural resources, climate change issues as well as the considerable migration of farming communities to urban areas. Among all these sectors, livestock sector is of utmost important as it can go a long way towards meeting this burgeoning demands. At present there is a huge gap between demand and production of milk, meat and eggs that needs to be tackled in order to meet the needs of an expanding population. In its haste to meet this need the livestock industry is using excessively high amounts of antimicrobial agents in food-producing animals to prevent diseases and achieve the fastest growth in the shortest period (Manna et al. 2006). Food animals are given small doses of antibiotics mixed with their feed to promote growth and prevent disease. This allows farmers to skimp on nutrition and hygiene, thus saving much financially in the short term but causing great harm in the long run to the human race as a whole.

What exactly is the cost to human beings? The heavy reliance on antimicrobials in animal production has resulted in bacterial resistance in humans, especially to many modern antibiotics used in the treatment of life-threatening diseases in humans. This comes about especially when antibiotic residues remain in the final food products (Bahri 2017) that human beings consume. Due to the presence of antibiotic residues in the final food products, consumers are chronically exposed to low levels of antibiotics leading to AMR, which adversely affect human, animal and

plant health systems. Thus, increasing global antimicrobial resistance (AMR) compromises modern human and veterinary medicine and undermines the safety of our food and environment (FAO 2016). These antimicrobial residues also diminish the economic value of

livestock products and lead to export losses for farmers with respect to international trade and consumer confidence, especially in view of global competitive markets in the post-WTO era and imposition of sanitary and phyto-sanitary (SPS) measures.

Box 1: Related terminology

An **antibiotic** is a low molecular substance produced by a microorganism that, at a low concentration, inhibits or kills other microorganisms.

An **antimicrobial** is any substance of natural, semi-synthetic or synthetic origin that kills or inhibits the growth of microorganisms but causes little or no damage to the host.

Antimicrobial resistance is the ability of microbes to grow in the presence of a chemical (drug) that would normally kill them or limit their growth. Antimicrobial resistance is the broader term for resistance in different types of microorganisms and encompasses resistance to anti-bacterial, anti-viral, anti-parasitic and anti-fungal drugs.

The burden of antimicrobial resistance in livestock and food animals has been poorly documented in South Asian countries, including India. Apart from sporadic, small and localized studies on antimicrobial resistance, evidence at the national level is lacking. We do not have a surveillance system that accounts for use and consumption

of antibiotics in the livestock sector, and there are very few regulations governing the use of antibiotics for non-therapeutic purposes in India, neither is there stringent implementation of protocols (Background paper, Inter-Ministerial Review Meeting on Antimicrobial Resistance 2016, MoH&FW).

Box 2: Reasons for using antibiotics in livestock farming

Therapeutic (or curative) use: to cure diseases, prevent death of livestock and restore their production (milk and meat);

Metaphylactic use: to control the spread of infection to healthy animals (in case 10 to 15% of the animals in a group are ill);

Prophylactic use: by administering sub-therapeutic doses of antibiotics to animals via feed or drinking water, when signs and symptoms of infection are absent but suspected, and are likely to develop into an illness in the very short term; and as Growth Promoters to increase the growth rate and productivity of animals (Chandron and Brugere 2014).

Reasons contributing to Antibiotic Residues in Livestock Products

The major reasons for appearance of veterinary antibiotic drug residues in livestock products include: need to achieve high productivity in short duration on farm; failure to notice drug withdrawal period; extra-label (refers to the use of an approved drug in a manner that is not in accordance with the approved label directions) and indiscriminate use; and over-the-counter purchase of antibiotics by livestock owners. Low-quality medicines, wrong prescriptions, and poor infection prevention and control also encourage the development and spread of drug resistance. Lack of enforcement of restrictive legislation on the use of antimicrobials, poor government commitment to address this issue, lack of guidance on withdrawal periods, and consumer awareness about the magnitude of human health hazards associated with antimicrobial residues consumption through meat

and meat products, and poor maintenance of treatment records – are also primary reasons for incidence of antimicrobial residues in meat and meat products (Muhammad et al. 1997; Kaneene and Miller 1997; CAC 2001; Prajwalet al. 2017).

Research Support on use of Antibiotics in Field Conditions

A few studies have been conducted in the field to understand the antibiotics usage pattern in different food animals. Ninety-five percent of poultry farmers from Punjab do not follow the withdrawal period of drugs after cessation of treatment mainly due to their ignorance and habitual practice over the years. Lack of awareness among poultry farmers and farm workers have been identified as one of the major reasons (Lalawnpuia 2015). The poultry farmers in Punjab use antimicrobials for disease treatment and prevention, and for growth promotion. Antimicrobials were often employed during

transportation of broilers or prior to slaughter for stress tolerance (Brower et al. 2017). According to Vasant (2016), 88% of farmers did not know about antibiotic use and its residue in their animals and milk in Krishnagiri (Tamil Nadu) and Kolar (Karnataka) areas. In Telangana, 94.17% of sheep farmers were reportedly using Oxytetracycline with only self-experience. Large chunks of sheep farmers (87.50%) practice over- or under-dosing of drugs without any knowledge, and most of them treat their animals with whatever medicines available by consulting neighbours instead of using medicines prescribed by veterinarians (Ramesh 2017). Pallavi (2017) reported that in Punjab 89, 74.5 and 70 percent of small, medium, and large dairy farms, respectively, administered antibiotics on a veterinarian's prescription, while 8, 16.5 and 22 percent of farms administered antibiotics by farm workers themselves. All three types of farmers were partially aware of a withdrawal period, and dairy farmers in Punjab never discard milk of the treated animals and continue selling those to consumers.

Antibiotic Residues in Livestock Products and Effects on Human Health

Antibiotic residues in livestock products are a potential threat to human health. Traces of antibiotic residues in contaminated foodstuffs can produce direct toxic effects, which are dangerous for consumers. Penicillin can evoke allergic reactions and small amounts of Chloramphenicol can induce a plastic anemia in certain sensitive humans. Some the Fluoroquinolones have many adverse effects, such as carcinogenicity, mutation photosensitization and allergic reaction (Luet al.2008). Sulfonamides can cause side effects, such

as micturition and hematopoietic disorders (Fang 2007). Tetracycline can damage liver and kidneys; it also influences the growth of skeleton, and can cause other side effects (Guet al.2007). Another threat is that the sub-therapeutic doses of antibiotics in food producing animals may induce antimicrobial resistance (AMR) including transfer of R factor. The resistant bacteria from animals may be transferred directly to humans via the food chain. Further, the resistant genes may also be transferred from animal pathogens or commensals to human pathogens (Barton and Hart 2001).

Strategic Interventions on Prevention and Control of Antimicrobial Resistance

In 2015 WHO unveiled a Global Action Plan (GAP) to combat antimicrobial resistance and implemented tripartite collaboration between FAO, OIE and WHO for this. These organizations are now sharing information and collaborating at all levels, on mechanisms to quantify the use of antibiotics in humans and animals. The strategic objectives of GAP include: improving awareness and understanding of antimicrobial resistance through effective communication, education and training; by strengthening the knowledge and evidence base through surveillance and research; by reducing the incidence of infection through effective sanitation, hygiene and infection prevention measures, optimizing the use of antimicrobial medicines in humans and animals; developing the economic case for sustainable investment that takes account of the needs of all countries; and by increased investment in new medicines, diagnostic tools, vaccines and other interventions (WHO 2015).

Box 3: Some important facts and the current scenario

Global consumption of antimicrobials in food animals was estimated as 131,000 tons in 2013, which would become 200,000 tons by 2030. Currently, China is one of the top five users of antibiotics in food production in the world. The projected consumption and percentage increase by 2030 would be highest in China (8200 tons, 59%), followed by the United States (9,476 tons, 22%), Brazil (6,448 tons, 41%), India (2,633 tons, 82%), and Spain (2,202 tons, 6%) (Van Boeckel et al. 2015).

Recommended inclusion levels in poultry and pig diets were 4 ppm for the narrow spectrum and 10 ppm for the broad spectrum antibiotics in the 1950s. Since then these levels have risen 10 to 20 fold (NAAS 2010).

Using the WHO guidelines, India has also developed a roadmap for combatting AMR (in April, 2017), with six strategic priorities. The focus areas of the National Action Plan (NAP-AMR) similarly include: improving the awareness and understanding of AMR through effective communication, education and training; strengthening knowledge and evidence through surveillance; reducing the incidence of infection through effective infection prevention and control; optimizing the use of antimicrobial agents in

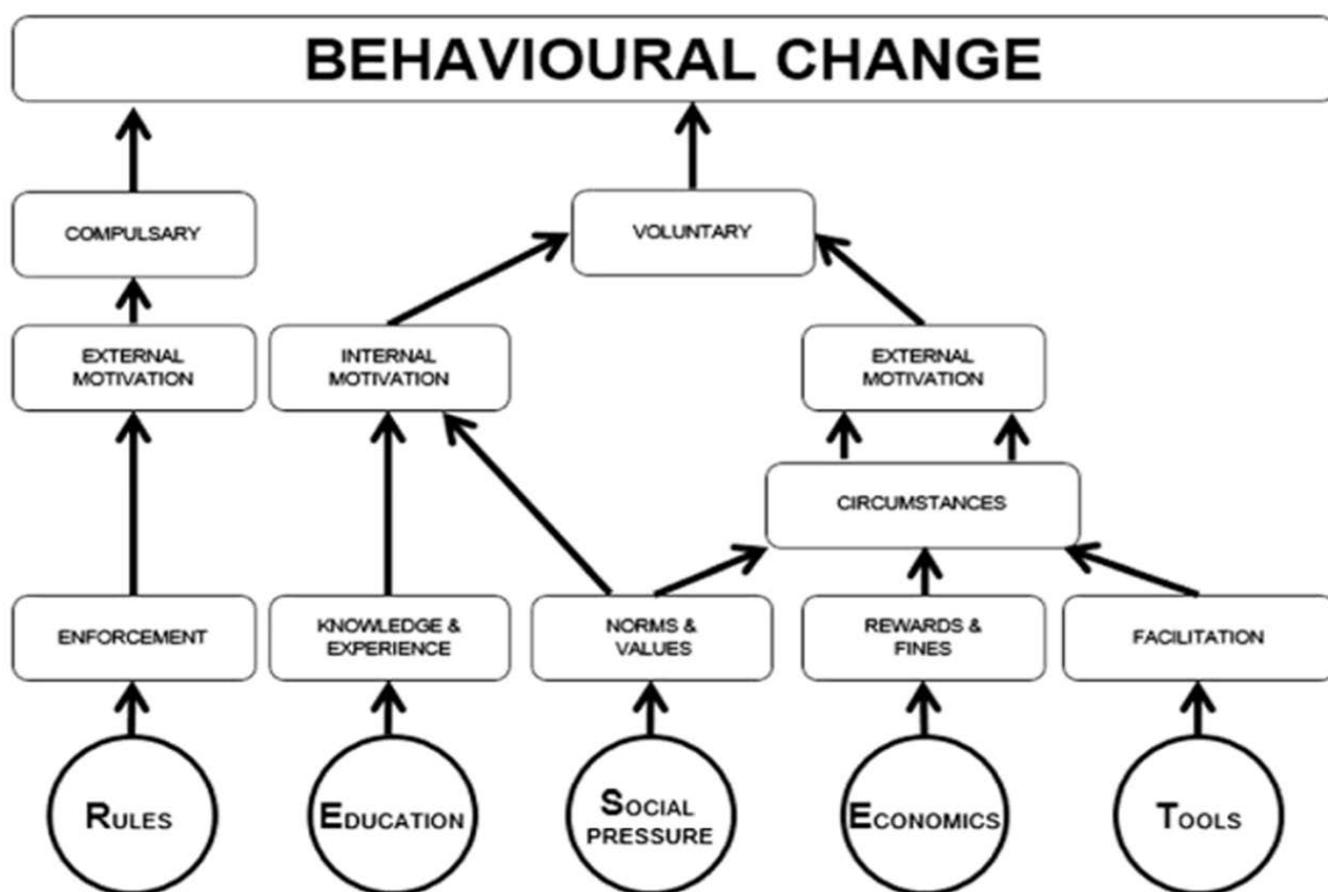
health, animals, and food; promoting investments for AMR activities, research and innovations; and strengthening India's leadership on AMR.

Globally, many organizations such as the World Veterinary Association (WVA) and the World Organisation for Animal Health (OIE) are actively involved in combating AMR by organizing various activities. These include celebrating the 'World Veterinary Day' with the theme Antimicrobial Resistance from Awareness to Action in 2017,

Box 4: Cases of extension intervention

Khatun et al. (2016) conducted a training program at two different locations (Joypurhat and Bogra districts) in Bangladesh on benefits of proper uses of drugs and additives, ways to keep hygienically operating poultry farms and poultry products, disadvantage of excessive drugs in poultry, and the eventual adverse effects of indiscriminate drug use on human health. After imparting the training program, they strengthened technical services provided to the trained farmers, monitored their performance and assessed the impact of this on selected poultry farmers in the next year. Findings revealed that 90-100% of the non-trained farmers and 8-24% of the trained farmers were involved in the indiscriminate use of drugs at respective farms. Further, it was found that 86% of the trained farmers from Joypurhat district and 56% from Bogra district were following drug withdrawal period, respectively. It shows that training and monitoring can play a vital role in changing the existing indiscriminate use of drugs and additives employed by farmers to increase profits.

Lam et al. (2017) used the RESET (Rules & Regulation, Education, Social Pressure, Economic Incentives and Tools) Model (adopted from Woerkum et al. 1999) to change the mindset of dairy farmers and veterinarians towards reduction of antibiotic use in dairy cattle in the Netherlands, and revealed that antibiotic use in dairy cattle decreased significantly. This was made possible by cooperation between the most important stakeholders in the dairy industry, by taking communication seriously, and by applying the RESET Mindset Model.



to create awareness among members of the veterinary community. World Consumer Rights Day 2016 was celebrated under the theme of 'Antibiotics off the menu'. A joint collaborative meeting was held in 2016 between FAO-ICAR to tackle the AMR problem. A Red Line campaign was launched in February 2016 by the Union Ministry of Health and Family Welfare, Govt. of India, to curb irrational use of antibiotics. Recently, the Indian Society of Veterinary Pharmacology and Toxicology organized a national seminar on **Combating Antimicrobial Resistance** and the Food Safety and Standards Authority of India (FSSAI) has issued a draft on **Food Safety and**

Standards (Contaminants, Toxins and Residues) Amendment Regulation-2017, to fix the tolerance limit of antibiotics and pharmacologically active substances in food stuffs of animal origin.

Role of Extension in Combating AMR

In fact, the Global and National Action Plans emphasize the importance of extension services in combating AMR. The first strategic objective of these plans is to improve understanding and awareness of AMR through effective communication, education and training. Veterinary services can play a critical role in building awareness about AMR in livestock production, and

encouraging the prudent use and management of antimicrobials in food producing animals. Though India does not have a separate extension system in the livestock sector the State Departments of Animal Husbandry (SDAH) have well-built networks with livestock owners up to the village level, and they can take primary responsibility to control the indiscriminate use of antibiotics at the field level.

At first instance a campaign should start by creating awareness among masses, on the benefits of proper uses of antibiotics, the adverse effects of indiscriminate use on animal health, and consequences of over-the counter purchase and self-treatment of their animals with antibiotics. SDAH can prepare posters in the local language for display at milk collections points, and veterinary hospitals showing how judicious use of antibiotics and its benefits can help them and their animals. After treating the animal, SDAH personnel need to educate livestock owners on withdrawal periods and its effects. Livestock owners generally do not keep up with follow-up services after administering antibiotics; therefore veterinarians should explain the need and necessity of follow-up services. 'Antibiotics awareness week' should be conducted at the village level at least once per year so that this information gets widely disseminated among farmers. Introduction of AMR as a core component into in-service training programs of SDAH personnel will help them to update their knowledge on AMR, and on latest policies and control methods. Providing basic facilities, such as timely supply of quality medicines to treat animals in addition to diagnostic facilities will help to reduce extra label use of antibiotics. Para-vets and quacks should be adequately taught about the adverse effects of injudicious use, especially of higher generation antibiotics at the very first instance in every case, except in clinical cases. They should not be allowed to treat animals without proper prescriptions from certified veterinarians.

Veterinary universities and KVKs can establish a public communication strategy targeting the community regarding appropriate use of antimicrobials through reading materials, web-based portals and mass media. Education and training on judicious use of antibiotics given to progressive farmers and dairy cooperative members will help to reduce the severity of the problem. These programs should concentrate on reducing the dependency on antibiotics by preventing infection with maintenance of hygienic conditions and good farm management practices, using alternative herbal/homeopathic medicines and herbal feed additives in poultry production, and timely vaccination of animals. KVKs and state veterinary universities should encourage women self-help groups and other farmers who are

involved in livestock-based products, to sell their products as 'antibiotic free' milk or meat to fetch higher prices as compared to the market prices. A general campaign must be initiated to create consciousness among consumers about safe food consumption, withdrawal period of drugs, as well as the ill-effects of drug residues on human health.

Way Forward

- Surveillance data on antibiotic use and information management in animals should be strengthened at the field level.
- There is a need to follow proper treatment protocols in antimicrobial treatment by field veterinarians, as well as by encouraging farmers to strictly follow the withdrawal period.
- The National Action Plan on AMR barely talks about the financial loss accruing to farmers by implementing the withdrawal period. There is need for a special policy to address this issue.
- Our extension programme must focus on creating awareness among livestock owners on judicious use of antimicrobials.
- Focusing attention on the effects of AMR on human and animal health along with creating consumer consciousness are the other major concerns that need to be adequately addressed through educational programmes, by writing about it in blogs, newsletters and mass media, and through ICT tools.
- Farmers must be encouraged to follow Good Farm Management Practices to reduce the incidence of diseases through effective prevention and control mechanisms.
- The State Animal Husbandry Department must allocate adequate human resources, finance and policy guidelines for this operation.
- Controls should be put in place for the purchase of over-the-counter antibiotics by livestock owners from veterinary pharmacy shops/input dealers.
- A multi-sectorial and multi-dimensional approach is needed to address the challenge of the AMR issue. A single organization or discipline cannot solely address this global threat, it calls for the convergence of state animal husbandry departments, NGOs, animal welfare associations and veterinary universities in order to mount a fight on AMR effectively.
- There is a great need to include the topic of AMR in the veterinary curriculum so as to create more awareness among undergraduates.

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BUFFALO CHAMPIONSHIPS AS MOTIVATORS FOR BUFFALO-REARING FARMERS

Considering the importance of buffaloes in Indian agriculture there is an increasing interest in organising buffalo championships in the country. However the quality and effectiveness of these events could be further enhanced argue Sajjan Singh, HemaTripathi, VB Dixit and BN Tripathi.

Agriculture fairs are gaining popularity by the day. Quite often there's more emphasis on crops, horticulture and agro-machinery than on livestock. Currently, there is a growing interest among farmers in diversity of livestock as they provide a steady income to these farmers, even when there is crop failure. Even otherwise animals play an important role in the life of rural communities in India as they are a part of many of their rituals, and are worshiped as well. India hosts some of the largest cattle and livestock fairs in the world, some of these are: the largest cattle fair in India is Bihar's Sonepur Cattle Fair (also known as *HariharkshetraMela*), Nagaur Cattle Fair, Jhalawar Cattle Fair, Pushkar Cattle Fair, Pushkar Camel Fair, Kolayat Cattle Fair, Bateswar Cattle Fair and Gangapur Cattle Fair. Most of these fairs are organised for the purpose of trading animals, including buffaloes, with no emphasis on competitions.

Now livestock shows/championships are being organized annually by the Punjab Government wherein best buffaloes from all over the country participate. In 2017, the Departments of Animal Husbandry, Fisheries & Dairy Development of Punjab State, along with the Federation of Indian Chambers of Commerce & Industry (FICCI) organized the 10th Agri. & Livestock Expo on December 1-5, at Patiala, Punjab, which turned out to be one of the biggest agriculture and livestock events in the country. This trade fair brought together all the stakeholders of this industry—government (both Central & State), policy makers, industry, research organizations, academicians, farmers, agronomists, NGOs, and Indian and foreign companies associated with the agriculture & livestock sectors – on a single platform to explore business opportunities.

Buffalo Championship

Over the last few years, there has been an increase in the number of cattle shows and championships in India. The prime reasons for organizing these events include: setting new records of milking, identifying best germplasm, and also to serve as a platform for livestock owners to share their problems and discuss potential solutions. During such events farmers also benefit by getting access to new information, along with literature regarding these, from national and international agencies/ companies/ cooperatives/ state departments who also have stalls at these venues.

Considering the importance of buffaloes in Indian agriculture and its contributions to the Indian economy (Box 1), there is an increasing interest in organising buffalo championships in the country. Glittering black beauties attracting crowds in

and around judging pavilions is a common sight in almost all the livestock championships. In the recent past we have seen a succession of championships. The competitions are organized across different categories and species of livestock. While some of the livestock species do not attract farmers in large numbers, buffaloes are emerging as the main crowd puller – both inside

and outside the ring. Buffalo exhibitions are also being organized by governments and some of the institutes demonstrate and showcase quality buffaloes to which farmers are attracted in large numbers. Livestock farmers, especially progressive ones, participate in these exhibitions in order to learn the latest technologies developed by research institutes.

Box 1: Buffaloes and the Indian Economy

Buffaloes are heralded as key contributors to ensuring nutritional security and employment to the rural masses. Asia hosts 97.04% of the total buffalo population across continents. India's contribution to this is 57.8%. India contributes 67.75% of the world's buffalo milk and more than 60% of the buffalo meat, although it is only 36% of the total bovine population. Statistics has revealed the significant role buffaloes play in the Indian economy. At present, buffalo products earn the highest foreign exchange and are the single largest agricultural commodity to generate this sort of revenue for India. The 19th Livestock Census noted that, while the total livestock population (512.05 million in 2012) decreased by about 3.3% over the previous census (18th Livestock Census 2007), the buffalo population recorded growth from – 105.3 million to 108.7 million i.e., about 3.19% (DAHD&F 2010). The female buffalo population is increased by 7.99% over the previous census. The major reason may be that the buffalo is a triple purpose animal, being suitable for milk, meat and as draught animals. It can efficiently utilize poor quality roughage and crop residue into high quality animal produce such as milk and lean meat. Buffalo milk is suitable for a wide range of dairy products including butter, milk powder, mozzarella cheese, khova, curd, yoghurt, shrikhand, dried ice cream mix, dairy whitener, etc., and is the most-liked milk among the masses.

The diversity of buffaloes in India is noteworthy and they are spread over almost all parts of the country with varying population density. India has the world's best buffalo breeds that are noted for their distinct superiority, adaptability to withstand heat, resistance to many tropical diseases, and ability to thrive even under harsh climatic conditions. Buffaloes are the new cash crop for farmers and can be used to double the incomes of their owners. High-milk-yielding buffaloes are redefining farm economics from Punjab, Bihar, and West Bengal to even the south. But it is Haryana that is at the epic centre of this success – for a growing number of farmers in Haryana the real icing on the cake is in raising champion breeding bulls. More than 70% of the milch breeds of buffalo are concentrated in the northern and western states, including Haryana, Punjab, Uttar Pradesh, Rajasthan, Gujarat and Maharashtra, but the population status of 13 recognized breeds varies within the country. In fact these animals are considered an asset financially as they serve as an instrument of insurance against the risk of crop failure due to natural calamities.

National Championships

The Punjab and Haryana governments have been organising National Championships on a regular basis. A few other states have also started following this trend.

Competitions for Adult Bulls

Buffaloes are categorized mainly in to two groups of males and females. Each group is further subdivided into 3-4 categories as per the convenience of organizers. In all, 6-8 competitions, excluding the overall championship of the event, are held. The most attractive show is the congregation of overweight, oversized (specific to breed), overfed and cosmetically prepared and decorated adult bulls, especially groomed for the livestock championships. The major challenge is that farmers are unaware of the genetic merits of these bulls as they are ranked by the judges in the melas on the basis of their phenotypic characters, and the owners exploit this situation by selling their semen at premium prices to innocent farmers who later on feel cheated due

to poor performance of the bulls. Only pedigree-verified bulls with recorded mothers are allowed to participate in the championships and semen from these can be disseminated to the farmers.



Beauty Competitions

The second category is female buffaloes, where the highest milk-yielding buffalo is identified. A sizable number of buffaloes are recorded that yield above 20 litres of milk per day. In this competition, participation is restricted to recorded and registered animals. This event hardly invites controversies, and it encourages farmers to rear quality buffaloes. Competition in other categories is very tough, especially in calf rallies. In these types of competitions only those calves participate who are progenies of tested bulls that have already been used in the field-progeny testing program. Retention or holding of milk for beauty competition is not in the welfare of animals, so it is suggested that routinely milked animals only be selected for competition.

State Championships

State governments also have many programs wherein huge prize money is distributed to encourage the farmers to adopt dairy farming as an enterprise. Many state governments are also organizing calf rallies and milk yield competitions; and give handsome amounts of money to the prize-winning animals. Very recently one mega livestock show was held at Jhajjar during the Golden Jubilee year of Haryana wherein highly lauded animals from all over Haryana and adjoining states participated, and buffaloes were the main attraction of the livestock show. Crores of rupees were spent in organizing this mega event and prizes worth lakhs of rupees were distributed among the breed champion buffaloes as well as to those with the highest milk production records. The state government is also recording the buffaloes at village level by constituting a team of experts. The incentive money is distributed to the owners of recorded animals. The minimum production level from 18 litres of milk upwards is considered for incentive money. This scheme has prompted the farmers to rear quality Murrah buffaloes in the state. This has also improved the quality of germplasm in the state.

Buffalo Competitions Organized by Breeders Associations

Organising *melas* and buffalo championships by breeders' associations is a regular activity and a cost-effective affair because it is arranged on a participatory mode by each participating farmer with no involvement of government machinery. This gives a message to buffalo-owning farmers to rear quality buffaloes, and helps in spreading the message of maintaining superior germplasm. These associations are helpful in registering, conserving, and propagating superior germplasm.

Milk Recordings: An Opportunity to Fetch High Prices for Buffaloes

The state animal husbandry department is making efforts to identify high-yielding Murrah buffaloes at the village level through regular milk recordings carried out at farmers' doorsteps. Murrah buffaloes meeting the benchmark of 18 kg peak yield or 3600kg lactation yields are properly identified (with ear tags) along with their progeny. Cash incentives and certificates issued by organisations enable farmers to get very high prices for their animals. These certified animals also participate in national and state level buffalo championships from time to time, and earn huge prices in cash for their owners. This activity tremendously enhances the price of recorded buffaloes as they are tagged as high yielders during such events. Thus this activity encourages the farmers to rear high-yielding animals.

Calf Rallies- An Opportunity for Farmers to Teach and Learn

Conducting calf rallies provide physical inspection and verification of the calves produced by the field units through Artificial Insemination. It is a great opportunity for livestock owners to learn more about progeny testing, health care, and management practices to get better returns from animal rearing. It not only brings livestock owners from different places onto a single platform and showcases their calves, but also acts as a meeting place for them to see the improved management techniques adopted by other livestock owners. They can also learn how to practically follow innovative feeding methods that can improve the health of their calves as well as how their healthy calves to other farmers. Calf rallies provide an opportunity to get extension advisory services from the scientific personnel at the venue on latest technologies and improved animal husbandry practices, and facilitate farmer-to-farmer extension. Awards and incentives to the calf owners as a token of their participation motivates them to maintain healthy calves so as to get maximum benefits in future. ICAR-CIRB and Haryana Livestock Development Board (HLDB) are a few examples of agencies who implement the progeny-testing program on Murrah buffaloes. They organise calf rallies along with several other extension activities to increase the active participation of farmers.

Way Forward

- The frequency of block and state-level animal shows need to be increased in order to promote quality animals. These livestock shows motivate farmers to rear high-yielding

buffaloes, which in turn will increase their income and enrich the state with valuable germplasm. Organizing these competitions is cost effective because government agencies are already entrusted with the task of organizing these. But they need to increase the frequency of milk recordings and identification of male calves. These animals may be put up for show at village and block level so as to be selected for participation in state and national championships. Competitions may then be held at district and state levels. At state levels, only winners of competitions held at district level may be allowed to participate.

- Judging should be based on set procedures and standards under each category to avoid acrimonious situations during these shows.
- The criteria with weightage should be decided in advance, and made public before the mela. The standard score card for buffalo shows should be followed strictly and animals should be scored accordingly – this makes the judging more objective.
- Ensure proper logistics for owners reaching from distant places with their animals, and arrangements must also be made for fodder and drink for animals.

- Organize buffalo shows and competitions with proper linkages with state departments, veterinary universities, NGOs, associations at regional level for best utilization of resources and efforts.
- During the event technical sessions/interactive sessions may be arranged for intensive discussions.
- Proper arrangements must be made for quarantine to prevent the risk of spreading disease because farmers from across the country bring their cattle, goats, pigs, sheep and other animals to participate, and the status of their health is not known.
- The model followed by Punjab Government for organizing Livestock Shows and Championships for all animal species should also be adopted and replicated by other states, for uplifting the financial status of their farmers.

Although there are certain challenges and threats in organizing buffalo shows and championships but the strengths/benefits outweigh weaknesses. On the whole farmers are greatly motivated and gain much from these events.

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THE YAK-MOVING TREASURE OF HIGH HIMALAYAS

Yak farming is critical for the livelihoods of poor rural nomads in the cold northern areas of Nepal. However, this sector is yet to get the attention it deserves, argues Krishna Acharya

The Himalayan highlands of Nepal are a unique ecosystem. Hardy tribes and various sturdy animal species reside in the harsh terrains that have scanty vegetation. In many places, the land is covered by snow for two-thirds of a year. However, settlements dot the landscape below the tree lines. The people of the high Himalayan region have been rearing animals from time immemorial. The rugged topography, poor precipitation and poor soils make it unfavourable for growing crops. Thus, nomadic pastoralism is critically important for the economy of Mustang District. This makes the yak that can thrive in the arid and cold climate with its poor vegetation a boon for the Himalayan people. They thrive amid the harsh climatic conditions of the high Himalayas with no feed supplementation. Almost every nomad who lives in alpine areas, far away from villages with yaks and chauri, relies solely on the herbal and traditional practices such as shamanic rituals, chants and blessed water as medicine (Acharya et al 2014, Acharya and Kaphle 2015).

Present Situation

Yaks have got special place in the livelihood and economy of Himali people commonly called 'Bhote' and 'Sherpa'. They are the main source of household incomes in the upper slopes of mountain districts of Nepal under the transhuman migratory system (Joshi 1982, Pande 2004). They are a good source of meat and milk. Wool, horns, hide and skin, are the main by-products.

These livestock products have substantial role on household food security of the highland nomadic communities (Acharya 2015). However, the herders are abandoning the yak and chauri farming and are shifting towards other businesses due to lack of adequate pastures, hardship, decreased production and poor animal health services (Pande 2004). The new generation or the youth do not want to be involved in this occupation. They rather prefer other options such as tourism and migration to Middle East or to major cities of Nepal or India (Pande 2007).

Marketing and Value Chain

Regarding the value chain of yak husbandry, the yak herders of Mustang District consume substantial portion of their products. The products mainly meat, milk or butter are consumed either by producers themselves or are shared with relatives living in other districts and overseas. Only the excess of livestock and their products enter the market chain. Marketing of live animals rather than their products at the production points predominates. In lower Mustang, about 200-300 adult yaks are slaughtered annually which is shared by the local communities.

The Yak Farmers Association in Mustang determines the allocation of land for the yak herders. It allows the use of land above the farmer's home at no cost, but association charges some levies when the herders have to use the land of other villages (Degen et al 2007). The live animals are directly sold by the producers without involvement of middleman in this region. Usually yaks above 10 years old are directly sold to those engaged in slaughtering and distribution of yak meat. The animals are slaughtered by traditional method without any regard for food safety.

In some areas such as Rasuwa and Dolakha, milk from chauri (Yak-cattle hybrids) during Baisakh (April/May) to Kartik (Oct/Nov) is purchased by Cheese Production Centers for cheese and butter production (Pande 2007, Chhetri et al 2011). Out of the 28 yak rearing districts, five districts, namely Solukhumbu, Dolkha, Rasuwa, Sindhupalchok and Ramechhap, have cheese factories which produce yak cheese. Most of the Chhurpi (dried cheese) produced is sold to the traders, who visit the herds regularly and export to Kathmandu and India. Ghee produced in the areas are either consumed locally or sold to the traders who export these to the Tibet (Pande 2004).

The herders are only the price takers with no bargaining power who sell their products directly to the traders (negotiators). Thus herders have weak link in the marketing chain. There is a traditional blood drinking ceremony twice a year. In April–May, ceremony takes place at Sekong Lake, Kowang and in Shrawan at Marche (near tukuche) and Mulee (near Kowang). Scores of people gather at the Sekom Lake, Marcheelek, and Mulilek to participate in a blood drinking ceremony. The blood of the yak is supposed to cure gastritis, malaria, purify the blood and enhance sexual vigour.

Yak wool is shorn once a year in June/July and is used to make clothes such as Bakkhu, Docha. Wool obtained from sub adult and adult yak that has poor market value is used to make ropes, tents and carpets (Pande 2007). Wool from the calves of fine quality is used to make warm clothes for humans.

Government and non-government sector namely High Mountain Agribusiness and Livelihood Improvement Project (HIMALI), Department of Livestock Service (DLS), United States Agency for International Development (USAID), and Food and Agriculture Organization (FAO) have made some efforts to promote yak breeding.

Project for Agriculture Commercialization and Trade (PACT) and Department of Livestock Service (DLS) involved in extension and Dairy Development Corporation (DDC) are involved

in marketing of yak cheese. But, initiatives to add value to products such as wool scouring, milk pasteurization have not been taken seriously here in Nepal. Neither the government nor the Mat made from Yak hide with wool NGOs are involved in imparting knowledge to yak herders. As farmers follow the subsistence way of farming, a strong professional extension service is required to transform subsistence farming to market oriented production.

Problems and Challenges of Yak Farming in Nepal

Despite their great potentiality, yak farming in Nepal is currently facing different problems and challenges. These are as follows:

1. Lack of encouragement and motivation to the nomads of remote areas
2. Inadequacy of forage and nutrients during the lean period
3. Inbreeding depression, inefficient selection of animals
4. Climate change and increased incidence of pests and diseases such as Helminthes, myasis, and FMD (Acharya et al, 2014, Shrestha and Prajapati M 2015).
5. Closure of Tibetan alpine pastures to Nepalese herds
6. Low level of research funding available to address the issues of Yak farming
7. Majority of yak herders are illiterate and cannot perform efficiently, scientific observation, record keeping and interpret results.
8. Another major obstacle is the lack of Artificial Insemination service.
9. Absence of veterinary and animal health service to the nomads due to the reluctance of technicians to visit herds
10. Lack of co- ordination among government and other concerned stakeholders.



Box 1: Organizations involved in Development of Yak Farming in Nepal Yak Development farm, Syangboche

This farm was established in 1973 with the introduction of 40 Yaks/Naks from Tibet. Since then the farm produces and distributes 13 breeding animals to the farmers, but the supply is still inadequate. The farmers currently purchase extra stock from Tibet. Apart from this, Yak development farm, Syangboche, Ministry of Agriculture and Co-operatives (MOAC) is working as per their annual programmes for yak development in different districts. Unlike the National Research Center (NRC) on yak In India, research on various aspects of yak husbandry has not taken any momentum in Nepal.

High Mountain Agribusiness and Livelihood Improvement Project (HIMALI)

HIMALI is an agribusiness development project being implemented by Department of Livestock Service (DLS) in 10 mountain districts of Nepal. It aims at agribusiness development, strengthening livestock farms and centres and also value chain development. Currently, in order to strengthen the yak development program in Nepal, HIMALI Project purchased 45 yaks/Naks from Tibetan Autonomous region and handed over to the Yak development farm, Syangboche.

Strengthening extension to promote better use of yak

There is an urgent need to strengthen extension services to support Yak farming. Extension should support farmers in the following aspects:

1. Establishment and promotion of commercial farming at each pocket area of the district
2. Formation of yak user groups @ 10-20 farmers per group
3. Distribution of breeding bull to each of the groups
4. Training yak farmers in modern methods of Yak husbandry

Apart from these, drenching and vaccination programmes for the disease surveillance and monitoring of diseases; formulation and development of policies for economic uplift of the yak herders and establishment of the breeders farm at the regional level (Humla, Jumla, Mustang, and Solukhumbu) are also important.

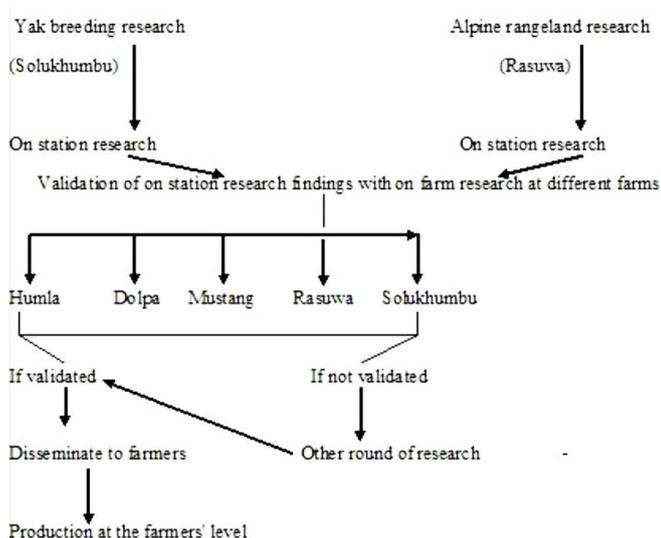


Fig. 1: Recommended research plan for promotion of yak husbandry in Nepal

Sujan Gurung, Yak herder of Kowang who has been rearing yak for 10 years, complained of no support from the government in yak farming. He is following the traditional way of husbandry, which he perceives as partially efficient. Their traditional way of ethno veterinary practices cures most of the diseases with no cost medicines that are collected from their own pastures (Acharya et al, 2014, Acharya and Kaphle 2015). Their indigenous knowledge of husbandry has to be evaluated and strengthened by modern scientific husbandry systems. Sujan perceived the increased incidence of parasitic diseases such as ticks and myiasis in summer pastures and death from extreme cold in winter pastures as compared to the previous year.

Resource constraints for agricultural research

Declining resource allocation for agricultural research and extension is having direct implication on attaining the objective of poverty reduction and food security. The challenge for Nepal Agriculture Research Council (NARC) and Department of Livestock Service (DLS) is to produce as many relevant research outputs to meet the changing needs of Nepalese farmers under increasing resource constraints.

Recommendations

One of the major priorities for development of Yak farming is development of an organized and transparent value chain with all those involved in yak farming, processing and export of yak products and by-products. The following are needed to implement this priority:

- Rangeland and pastureland restoration programmes
- Provision of shelter during the winter months and appropriate feeding, heeding and weeding systems

- Development of niche markets for Yak products both national and internationally
- Well-equipped yak research should be established to develop nucleus herd and replacement stocks along with the other aspects of yak farming
- On farm research on feeding breeding, healthcare, rangeland management and marketing structures in the perspective of Nepalese Himalayas and has to be promoted by strong extension services
- Strong extension services to the farmers for better animal husbandry
- Provision of subsidies to the Yak herders and insurance of Yaks
- Routine vaccination and effective disease management/treatment program.

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**ENGAGING
YOUTH, FARM
WOMEN AND
PRODUCER
ORGANISATIONS
IN EXTENSION**

09

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YOUTH: POTENTIAL TARGET FOR AGRICULTURAL EXTENSION

Agricultural extension services should tap the energy and creativity of rural youth to transform agricultural sector, argues Mahesh Chander.

India is losing more than 2,000 farmers every single day and that since 1991, the overall number of farmers has dropped by 15 million (Sainath, 2013). This has several implications for the future of Indian agriculture and India's food security. Young farmers can play an important role in ensuring food security if they are encouraged to involve in farming and the challenges they face are addressed. Over the past few years, rural youth have been shying away from agriculture and globally there is an increasing interest in finding ways of engaging youth in agriculture (IFAD, 2012; Paisley, 2013).

Box 1: Why Youth in Agriculture?

Young people are three times more likely to be unemployed than adults and more than 75 million youth worldwide are looking for work, according to the UN International Labour Organization (ILO). Due to their limited access to assets (in particular land), markets, finance and education and skills training, youth are often unemployed or work informally – often in unpaid, very low-skilled, insecure and sometimes hazardous jobs (IFAD, 2012). Most of the educated youth find agriculture as an unattractive proposition; especially the way it is practiced traditionally by their parents. The society largely looks down upon farming, as also families of prospective brides do not prefer farming youth.

When specific youth policies do exist in developing countries, they often do not cater for poor rural youth but tend to be biased towards non-poor males living in urban areas. Consequently, there is growing disenchantment among rural youth towards agriculture vocation and they find it much lucrative to migrate to cities to do even menial jobs. Large-scale migration of rural youth from farming to urban areas has caused concern among the agricultural policy makers, since, such a trend, if not checked, is likely to affect agricultural activities in the future. Thus, checking migration and retaining youth in agricultural sector is currently a big challenge.

Generally youth are willing to adopt new ideas and technologies and therefore agricultural extension services should target youth to transform agriculture. The youth could be the ideal catalyst to change the poor image of persons involved in agriculture, especially in the rural communities given their greater possibility to adapt new ideas, concept and technology which are all important to changing the way agriculture is practiced and perceived. Agricultural extension services can effectively address these issues by encouraging and supporting youth participation in agriculture. Improving their capacities and increasing their involvement will also help in changing the

negative perception about farmers as “uneducated and unskilled, physical labourers engaged in a glamourless vocation with extremely low economic returns”.

The population in the age-group of 15-34 in India increased from 353 million in 2001 to 430 million in 2011. More than half of India’s population is under the age of 25, with 65 percent of the population under 35. The rural population is about 70%, and the indications are that the migration of rural youth to cities is around 45% in the country, which is quite alarming. The youth from low income families are disadvantaged due to poor telecommunication connectivity, poor

quality of educational standards coupled with a high dropout rate beyond primary school stage is a major challenge. Such youth have very limited information about or access to various options in relevant skill training and are often also unable to pay the admission fees for such training.

The Government of India has formulated its youth policy (NYP-2012 draft) to respond effectively to the changing conditions of the young people in the 21st century. This national policy aims to put young people at the center of country’s growth and development by recognizing the problems of rural youth to be addressed through suitable interventions.

Box 2: Youth Defined

Youth is often understood to be the period of transition from childhood to adulthood, encompassing processes of sexual maturation and growing social and economic autonomy from parents and carers (Bennell, 2007). There is no universally accepted definition of youth, since the age ranges anywhere from 8 to 40 yrs. On the occasion of the International Youth Year in 1985, the United Nations General Assembly for the first time defined youth as people between the ages of 15 and 24 for its work on youth (with under 15s being classed as ‘children’). For global programming purposes, FAO defines the priority age range for rural youth development from 10 to 25. The World Development Report (2007) expanded the range to include all people between 12 and 24 years.

The Government of India (GOI) officially defines youth as persons between the ages of 13 and 35 years and it also varies depending on the programme. For instance, the National Youth Policy of India considers age group 10 to 34 yrs as youth. The United Nations (UN) and the International Labour Organisation (ILO), however, defined the youth as persons between 15 and 24 years of age for cross country comparison and analysis.

Youth and Extension

Adult Vs Youth: When India became independent in 1947, about 83% of the Indian population was living in rural areas and most of the Indians were illiterate (over 88%). Adult education was the main focus for extension at that time and the agricultural extension programmes, obviously were mostly designed considering this mass scale rural illiteracy, focusing on interventions aimed at improving the functional literacy among rural adults. However, over the years, the literacy rates have gone up and in 2011, it stands at 74.04%. The rural youth are now more literate, aware, educated and many are looking for new livelihood options including migrating to urban areas. Here lies the importance of developing extension programmes for youth, who are the future farmers.

Head of family Vs Youth: Most of the agricultural extension programmes which we implemented since independence in India traditionally targeted the head of families for training and technology transfer. In extension studies too, we consider the head of family, mostly male as the respondent, though in every diffusion-adoption study we found the early adopters to be younger. Youth are more techno-savvy and they could access information & knowledge promoted through

the new ICTs which uses computer, internet and mobiles. Young farmers often have greater capacity for innovation, imagination, initiative and entrepreneurship than older adults and these characteristics should be effectively harnessed by extension services to provide better livelihood opportunities for youth in agriculture.

The investment on youth in agriculture is still minimal, as there are only a few youth focused programs and thus, few clear examples of impact. Nevertheless, the ICAR and departments of Agriculture in many states are recognizing the farmers including the young and innovative ones for the innovative and diversified farming ventures taken up by them. Many young farmers are



taking up high risk high returns agri-ventures like protected agriculture, precision farming, organic agriculture, floriculture, medicinal and aromatic plants cultivation etc, which are mostly avoided by the aging farmers. These new agri-ventures need to be actively supported by the government agencies and financial institutions with skill training, financing and marketing support.

Some of the initiatives presented below have tried to enhance capacities of rural youth and some new initiatives have also been planned.

On-Going Initiatives

Krishi Vigyan Kendra (KVKs): Imparting need based vocational training to farmers, farm women & rural youth to change their knowledge, skill & attitude as a result uplift the standard of living, is the main mandate of the KVKs. KVKs numbering over 631, exist practically in every district of India. A total of 4.86 lakh extension programmes/activities were organized by the KVKs during 2012-13, which attracted the participation of 170.16 lakh farmers and 2.61 lakh extension personnel. These KVKs organized 65,314 training programmes under capacity building with the participation of 18.8 lakh farmers/farm-women, rural youth and extension personnel during 2012-13.

Besides this, 8,486 skill-oriented training courses (both on-campus and off-campus) were organized exclusively for 1.91 rural youth, of which 69,163 (36.17%) were young women. These trainings were organized on various vocations viz. crop production and management, post-harvest technology and value-addition, nursery management, livestock, fisheries, income generation activities, capacity building and group dynamics etc. These KVKs also conducted 5,730 capacity building programmes for 1.42 lakh extension personnel, which included 34,563 (24.35%) women extension personnel (ICAR, 2012-13). KVKs need more resources to organize more number of similar trainings.

Nehru Yuva Kendra Sangathan (NYKS): Established in 1987-88 as an autonomous organization under the Ministry of Youth Affairs and Sports, it has been channelizing the power of youth (13-35 yrs) on the principles of voluntarism, self-help and community participation. Over the years, NYKS has established a network of youth clubs in villages, where Nehru Yuva Kendras (501 at the moment) have been set up, harnessing youth power for development by forming Youth Clubs, which are village level voluntary action groups of youth at the grassroots level to involve them in nation building activities,

working for community development and youth empowerment. However, only a few NYKS are involved in agricultural development. Much more could be achieved if NYKS could focus on skilling rural youth in agricultural activities.

NABARD Farmers' Clubs: NABARD's policy support for Farmers' Club Programme emphasizes on linking technologies with farmers' club members, while facilitating market access through capacity building of members of Farmers' Clubs including leadership training; linkage with technology/markets; Self Help Groups (SHGs)/ Joint Liability Groups (JLGs) formation and forming Federations of Farmers' Clubs/Producers' Groups/ Companies. Under this programme, the NABARD has so far (March 2013) assisted formation of 1.27 lakh farmers' clubs across the country. These clubs are organized by rural branches of banks with the support and financial assistance of NABARD for the mutual benefit of the banks concerned and the village farming community/rural people.

The broad objective of setting up Farmers' Clubs is to achieve prosperity for the farmers with overall agricultural development in its area of operation by facilitating credit counseling, technology counseling and market counseling. The NABARD provide a financial assistance of Rs. 10,000 to each club per annum for three years. The club members are expected to utilize this amount to meet routine expenses for formation, maintenance, and organising awareness meets. Most of these farmers' clubs have a good representation of rural youth.

New Initiatives

ARYA (Attracting and Retaining Youth in Agriculture): The Indian Council of Agricultural Research (ICAR) has constituted a seven-member expert committee, to suggest ways of attracting youth to agriculture. The committee is working on issues such as providing training to farm youth on innovative and sustainable agricultural practices to help make agriculture a profitable venture. This would involve a series of activities, including exploring opportunities in secondary agricultural operations such as value addition of crops and hiring, and servicing of mechanized farm implements. This is going to be an important strategy of the ICAR focused on rural youth mobilization for agricultural transformation during 12th plan (ICAR Reporter (October-December-2012).

National Rural Livelihood Mission (NRLM): NRLM aims at creation of opportunities for both wage employment and skill development for the rural youth, who lack skills in many areas of

agricultural production and processing. National Skill Development Mission and the National Skill Qualification Framework are, thus, aggressively pushing the agenda of skill development to build the capacity of rural youth so that they are meaningfully employed in rural areas itself. Thus, need based experiential skill learning supported by public sector banks/organizations in rural areas is the key to strengthen the Rural Self Employment Training Institutes (RSETIs) being set up in all districts under NRLM to assist such youth (Likhi, 2013). NRLM requires suitable decentralized convergence of skill development programs run by multiple central ministries including the National Skill Development Corporation (NSDC).

Agricultural Skill Council of India (ASCI):

Considering the need for skilling the work force in agricultural sector, the Agricultural Skills Council of India (ASCI) has been recently proposed by National Skill Development Corporation (NSDC), which could be one ideal institution to train rural youth. The ASCI proposes to train, certify and accredit 56.5 million workforce comprising of farmers, wage workers, entrepreneurs and extension workers, over 10 years through its training partners.

ASEAN-India Farmers Exchange: The Ministers of the ASEAN (The Association of South East Nations) concerned over the small number of young farmers' involvement in the agriculture sector, agreed on the importance of promoting innovation and entrepreneurship among young

farmers to achieve more sustainable agriculture development in the region. This initiative is expected to create greater awareness among the young and innovative farmers on the promising career in the agriculture sector. The 1st Exchange Visit was conducted in Malaysia in conjunction with the 2012 ASEAN Farmers' Week and the Malaysian Agriculture, Horticulture and Agro-tourism (MAHA) International in November 2012, followed by the 2nd Exchange Visit conducted in India during December 19-30, 2012, wherein, farmers' delegation from nine ASEAN member states participated.

Mobilizing Young Farmers

Attracting and retaining youth in agriculture is critical for Indian Agriculture. Most of the new innovations (both technical and institutional) require a skilled agricultural work force. For instance, promotion of high value agriculture, precision farming, organic cultivation, Hi-Tech horticulture, micro-propagation, Integrated Pest Disease & Nutrients Management, Post-Harvest Management, development of backward and forward linkages etc. require well trained young farmers with enthusiasm and passion for farming and ability to take risks. The rural youth could be the ideal target for skill training in these new areas of agricultural growth and to do this effectively there is a need to mobilize young farmers. Organised groups of young farmers will be useful for introducing new production technologies and organizing effective input and output markets.

Box 3: Young Farmers' Associations

The enthusiasm of youth for new technologies facilitated the initiation of rural youth programmes in USA, leading to the birth of the 4-H clubs in 1914. These clubs well recognized as an innovative way to introduce new agriculture technologies to rural communities, now have become important partners of the Cooperative Extension Service in USA especially on promotion of youth involvement in agriculture. Similarly, in European Union and in other developed countries, the young Farmers Associations are active since long. For instance, the National Federation of Young Farmers' Clubs (NFYFC) is one of the largest rural youth organisations in the UK, There are 662 Young Farmers' Clubs in England and Wales.

In India, the recently initiated "The Young Farmers Association (YFA), Punjab" is involved in promoting and modernizing agriculture. The YFA, has started a programme called the Future Farmers Foundation (FFF) to encourage the youth to take up farming as a viable and lucrative occupation to increase farm income, while maintaining sustainability in agriculture.

Way Forward

The following measures may help boost involvement of rural youth in farming:

- **Farm Youth Policy:** Formulating a comprehensive policy on farm youth including suitable institutional arrangements for its implementation as recommended by the 12th plan Working Group on Agricultural Extension. If acted upon, it would take care of many of

the concerns and challenges rural youth face in taking up farming.

- **Extension Programme for Youth:** An exclusive nationwide extension programme may be launched to address the issues concerning rural youth to mobilize them towards their greater participation in agricultural production activities. The proposed "Farmer First" programme of the ICAR to be implemented in 12th plan should focus on

young farmers to draw maximum benefit from the programme.

- **Beyond technical skills:** The rural youth may be encouraged, trained and supported for undertaking innovative farming and associated ventures like agri-tourism to supplement income. Sufficient resources should be invested to improve not only technical skill training, and entrepreneurship development but also a range of other skills and competencies, particularly those 'soft' skills such as communication, leadership and business skills. This can be achieved effectively, if youth are mobilized through youth clubs, financially supported under extension reforms.
- **Farm Youth Clubs:** Farm youth may be mobilized as Farm Youth Clubs (FYCs) so that it serves as a platform for rural youth to discuss issues related to farming, farm enterprises and skill development. Inter-country and inter-state youth exchanges may also be organized by these FYCs to share experiences on best practices and learning. ICAR/SAUs, state Departments of Agriculture and the Gram Panchayats may take a lead in this.
- **Use of Media:** Success stories of the innovative young farmers/agripreneurs including those youth who have successfully launched agri-ventures/agri-entrepreneurship in different parts of the country may be highlighted through radio, TV and newspapers to motivate other young farmers. The community radio too can play vital role in encouraging and making young farmers aware about the possibilities in agricultural sector. Extension staff should effectively use the mass media and also the social media to encourage and support rural youth to play meaningful roles in agricultural transformation.

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ENHANCING THE CAPACITIES OF FARM WOMEN

Women do play an important role in crops such as wheat and they really value information if it is provided to them. Surabhi Mittal and Vinod Hariharan explore the gender roles and decision making in wheat farming in India, based on empirical data in this blog.

In India as per the agricultural census, one third of the agricultural cultivators, both farmers and laborers are women. Their participation in agriculture is rapidly increasing because of multiple factors but the prime reason is out-migration (temporary or permanent) of male members of the family in search of alternative avenues for income, thus leaving the women of the household to be fully involved in agriculture.

In the case of wheat cultivation, it is generally perceived that all the operations in wheat production are carried out by men and the women have only a secondary role in it. A wheat survey conducted by CIMMYT in 2014 covering 1022 households in three states of India; Haryana (335), Bihar (357) and Madhya Pradesh (330) however revealed several new insights on their roles in different operations.

To understand women's participation in various activities, we calculated the average number of days women spend on a particular operation in wheat production and also compared it with men's contribution for the same in the household. We found that, women's share of contribution of labour to wheat production is lowest in Haryana and highest in Bihar. In Bihar and Madhya Pradesh, women are mainly engaged in seeding and fertilizer application while in Haryana and Bihar it is weeding and irrigation. Harvesting is an important activity in all the three states where women are actively involved. Overall table below presents the average time spent in wheat production, disaggregated by gender.

Women's Role in Decision Making

Though women spend a substantial amount of time in agriculture, what is her role in decision making? The literature review revealed that women are not playing an important role in decision making, though she is an active participant in farming. This is attributed to her lack of education and low decision making power within the household. (Mehtar, 2014). Studies argue that men remain the key decision makers in crop production and marketing. In the survey we also found that, almost all the decisions related to the use of technology and marketing of produce were primarily taken by men. However, decisions on storage and consumption were found to be mostly taken either by men alone or jointly with women in the household.

In Haryana, a large proportion of households responded that most of the decisions are taken by men. In Bihar and Madhya Pradesh there are evidences of joint decision making but trends vary among different agricultural activities. However,

percent of households that reported women only taking the decisions was negligible. The households that reported such instance were usually women headed households where men have either migrated or where men are too young to take decisions.

Lack of information?

Why women are not taking decisions though they play several roles in farming? Is it the social cultural barriers or inability to make decisions? When we discuss these issues in detail with the farmers in villages (which are mostly men) their usual

response is that women did exactly what men told them to do as women don't get information about agricultural technologies. Because of this reason, they "lack technical know-how" on farming.

Women in farming households, also feels the same. So if we are keen to improve their decision making skills on farming issues, they should also have equal access to information. Studies show that women are usually left out by information providers due to institutionalized socio-cultural barriers, low literacy levels, low involvement in decision making and their hectic daily schedules.

Table 1: Average Time spent (days per acre) by men and women in wheat production

		Haryana (335)	Bihar (357)	Madhya Pradesh (330)
Men	Hired Labour	4.37	10.24	3.14
	Family Labour	6.67	22.44	4.52
	Total	11.04	32.68	7.67
Women	Hired Labour	0.67	14.37	3.92
	Family Labour	7.26	25.92	4.33
	Total	7.93	40.29	8.25

*Note: Figures given in the parenthesis are the number of households in each State.
Source: Authors calculation from CIMMYT wheat value chain survey, 2014.*

M(obile) Solution in Bihar and Haryana

CIMMYT-CCAFS programme initiated the project "M(obile) solution" in Bihar and Haryana (Box 1) to specifically address this issue of information asymmetry. The project has taken special efforts to ensure that it is inclusive - where not only women from women headed households but also women from male headed households were included in information transfer as voice message on climate smart technologies/ practices, weather agro advisories etc.

Initial analysis of the data collected from the pilot study of the project carried out in Bihar and

Haryana has thrown up interesting results. Nearly 1,100 farmers received about 325 messages over a period of 9 months between 2013 and 2014. Feedback was randomly sought from 510 farmers, nearly 16 percent of whom were women. These feedbacks were collected through systematic paper survey that helped to identify the type of information that farmers were using and action taken on then along with quantification of the impact if visible. The feedback also included information about what information farmer do not find useful or is inconsistent. This helped to develop the priority plan and customization according to villages and districts.



Box 1: M(obile) Solution

The project is working with local partners like Kisan Sanchar limited, IKSL, Farmers cooperatives of some of these villages and also the state agricultural department, KVKs and national research institutes and universities to provide climate information and agro advisories to farmers. As part of promoting climate-smart approach to farming, the couple are subscribed to M(obile) Solution.

It offers an alternative model of information dissemination that incorporates farmers' feedback by creating an information loop that not only pushes information, as traditional climate information services do, but also pulls back information from farmers. Farmers are delivered information in form of voice messages on their mobile phones on weather, climate smart technologies and practices, seed, nutrient management, livestock management, pest management etc.

Farmers have access to helpline numbers to contact back for detailed or follow-up questions. These queries are also used as feedback to develop the agro-advisory messages. The field staff of the project and partner organizations also interacts with the farmers from time to time to understand the usability of advisories, action taken and impact. Farmer to farmer messages are also transmitted, if benefits or threats faced by some farmers need to be passed on to other farmers in that geographical area. All these efforts helped to create a feedback loop for more timely, usable and actionable agro advisories.

The most interesting observations from the study are as follows:

Need for Information: During the initial survey on information needs, women farmers responded that they are interested in messages linked with pest management and weather information only. But when they started receiving these information on their mobile phones, they showed increasing interest to receive information on related technologies and practices and also information on livestock management. This means the demand for information keeps evolving and one has to continuously assess demand to provide the needed information.

Use of information: Within the project team, there were apprehensions initially that that women might not value this information as they are not the decision makers. But actually what we observed was that women do value these information. This is clearly revealed from the equitable listening rate to the messages that women farmers have in two contrasting states. In the study we had around 13.75% women farmers of which almost 70 percent were listening to the messages that they received on their mobile phones as voice messages. Their listening rate was on average 44 seconds per message almost equivalent to their male counterparts. They were listening to almost 88.9 percent of all the messages delivered which made them informed and aware about climate smart practices, weather information, seed information and pest management.

Gains from information: Many women farmers, particularly in the study villages in Karnal (Haryana) though not directly engaged in farming were spending the same amount of time as male farmers in listening to the full voice message.

This is a good indicator of their interest in the information provided, although it is yet to be seen, if this translates into greater participation and decision-making in agriculture. The feedback received from female farmers clearly revealed that they appreciated the awareness they got on climate-smart agriculture practices and issues related to climate change. Several of them noted that they often shared the information with other women who were not part of the project.

Overall benefits: With the dissemination of information, it is observed that farmers have become more aware about these technologies and have started recognizing the value of information on weather delivered to them. They shared anecdotal evidences as to how precise and timely weather based agro-advisories have helped them to take informed decision about use of inputs during the sowing season based on which they have saved the irrigation and the cost on pesticides and weedicides. Women farmers have become more aware about climate smart technologies and they feel empowered with access to information. Moreover, where ever possible they were taking action as well.

Lessons for Extension

- It is imperative that extension services should target the entire family and not just male farmers.
- To reach women, it is important to understand how information services can overcome existing barriers, keeping in mind the existing social and cultural context
- Voice messages in local language through mobile phones offers new opportunities to reach women farmers and women in male

headed farming households

- Provision of information on all aspects related to agriculture (not merely on operations

which they are currently involved with) can potentially increase women's ability to do farming better and also enhances their decision making capacities.

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LEVERAGING EXTENSION SERVICES FOR ACHIEVING GENDER- AND NUTRITION-SENSITIVE AGRICULTURE

Enhancing women's skill and knowledge through a targeted extension system is a prerequisite for achieving the goal of gender- and nutrition-sensitive agriculture. However, efforts in this direction are few. Surabhi Mittal explores these issues in this blog.

Empowering and educating women has positive implications for children's health and nutritional status, which in turn influences the demographic dividend, and that is what India aims to harness in the medium to long run. Many experts consider women to be at the nexus of agriculture, health and nutrition, and thus gender and nutrition are increasingly being viewed as priority areas for research and extension.

Women often hold dual roles as consumers and food managers at home, influencing intra-household management of both food and nutrition security (Box 1), as recognized by India's National Food Security Act (NFSA). They also play a substantial role as producers, and contribute a significant share to farm labor all over the world. It is important to find ways to mainstream gender in nutrition into the field of agriculture, so as to create gender and nutrition linkages in the food systems.

Thus, in this blog we present a discussion around how women's involvement in decision-making and time-use in agriculture influences the nutritional status of the household. We also discuss how extension can play an important role in women's empowerment and behavior change for improved nutritional outcomes.

For improved Nutritional outcomes

Even if women are playing an active role in agriculture, it is often found that their involvement in the decision-making process on various agricultural activities is very limited. It is often cited that a lack of access to information sources, new technology, credit facilities and proper training limits the decision-making capacity of women (Mittal 2016¹). These factors also have an impact on aspects related to food and nutritional security.

Women's role is also important in meeting the cultural needs of food consumption and preparation within the household. Empirical evidence shows that household consumption patterns, and mainly that of women in the household, change during times of crisis and uncertainty. Women tend to prioritize the food intake of the elderly and children before themselves during food shortages caused by factors like variations in household income and seasonal availability of food products. Therefore, it is important to improve the affordability of nutritious foods by ensuring their year-round availability, and by limiting the impacts that price

¹Mittal S.2016. Role of mobile phone enabled climate information services in gender inclusive agriculture. *Gender, Technology and Development* 20(2): 1-18. doi: 10.1177/0971852416639772

shocks can have on household incomes.

Increasing the quantity of food available at the household level does not always guarantee improvement in nutritional status, since the latter depends as much on the diversity and quality of food as on its availability for consumption and the intra-household distribution of that food. For this reason, enhancing women's understanding of nutrition and why it is important to have

a nutritious and diversified diet, as well as encouraging behavioral change towards self-consumption are critical to achieving positive nutritional outcomes. Reaching out to women, however, warrants a differentiated communication strategy on nutrition for different age cohorts (such as for school going girls, adolescent girls, young women attending colleges and universities, young women in the reproductive age cohort, and other older women).

Box 1: Pathways of effect on nutrition

Studies have shown a growing trend of feminization in Indian agriculture (Satyavathi et al. 2010²; Rao 2006³, Headey et al. 2011⁴). With increased feminization of agriculture, it is often seen that consumption habits change as time available for the household reduces and traditional ways of cooking and eating habits adapt to the woman's formal work lifestyle. The changing role of women in agriculture, and how they make decisions about their time and expenditure choices have direct implications on agricultural sub-systems – ranging from production to anthropometric outcomes. Income, education and food expenditure are some of the direct routes through which health outcomes can be improved.

Moreover, it is important to recognize that the combined provision of children's health services, nutrition education for mothers, and women's empowerment interventions has been shown to lead to heightened impact on child stunting. Everyday logistics, such as childcare services for working mothers can also have real implications on gender and nutrition outcomes, and therefore warrant special consideration (Gillespie and Mason 1991⁵). We need to have structural policies that support working women, such as having proper daycare facilities at work locations; breaking down gendered roles in the household and at work, is important for better child nutritional status in the case of women who work outside the home.

The amount of time that women devote to labor-intensive agricultural activities and work outside the home can have implications for their own nutritional status as well as the nutritional status of their children and family members (Smith and Haddad 2015⁶). Household chores, farm and non-farm activities constitute approximately half of women's total time use. The more time women spend in agricultural work and domestic activities, the less hours they have available to spend on personal and family care (Padmaja et al.⁷). It is in this context that enhancing women's access to low-cost mechanized equipment and tools is essential for reducing their drudgery and overall time spent in the field.

Increased labor market participation by women also manifest income effects that have a positive implication on nutritional security. Higher incomes help in improving the household food security status, but better awareness and education can bring about nutritional security, because women can then buy cautiously as well as choose a diverse food basket for family consumption.

Leveraging Extension Services in Empowering Women and Enhancing Nutrition

Access to income and equal employment opportunities for women enhance the household's access to food and nutrition. A fundamental step forward in that direction involves removing

the constraints faced by women with regard to their access to information, dissemination, and extension facilities. Information asymmetries tend to limit the ability of women farmers to harness the potential of agriculture, as they often do not have access to the appropriate technological know-how and inputs, as well as information on weather patterns and best agronomic practices.

²Satyavathi CT, Bharadwaj C and Brahmanand PS. 2010. Role of farm women in agriculture: Lessons learned. *Gender, Technology, and Development*, 14(3): 441–9.

³Rao EK. 2006. Role of women in agriculture: A micro level study. *Journal of Global Economy* 2(2), 109–123.

⁴Headey D, Chiu AandKadiyala S. 2011. Agriculture's role in the Indian enigma- Help or hindrance to the under nutrition crisis? (Pp. 1–38). IFPRI: Washington DC. Retrieved from <http://www.ifpri.org/sites/default/files/publications/ifpridp01085.pdf>

⁵Gillespie S and Mason J. 1991. Nutrition relevant actions: some experiences from the eighties and lessons for the nineties ACC/SCN State-of-the-Art Series. Nutrition Policy Discussion Paper no. 10. Geneva: United Nations.

⁶Smith LC and Haddad L. 2015. Reducing child under nutrition: Past drivers and priorities for the post-MDG era. *World Development* 68:180–204.

⁷https://www.researchgate.net/profile/Padmaja_Ravula/publication/305657476_Gendered_time-use_patterns_and_effects_on_nutritional_status_of_women_and_children_in_the_semi-arid_tropics_micro-level_evidence_from_selected_villages_of_India/links/57987aa308aed51475e83d60.pdf

In this context, the roles of extension services become significant. Extension agents often fail to reach out to women farmers due to structural impediments such as staffing and funding shortages that make it difficult to reach resource-poor, remote farms (as women's barriers to credit and land titles usually leave them with marginal lands). Existing cultural and social barriers also discourage women farmers from interacting with male extension workers. Enhancing women's skills and knowledge through extension systems is a prerequisite for increasing their decision-making capacity and income, which lead to better nutritional outcomes.

Within agriculture extension services, agri-nutrition-related education and communication have a very critical and important role to play if we want food security to translate into nutritional security and gender empowerment. Extension has a facilitating role in multi-sectoral convergence for leveraging agriculture with regard to nutritional security and gender empowerment. Information and Communication Technology (ICT), together with traditional media, offer a platform for promoting extension for agri-nutrition. Although extension services in India have started integrating modern ICT tools to disseminate information, yet gender bias exists due to poor access of women to these resources.

Nutrition-sensitive information is still not a mandate for the extension system of India. It is necessary to deviate from just the conventional information about staple crops and agronomic practices and include information that incorporates a diversified production system. For example, to enhance household nutrition, it is important to promote labor-saving technologies and a variety of allied activities, such as kitchen gardening, wadi (orchard), livestock, poultry, and fisheries. This can help in creating gender-driven diversification of production activities.

Studies,^{8,9} suggest that there is need to update the curriculum of extension agents so as to integrate such information into their training. The current curriculums taught to extension agents in the state agricultural universities do not integrate the agriculture and nutrition linkages.

Nutrition-related extension is done through the Ministry of Women and Development and they focus largely on women's health aspects. The

agricultural extension system needs to be linked more closely with the health extension services so as to create extension material that is relevant for nutritional improvement in the agricultural sector.

Self-Help Groups (SHGs) have been a successful platform for initiating behavioral change – by educating and empowering women to increase their incomes and economic opportunities. These groups emerge as potential change agents for creating an enabling environment that can enhance women farmers' access to technology and related inputs. SHGs can be leveraged and institutionalized to enhance capacity and employment opportunities in agriculture; examples of such are 'Kudumbashree' in Kerala, and 'Jeevika' in Bihar. Extension can play an important role in developing entrepreneurship among women. There is a need for transforming and graduating from micro-credit to micro-entrepreneurship, taking advantages of the SHG network and using it as platforms for extension education.

Way Forward

There is an obvious and glaring disconnect between agriculture and nutritional security. Bridging the gaps between agriculture, nutrition, and gender empowerment will make a major contribution towards achieving the goal of freedom from malnutrition. Women play an important role in ensuring both food security and nutritional security in the family as they are producers of food and also because they play an important role in food management. Empowering them to make informed decisions and recognizing their role in this process can help solve some of the challenges related to nutritional security. There is a need to invest in the development and distribution of time-saving farm technologies to reduce women's drudgery as this will help to improve labor productivity and limit women's time in the field. This will help improve her and her family's nutrition by allowing them to spend more time on activities like child care and food preparation.

There is need to ensure that extension services and extension tools and materials are gender and nutrition inclusive. Enhancing women's skill and knowledge through a targeted extension system is a prerequisite for achieving the goal of improved decision making in the context of

⁸<https://openknowledge.worldbank.org/bitstream/handle/10986/23767/Improved0nutri0l0lessons0from0India.pdf?sequence=1&isAllowed=y>

⁹Kachelriess-Matthess S, Matthess A, Stancher A, Asare B and Afoakwa EO. 2016. Promoting nutrition-sensitive Extension Advisory Services. Note 25. GFRAS Good Practice Notes for Extension and Advisory Services. Lausanne, Switzerland: GFRAS. <http://www.gfras.org/en/knowledge/gfras-publications/category/tag.html?tagid=67>

increased feminization of agriculture. Farmer-to-Farmer extension programs can be more focused on engaging women lead farmers, who can then

reach out to other women farmers.



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PRODUCER ORGANISATIONS AND EXTENSION: PERFORMANCE AND SUSTAINABILITY

Producer Organisations often need continuous hand holding support to emerge as viable and effective organizations and quite often this kind of support is not available, argues Utpal Barman.

Producer organisations (POs) are widely heralded as leading contributors to poverty reduction and achievement of food security (FAO, 2010). POs can successfully strengthen the economic position of their members by providing agricultural inputs, credit, processing and marketing services (Narayanan and Gulati, 2002), In India, the Central Government has identified farmer producer organisation as the most appropriate institutional form around which to mobilize farmers and build their capacity to collectively leverage their production and marketing strength (GoI, 2013). While several POs are doing well, a large number of POs struggle to continue their activities after the first few years of its formation.

Context

The economy of Assam state, India is predominantly based on agriculture. Its agriculture is characterised by large number of marginal and small farmers, fragmented land holdings, low level of adoption of technologies, low productivity, dependency on monsoon rainfall, etc. These hinder improvement of agriculture. To address these issues, the Government of Assam decided to mobilize farmers in the form of Field Management Committee (*Pathar Parichalana Samitee* in Assamese).

Box 1: FMCs

Field Management Committee (FMC) is a producer organization meant for effective management of agriculture in a specific crop field. It is formed in a contiguous field where large numbers of farmers of a village or of a locality have their land or cultivation. A farmer can be member of more than one FMC, but he/she will be eligible to be a member of only one executive body. It came into operation by a resolution on settlement of agricultural land and reorganisation by the Government of Assam in 1951. FMC is a non-government organisation (NGO) registered by the District Agricultural Officer, Department of Agriculture, Assam. The Agricultural Development Officer (ADO) and Village Level Extension Worker (VLEW) of the concerned area are the technical advisers of the FMC.

Considering its numbers, membership and nature of activities, the FMC is a giant and unique organisation in the country. It earned the recognition as a village intermediary and a project delivery instrument. Actually, the FMC is a bold step in reaching out to the farmers (target groups). By 2011, the Department of Agriculture, Government of Assam has organized about 1.8 million farmers in 25,938 FMCs (Govt. of Assam, 2012).

Box 2: Objectives of FMC

The basic objective of the FMC is to organise farmers of a contiguous field to bring about development of agriculture and allied activities through collective planning and implementation of programmes. Its specific objectives include:

- Preservations of seeds and seedlings for emergency situation and to take up suitable cropping programmes in areas affected by flood and other natural calamities.
- To develop field by taking up soil conservation & land development wherever necessary and to adopt irrigation and water management measures for higher production.
- To take up crop cultivation, plant protection and post harvest measures collectively by the members of the FMC and popularise use of improved agricultural inputs, organise seed production programme.
- Continuous programme in the field by adopting crop rotation system to raise 2 to 3 crops a year.
- Arrange to protect crop from stray cattle to venture in fodder cultivation.
- To open sales counter for agricultural inputs and to have a common stock of agricultural machineries and implements for use.
- To arrange to get the farmers and farm women trained on modern methods of agriculture through both institutional and peripatetic training.
- To train educated unemployed youth on operation and maintenance of agricultural machineries etc.
- To provide suitable warehouse facilities for the produce.
- To maintain liaison with the Department of Agriculture, Agricultural Universities, Research Stations and other Department.
- To keep basic information/statistics of the FMC and to review its progress.
- To enthuse the members to take up other agricultural activities like animal husbandry including poultry, piggery, duckery, fisheries, beekeeping, social forestry, sericulture, weaving etc.

The World Bank aided project ARIASP (Assam Rural Infrastructure and Agricultural Services Project) recognized and used the FMC platform to implement several projects. The financial institution like National Bank for Agricultural and Rural Development (NABARD) and North Eastern Development.

Finance Institution (NEDFi) have treated it as the vehicle for grass root level project implementation. Council for Advancement of Peoples' Action and Rural Technology (CAPART), Indian Tea Board, Regional Rural Bank and others have also effectively collaborated with the FMC in various schemes (Barah, 2006).

Performance

Through FMC, farmers have benefitted by way of access to new and improved machinery (power tillers and other implements for farm mechanization), collective labour sharing and development of marketing facility for agricultural produce. There has been increase in cropping intensity and productivity in different areas and many farmers adopted modern technologies and diversified their farming activities.

However, the history of FMCs indicates that sustainability is an issue from very beginning. During the period 1951-63, over 10,000 FMCs were formed. These FMCs functioned up to the expectations only for a short period. FMCs were

reorganised during the 1970s for the benefit of farmers. However, this time also FMCs did not perform well after the initial years.

In 2001-02, a capacity building programme for FMCs was under taken by ARIASP and the Department of Agriculture, Assam with the help of National Institute of Agricultural Extension Management (MANAGE), Hyderabad and Extension Education Institute (EEI), AAU, Jorhat. The project covered different aspects of organisational development and trained the FMC members. Significant improvements were recorded on the status of FMC in terms of 17 parameters in the initial years, but again with time the performance diminished. The parameters were leadership, group action, organizational aspects, records and accounts, repair and maintenance of implements, arranging shallow tube wells and other Government Subsidies, capital formation, communication between executive committee and general members, adoption of modern technology, service to members by executive committee, solving stray cattle problem, social welfare actions, SHG formation, registration of FMC, establishment of office, community marketing etc (Neog, 2004).

However, by 2012, almost 95 per cent FMCs were defunct. Therefore, it is important to analyze the reasons for their lack of sustainability. Though FMCs are old and big, there are only very few studies that have explored this topic. Based on reviews of official documents and research studies;

interactions with extension personnel, members and non-members of FMCs and through my own observations, I have arrived at the following conclusions.

Reason of Poor Sustainability of FMC

From field based to village based

Though FMC is a field-based producer organisation, in practice it has evolved as a village-based organisation of a particular group meant for agricultural development. In reality all cultivators of the selected field are not the members of the FMC. For instance, some of the cultivators are staying in different villages. Though they are eligible to become members of FMC (in the village they are cultivating) the members of that village who were in majority didn't allow them to become members. Therefore the land remains fragmented and the FMC didn't receive cooperation from these potential members. In such situations, the FMC could not take collective decision on proper use of the field. As a result aspects related to farm mechanisation, intensification, irrigation, land development, soil conservation, collective purchase of inputs, storage of farm produce etc., remained untouched. Only few FMCs took collective action for preservation of seeds and/or seedlings to take up suitable cropping programmes in area affected by flood and other natural calamities. Because of these factors, most of the small and marginal farmers having fragmented land lost faith in the FMC and slowly withdrew from the FMCs.

Demarcating the field

Though the field of FMC should be properly earmarked (not necessarily a fenced one), in practice the FMCs did not demarcate the field from fields of other farmers. People could not recognise the field as a field of a particular FMC. Most of the areas of Assam are still under mono cropping and winter paddy is the main crop. Therefore, after harvesting of winter crop generally farmers practiced open grazing system as there is a shortage of fodder for livestock. Under such conditions, the interested farmers cannot raise second crop. The cost of fencing is also a problem. Therefore, the cropping intensity is also low. However, the farmers can solve this type of problem by cultivating the second crop collectively. Even they can bear the cost of fencing and alternatively cultivate fodder crops. Inability to demarcate the area of operation of the FMC has been another reason for poor sustainability of the FMCs.

Member contribution

The members of the FMC are expected to deposit a monthly contribution as fixed by the FMC.

However, in most cases the members did not deposit the contribution regularly. Nevertheless, whenever there is some subsidy-oriented schemes, the members quickly deposited the required amount to get the subsidised inputs. In all other times, they remained inactive as members of the FMC.

In such situations, the active members also could not do much through the FMC. Hardly any FMC in practice gave due importance to farm women though they are also equally involved in agricultural activities. Likewise little or no effort was given to organise training for farmers, farmwomen or unemployed rural youth.

Distribution of Inputs without Support and Services

Most of the FMC received agricultural machineries, tractor, power tillers, pump set etc. from the Department of Agriculture. However, in the villages mechanics to repair these machines were often not available. Though FMC members were interested to contribute to procure subsidised machineries, they were not interested to contribute for its maintenance. Moreover, the FMCs in most cases did not formulate any mechanism to fund these initiatives. In some other cases, some interested farmers maintained some machineries at their own cost and they kept it with them for use. Finally due to inactiveness of the members and/or executive body of the FMC, most of these machineries are not traceable now.

Governance of FMC

Though the executive body of FMC should be formed at regular intervals, the FMCs in most cases is managed by the same group of people. The executive body meeting of FMCs were also not held regularly. Members in general are not concerned as very few attend these meetings. In practice, FMC president/secretary generally convened a meeting when some government schemes are offered to them. In the meeting, they discussed mainly that issue only. The members generally did not review the progress of implementation of the decisions taken by the FMC. From the very beginning, most of the FMCs heavily depended on the staff of the Department of Agriculture, who could not help them or solve their problem.

Forming Groups without Mobilization

FMC emphasises the role of farmers and their active participation in programme planning and resource allocation. It assumes that farmers will be able to understand their situation and to act on it. However, success of this group approach depends on sufficient mobilisation at the grassroots level.

However, most of the groups were formed by extension staff (Agricultural Development Officer/ Village Level Extension Workers) without investing sufficient time and effort in mobilising the farmers. As a result, farmers did not realise the importance of FMC and they did not involve actively in FMC activities.

In practice, the FMCs faced several challenges related to leadership, group dynamics, organisational development, conflict management, planning, decision-making, accounting, record keeping, resource management etc. However, there was little or no regular programme on capacity building of FMC members on these aspects. The extension personnel were also not well equipped on such topics to help the FMC members. They mainly acted, as technical advisers on agriculture. These types of unresolved issues finally affected the sustainability of FMCs.

Lack of Capacities within Extension

Extension personnel should act as facilitators of FMC and not as technical experts. As a facilitator, extension personnel should ensure that the FMC work as a constructive, collaborative, creative and cohesive unit. As facilitator, they should have been more concerned with helping farmers to gain confidence, to organise them and to get them involved in agricultural development initiatives. To perform these roles, the extension personnel should act as an enabler, supporter, team builder, problem solver, conflict manager, motivator, counsellor etc. These roles are completely different from the role of an expert. However, no effort was made to develop their skills among extension staff and therefore, they couldn't perform these roles effectively.

Lack of Clarity on Registration and Access to Funds

As per rule, the FMC, though an NGO, is a producer organisation formed under Department of Agriculture, Government of Assam. District

Agriculture Office registers the FMCs. After the registration, the FMC become illegible to get various services of the Department of Agriculture and other government organisations. It also acted as an extension wing of the Department of Agriculture. However, in the mean time a state level NGO named as *Sodou Asom Pathar Parichalana Samity* (SAPPS) was formed in 1993. It also has similar types of objectives to form FMC just like the Department of Agriculture. However, they are not working in collaboration with the Department of Agriculture and there are no fixed sources of funding for running their activities. It has its own rules and regulations. Initially, the SAPPS showed some progress. To get the benefits from SAPPS, a FMC must register with it. However, these registrations have no value to the Department of Agriculture because they provide services to those FMCs, which are registered by the District Agriculture Office. The parallel activity created confusion among farmers and they registered their organization with both agencies and this dual registration created problems. Currently SAPPS lack sufficient funds to support FMCs formed all over the state. The Department of Agriculture consider the FMCs formed by them only as an extension wing of the Department of Agriculture have difficulty in recognizing FMCs formed by others and this has created confusion among farmers resulting in weakening of the FMCs.

Way Forward

The Government of Assam has started reorganization of FMCs once again. Hopefully they will analyze the reasons for the poor performance of FMCs so far. Capacity building of extension personnel to play the role of facilitator should be of high priority. Extension personnel should follow proper steps to form FMC. They should analyse the past record of earlier FMCs as many of those ex-members will come to form FMCs again. The Agricultural Department should not give target



to extension personnel to form FMCs. Proper mechanism should be established to monitor the performance of FMCs on regular basis. Emphasis should be given for convergence of FMCs at different levels. If needed an in-depth analysis of services provided by SAPPS and the Department

of Agriculture to FMCs should be undertaken. For sustainability of group efforts, there should be proper planning of FMC activities. The extension personnel should involve the members to prepare their activity calendar. This will help the members to stick to the activities of FMCs.

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PRODUCER ORGANIZATIONS (POs) AND EXTENSION: THE ROAD AHEAD

Farmers are organizing their own support systems including extension delivery through forming their own organizations to access information, advice and support on production and marketing. It is time to recognize the contributions of producer organizations and enhance their capacities to provide a much wider range of services to producers, argues, Mahesh Chander.

Producer Organizations (POs) are successfully strengthening the economic position of their members by providing agricultural inputs, credit, processing and marketing services (Narayanan and Gulati, 2002). Organizing farmers into specific producer groups also improves the effectiveness and efficiency of agricultural extension systems in supplying relevant commodity or product-specific information and training directly to farmer groups who are producing particular crops or products (Swanson, 2008). Globally, POs are also increasingly recognized as an important actor in the Agricultural Innovation System (Heemskerk & Wennink, 2005; Shapland & Kampen, 2006; Rondot and Collion, 2005; FAO, 2010).

Producer Organisations in India

In India too, organizing producers, especially the small and marginal farmers is considered as one of the most effective pathways to address some of the most important challenges in agriculture. For instance, during the 12th Plan period (2012-2017), the Small Farmers' Agribusiness Consortium (SFAC) aims to further promote POs (GOI, 2013). The Government hopes that this will foster technology penetration, improve productivity, enable improved access to inputs and services and increase farmer incomes.

Similarly, the Ministry of Agriculture has identified farmer POs registered under the special provisions of the Companies Act, 1956 as the most appropriate institutional form around which to mobilize farmers and build their capacity to collectively enhance their production and marketing strengths. It also involves linking POs directly to market opportunities to enable integration in the agriculture value chain and create direct producer consumer supply chains. These developments have important implications for extension.

Basically POs cater to the producers' interests and their varied needs and organize activities that help strengthening the capacities of their members to deal with production and marketing challenges. POs could be a farmer associations around a commodity (eg: Maharashtra State Grapes Grower Association) or around an activity like water management (eg: *Pani Panchayats*); a producer co-operatives (eg: milk cooperatives promoted by the National Dairy Development Board); or a producer company (eg: Vanilla India Producer Company Limited (VANILCO)). The major types of producer organizations active in India are discussed hereunder:

The Grower Associations

Many commodity oriented (fruits, vegetables, sugarcane, banana, etc.,) grower societies are

functional in India, which help farmer members in getting the latest information and technology. For instance, the Maharashtra State Grapes Grower Association maintain regular contacts with research centres working on grapes to access information and technologies related to grape farming and organizes educational programmes for its member farmers. They also support

grape growers in developing integrated plant protection schedule against pest and diseases and implementing measures to reduce pesticide residues to facilitate exports. The Association organizes a number of seminars and conventions to educate growers and engage in policy advocacy on behalf of growers and also for strengthening the grape sector.

Box 1: Producer Organisations

Farmers' and rural producers' organizations refer to independent, non-governmental, membership-based rural organizations of part or fulltime self-employed smallholders and family farmers, pastoralists, artisanal fishers, landless people, women, small entrepreneurs and indigenous people. They are based on principles of non-discrimination, provide a range of services for their members, including market opportunities and empower all their members, women, men and youth. The POs are grounded on the principle of collective action among potential beneficiaries. Collective action occurs when individuals voluntarily cooperate as a group and coordinate their behavior in solving a common problem. These can assume a variety of forms, from small, grassroots associations to unions, federations and chambers of agriculture. They range from formal groups covered by national legislation, such as cooperatives and national farmers unions, to looser self-help groupings and associations (FAO, 2007).

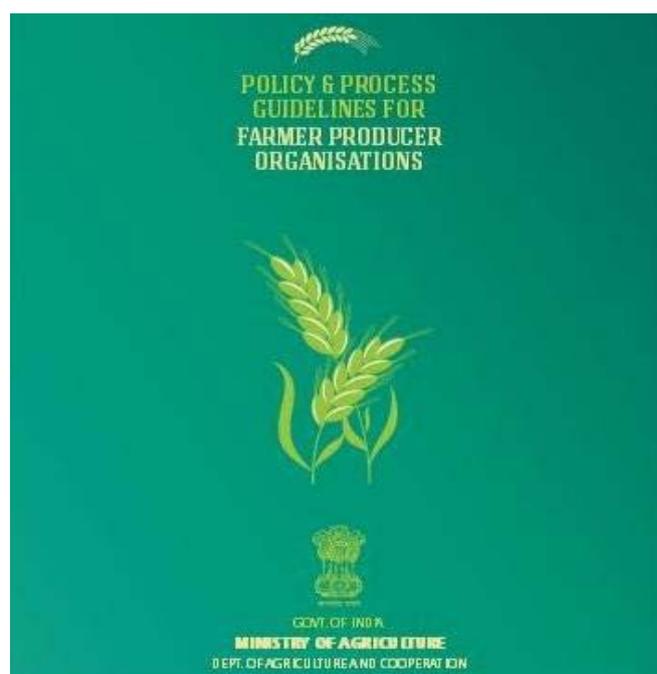
The User Associations

User groups are common in the area of participatory irrigation management, watershed management and community forest management. For instance, in Odisha, the Orissa Farmers Management Irrigation Act provides for the establishment of farmers organizations in all the irrigation systems, for their operation and maintenance. The Act enables farmers' participation, not only at a lower level but also in a restricted manner at the main system level. The farmers' collective action is enabled through the formation of *Pani Panchayats* whose office bearers are elected through a democratic process. The Act also provides for the autonomous management of the irrigation system by producer organizations in their respective areas for both the maintenance of the system and for the distribution of water. In some state, the *Pani Panchayats* could orient farmers to adopt the best water management practices; understand the collective management systems in crop planning, water distribution and conflict resolution and develop an action plan for strengthening learning.

The Farmer Cooperatives

The cooperatives especially in the dairy sector have organized an effective extension delivery system in India. Extension activities are undertaken at the level of the Dairy Cooperative Societies and the milk unions to create awareness about improved animal husbandry practices. For instance, the Anand Milk Cooperative Union (AMUL) in Gujarat organizes field demonstrations and extension camps to promote better feeding practices, fodder development and clean milk production practices

among milk producers. Dairy cooperatives exist in many states and are owned by about 15 million farmer members, out of which over 4 million are women members.



The Farmer Interest Groups (FIGs)

A Farmer Interest Group (FIG) is a self managed, independent group of farmers with a shared goal and interest. Commodity oriented Farmer Interest Groups (FIGs) are promoted by the Agriculture Technology Management Agency (ATMA) at block/village level to make the technology generation/dissemination farmer-driven and farmer-accountable. These Village level FIGs are ultimately federated at block/district level and they are represented in Farmer Advisory Committee and ATMA General Body (GB).

The Farmers' Clubs

The NABARD has assisted formation of 54,805 farmers' clubs across the country. These clubs are organised by rural branches of banks with the support and financial assistance of NABARD for the mutual benefit of the banks concerned and the village farming community/rural people. The broad objective of setting up Farmers' Clubs is to achieve prosperity for the farmers with overall agricultural development in its area of operation by facilitating credit counseling, technology counseling and market counseling. The NABARD provide a financial assistance of Rs.10,000 to each club per annum for three years. The club members were expected to utilise this amount to meet routine expenses for formation, maintenance, and organising awareness meets.

The Producer Companies

Producer company means a body of corporates having objects or activities specified in section 581B of companies Act, 1956 and registered as producer company under this Act [S.581A(1)]. The concept of Producer Companies was introduced in India in the year 2002, and about 500 Producer Companies are registered till date. To support POs in forming Producer Companies, the NABARD (National Bank for Agricultural and Rural Development) has also established Producers' Organization Development Fund (PODF). This fund is used for promoting organizational and skill building exercises, organizing meetings of the experts, organizing for tie-ups with the various agricultural universities, etc. Indian Organic Farmers Producer Company Limited, Vanilla India Producer Company Limited, Rangсутra Craft Duniya Producer Company Limited, Masuta Producer Company Limited, and ESAF Swasraya Producer Company Limited are some of the successful producer companies established so far in India.

The POs discussed here are only a few illustrative ones which have role in extension services delivery to farming communities. All POs, however, may not be equally effective or focused on extension delivery. Other than the POs discussed above, there are other farmer organizations that lobby for government support like input subsidies, price support and other favourable policies in support of farmers. For instance, *Shetakari Sanghatana* (a non political union of Farmers) works towards freedom of access to markets and technology. Similarly, the *Bharatiya Kisan Union* negotiates for fair deals to farmers on land acquisitions and reduction in toll tax. Such organizations have deep influence on the

farmers' they represent and can potentially play an important role in technology promotion and market development.

Way Forward

- Experience shows that POs represent the interest of their members and have the potential to articulate their need for agricultural services. Extension organizations should therefore collaborate with them in their activities. Partnering with POs would improve knowledge promotion, adaptation and its eventual use. It also helps extension to assess better the priorities of farmers. Many POs need support to develop their capacities to serve farmers better especially in promoting adoption of new technologies, stimulate learning and develop entrepreneurial skills.
- Extension should also help in promoting producer organizations. POs need to be built on a strong foundation of producer initiative and ownership and they need long term efforts and provision of hand holding support. The public extension system traditionally has very limited skills in this area and therefore it should partner with others (mainly NGOs who are often skilled in social mobilization and market development) in supporting their development and improving their links to markets.
- Extension should develop its own capacities related to development of producer organizations and these include capacities related to organising, sustaining and federating POs to take up new extension and advisory service tasks in agriculture and linking them to new source of knowledge and services); facilitation (facilitating discussions, enabling consensus building and joint action, accompanying multi-stakeholder processes); ,mediating in conflicts (by improving dialogue and helping to reach agreement); negotiating (helping to reach a satisfactory compromise or agreement between individuals or groups and developing negotiating capacity among other stakeholders); brokering (creating many-to-many relationships among the wide range of actors) etc.

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INFLUENCING POLICIES

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IT IS TIME TO INFLUENCE THE 13TH PLAN

Planning is a massive and time consuming exercise in India, involving multi-agency and multi-stake holder consultations. Changing policies after formulation is not easy and there is no platform or forum for extensive deliberations, after the plan is finalised. All those interested in influencing the policy framework should therefore use the current plan document as the base paper for conferences, workshops, consultations, research and analysis and should start influencing the next plan. Policy discourses conducted without taking note of the Plan document often fails to yield results, argues Suresh Kumar.

The Five Year Plans form the basis of development planning indicating strategy, policy and programs of every sector including agriculture. Each plan is based upon recommendations of various subject matter working groups and sub-groups (Box 1). These groups and sub-groups comprise representatives of various ministries, public agencies, experts, activists and stakeholders. Every sector also has a steering committee to consider the recommendations of various working groups. Working group recommendations are formulated after detailed deliberations at various levels. For the 12th Five Year Plan (2012-17) preparations, 11 working groups were constituted for agricultural sector, including one for agricultural extension (Box 1).

Box 1: Planning for Agricultural Extension for the 12th Plan

The Planning Commission (Government of India) constituted a Working Group on "Agricultural Extension for Agriculture and Allied sectors" for the Twelfth Five Year Plan in March 2011 with 27 members representing different organisations and interests related to extension. The group was tasked to review the effectiveness of the on-going extension services including the recent innovations in it, and to recommend a more responsive and accountable extension mechanism to the farmers.

The working group constituted 9 sub-groups (comprising 8-11 members) to deal with different themes related to extension in May 2011. The working group and the sub-groups held extensive consultations to come up with specific recommendations. These were consolidated by the Working Group in its report submitted in November 2011.

The recommendations of the Working Group are grouped into 12 thematic areas: 1. Technology Solutions and Innovations; 2. Extension Policy and Systems; 3. Convergence, Programme Delivery, Governance and Innovations; 4. Manpower Planning, HRD and Accreditation; 5. Leveraging ICT, Mass media and e-Governance; 6. Partnership for Agri-preneurship and Business Development; 7. National and International Linkages and Partnerships; 8. Jai-Kisan- Mobilisation for Farmers Empowerment; 9. Women Empowerment and Household Food and Nutritional Security; 10. Leveraging Youth for Agriculture; 11. Extension Strategies for Difficult Areas and Disadvantaged Groups; and 12. Agrarian Distress and Conflicts, Instantaneous Response and Farm Studies (Planning Commission, 2013b).

The Planning Commission also invites suggestions from the general public during the plan preparation process. Planning process thus

provides the only forum for convergence of various intra and inter-sectoral objectives, concerns and interests.

These Plans are finalised after discussions in the National Development Council (NDC), which provides broadest political support. Programs are formulated in the light of the plan and announced after approvals by competent authorities. In between the plans, there is a mid-term review.

12th Plan Documents

The 12th Plan document (Planning Commission, 2013a) and the recommendations of the various working groups are uploaded on the Planning Commission website. The next opportunity to influence this plan is during the mid-term review and later during the formulation of the 13th Five Year Plan (2017-2022). If we are serious about influencing policy changes, we should start scrutinising the plan document and the working group reports, and organise policy advocacy events now so that the recommendations will be ripe for consideration during the 13th Plan.

This advocacy should meet the following requisites:

- Issues, concerns and demands should be reflected in public policy and pronouncement
- Public policy should be translated into specific legislations, schemes and programs
- Legislations should be enforced and schemes and programs are implemented

Influencing Plan Formulation

National plans provide the right forum for advocacy as multi-agency and multi-stakeholder consultations are easier and happen as part of the planning process. Advocacy with the Planning Commission should include getting the policy reflected in the reports of the various working groups and then the plan; ensuring that the plan write up is reflected in the schemes and programs and further that the same are implemented as proposed. This requires advocacy before and after plan formulation.

Advocacy before Plan Formulation

One could approach the Planning Commission well in time with suggestions about the constitution of working groups and sub-groups. This should include both the constitution and TORs of the groups.

TORs are most important as these determine the scope and contents of the reports. Even after the group composition is announced, concerned groups and the planning commission could be approached to include certain stakeholders and modify the TOR. One could send the proposals for inclusion in these groups and presentation of views by writing to the Chairman or Member Secretary of these groups.

In the event of the sub-groups not accepting the proposal, appropriate working groups may be approached and if the sub-groups accept the proposal, it needs to be ensured that the same

is included in the report of the working groups. In the event of a particular working group not accepting the recommendation, the matter may be taken up directly with the Planning Commission.

Advocacy after Plan Formulation

Issues and concerns not accepted in the plan may be referred to the Planning Commission for consideration in the mid-term review. It would be useful to prepare a directory of issues and concepts that are included in the Plan document and against each item indicate whether specific policies, schemes and programs have been formulated to operationalise these items.

Subsequent advocacy should be aimed at the gap between reflection of issues in the plan and their being operationalised through policies, schemes and programs. Planning commission may be approached during the mid-term review to examine operationalisation of the concepts that are yet to get reflected in policies and programs.

It is Time to Act

Considering the magnitude of the task, initiatives for influencing the 13th Plan (2017-2022) need to start now. Every sector has various dimensions and large number of stake holders with divergent views. Wider consultations are necessary to achieve maximum convergence of views and this requires time.

Workshops and seminars organised on specific policy issues should use the 12th Plan document and working group reports as a base document to make new recommendations. Making recommendations for policy without taking note of the 12th plan exercise doesn't yield results. More over specific recommendations for improving performances should be brought to the working groups and sub-groups during the plan formulation phase to make sure that these are included.

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WHY FISHERIES SECTOR NEEDS AN EXTENSION FRAMEWORK?

Though a large percentage of rural population in South Asia depend on capture fisheries and aquaculture, lack of an appropriate extension framework constrains this sector from optimizing its performance, argues, SN Ojha.

Both aquaculture and capture fisheries provide employment and nutrition to a large proportion of rural communities in South Asia. Aquaculture has expanded steadily in recent years, now contributing 40% of total fishery production in South Asia (World Fish, 2009). However this sector faces a number of challenges. For instance, the introduction of mechanized trawlers, use of purse seine nets and adoption of dynamite fishing have all contributed to over exploitation of fisheries resources. The other challenges include: habitat destruction, climate change, ultra-violet radiation, ocean acidification, and water pollution through nutrients, chemicals, human pathogens, and marine debris. In the case of small scale aquaculture, lack of community approach continues to discourage input suppliers and marketing agents to service this sector effectively. Limited access to information and lack of adequate training programmes further constrain those dependent on the fisheries sector (Geethalakshmi et al, 2012).

In India, several organizations exist to support fisheries sector. The overall responsibilities to manage this sector at the national level lies with the Department of Animal Husbandry and Dairying (DAH&D), now renamed as the Department of Animal Husbandry Dairying & Fisheries (DADF). The Fisheries Division under DADF supervises 6 centres involved in coastal engineering, survey and aquaculture. It also implements several development schemes for development of inland and marine fisheries, fishermen welfare, strengthening database and application of Geographical Information System. The National Federation of Fishermen's Cooperatives Ltd., (FISHCOPFED) educate, guide and assist fishers in their efforts to build up and expand the fishery cooperatives. At the state level, the Department of Fisheries organizes training programmes and schemes on freshwater fish farming, use of modern fishing gears and methods and maintenance of marine diesel engines.

Despite having many departments and institutions working on fisheries, this sector needs a very high level of coordination as it deals with common resources to address the community needs whose livelihood is dependent on such common water bodies. Though the National Fisheries Development Board (NFDB) was set up in 2006 mainly to bring about better coordination among the different actors in the fisheries sector, "responsibilities are still not clearly defined between NFDB and the Department of Animal Husbandry, Dairying and Fisheries"(Planning Commission, 2012).Lack of coordination between Central and State Government agencies involved in research, education and training, NGOs

Box 1: Training and Information needs

Fishermen mostly need training and information on, fishing methods, navigation and safety, fishing gear design and construction, gas and diesel maintenance, vessel repairs and maintenance, coastal zone planning and management and exports. They also need training in fish handling, value addition and marketing. Mostly the fishers are dependent on credit to run their fish business. This may be because of the uncertainty of fish catch, high cost of fishing, and lack of trading activities and infrastructural facilities (Ulman et al, 2008).

Both fishers and fish farmers need training on, project management to improve their credit worthiness. Pollution is a major menace in common water bodies. While bringing awareness on marine pollution it was found that first priority should be given to a basic legal understanding of the regulatory framework (Kwak, 2012). Under this they may be made aware about how the pollution control boards work, levels of the courts and authorities related to pollution, and court terminologies. In addition to above fishers and fish farmers also need know-how on alternative livelihood options to sustain their rising population as mechanized harvest of fish lowered fish population though modern living amenities has been increasing fishers' population.

Gawde, et al, 2006, has reported that large fish farmers engaged in aquaculture may need training on, site selection, pond construction, testing of water parameters, proper bottom slope for drainage of water, formation of bloom in colour range of brownish to yellowish before stocking, PCR testing of seed for presence of WSSV, checking healthiness of seed before packing for transportation, acclimatization of seed, frequent checking of water parameter, use of feed probiotics, use of check trays and adjustment of feed accordingly, maintenance of bloom for initial two months, etc.

NGOs and community organizations also constrain addressing the training needs of fishers, fish farmers and development agencies.

While there are several ongoing efforts to address the issues of the fisheries sector and the training needs of fishers and fish farmers, there are several gaps in the field of knowledge management in this sector at the field level, the change agent level and the planning level (Box1).

Moreover there are not enough programmes on alternative livelihood options, aqua tourism, fish marketing, fish processing and value added product development and community management of water resources, etc. Finally, there is very little recognition of the role of fisheries and aquaculture extension.

Without addressing this gap, other interventions are unlikely to result in sustainable and long term improvements in the livelihoods of fishermen and fish farmers.

Way Forward

Need Assessment

Before deciding on the techno-organisational interventions to empower fishers and fish farmers, it is essential to conduct a need assessment at three levels.

- Situational analysis (sectoral needs in an area),
- Task/occupational analysis (expectations from the fishers, fish farmers, marketing agents and input suppliers by the development agencies) and
- Individual analysis (expectations of the fishers and fish farmers from the development agencies).

Establishing Fisheries Innovation Platforms at state level

Platforms comprising all the stakeholders in a given "aqua-eco-zone" involved in fisheries innovation should be constituted to plan and review needed interventions and also to draw lessons to guide future interventions. The platforms may be composed of fisheries research centers, fisheries colleges, fisheries training units, fisheries development agencies, NGOs and community organizations. The platform should analyze existing livelihoods and environmental changes and should review marketing strategies and develop a "Livelihood-Environmental-Governance (LEG) Security" for the fishers and fish farmers of the zone. This should form the basis for capacity development of fishers, fish farmers and development agencies in that region.

Convergent Fisheries and Aquacultural Extension Framework

The development agencies in the fisheries sector, especially the staff of the state department of fisheries needs to be first sensitized on emerging issues such as the Code of Conduct for Responsible Fisheries, Community Management of Water Resources, Alternative Livelihood Options like, Aqua Tourism, Ornamental Fishery, Fish Processing and Product Development, Further, they should be supported to implement concepts like, Participatory Planning, Mentoring, Monitoring and Evaluation Process; and also public, private and community participation in fisheries development. The sector needs a convergent extension framework to deal with the existing challenges (Table 1).

Table 1: Convergent Fisheries and Aquacultural Extension Framework

Level	Capture Fisheries	Aquaculture
Field Level	<ul style="list-style-type: none"> Fishing methods, navigation and safety Fishing gear design and construction Gas and diesel maintenance Vessel repairs and maintenance Fish handling and Processing Coastal zone planning and management Biodiversity and habitat management Value added product skills Alternative Livelihood, etc. Marketing and exports Project management Environmental impact assessment, etc. 	<ul style="list-style-type: none"> Site selection Pond construction Testing of water parameters Testing of seed Acclimatization of seed Feeding and use of feed probiotics Seed packing for transportation, etc.
Change Agent Level	<ul style="list-style-type: none"> Project formulation on sustainable fisheries and aquaculture incorporating fishers' friends and fishers –field –school methods. Community Management of Water Resources Alternative Livelihood Options like, Aqua tourism, Ornamental Fishery, Fish Processing and Product Development, etc. 	
Planning Level	<ul style="list-style-type: none"> Participatory Planning, Mentoring, Monitoring and Evaluation Process Public, Private and Community Participation 	



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IS HORTICULTURAL EXTENSION GETTING THE PRIORITY IT DESERVES?

Though public extension has played a key role in transferring technologies in agricultural crops, its role in promotion of horticultural technologies in India has been limited. While horticultural development got comprehensive policy and budgetary support during the XIth Plan, it hasn't made any difference to horticultural extension provision which continues to remain weak. The need for strengthening extension provision in horticulture is much greater now than ever before, argues, Saju George and MR Hegde.

The diverse agro-climatic conditions prevalent in India enable the production of a wide variety of horticultural crops. It also facilitates crop diversification, productive use of marginal lands and employment generation through cultivation and value addition.

Horticulture sector also contributes to achieving nutritional security and earning export revenue. It contributes around 30 % of the agricultural GDP (from about 13.08 % of the total cropped/net area) and 37 % of the total exports of agricultural commodities (GOI, 2011).

Box 1: Horticulture in India

In India, the Horticulture sector refers to fruits and vegetables including tubers, ornamental, medicinal and aromatic crops, spices and plantation crops. India is the second largest producer of fruits and vegetables in the world with annual production of 77 MT and 150 MT respectively. India occupies the first place in the production of mango, banana, litchi, papaya, pomegranate, sapota and aonla and 2nd place in lime and lemons. It also occupies first position in the production of cauliflower, second in onion and third in cabbage (NHB, 2011).

Small and marginal farmers dominate the sector. The sector is labor intensive and on an average it employs 84.33 man days per acre per year (GOI, 2005). Only 2 % of the horticultural produce is commercially processed in India as compared to 30% in Thailand, 70 % in Brazil, 78 % in Philippines and 80 % in Malaysia (GOI, 2005).

Horticulture has been recognized as a potential sector since the IVth Five year plan (1969-74). Comprehensive support (policy and budgetary) has been extended for the development of horticulture sector in the country during XIth five-year plan period (2007-2012). During this period three flagship schemes having impact on horticulture development namely, National Horticulture Mission (NHM), Horticulture Mission for NE and Hilly Area and Rashtriya Krishi Vikas Yojana (RKVY) were also implemented. The effort made for horticulture development through the said flagship schemes have been reinforced by other ongoing schemes of National Mission on Micro Irrigation, schemes of Coconut Development Board and National Horticulture Board.

Though the horticulture sector was pegged to grow at 6 % in the eleventh five year plan, the latest estimates indicate that it will achieve only about 5 % growth during this period (GOI, 2011). India aims to double its horticultural production by 2030. But achieving this growth depends to a large extent on the availability, access and application of new knowledge by

different stakeholders in the horticultural sector. An efficient and effective extension provision that facilitate knowledge exchange and application is therefore critical for enhancing productivity and competitiveness of the horticultural sector.

Public sector extension has been generally weak in the horticulture sector. Several positions remain vacant in the state Departments of Horticulture (DoH). The working group on horticulture and plantation crops for the XIIth Five Year Plan (GOI, 2011) noted that that horticulture extension is not only dependent on strength and high academic qualification of manpower appointed as extension workers but it also depends on quality and relevance of extension messages, capacity of extension workers in understanding of technology needs of the stakeholders and selecting most appropriate technology solutions to the problems and finally in conveying the same to horticultural farmers and producers. Extension also has to deal with the increasing demand for advice on high-tech horticulture and managing post harvest infrastructure. Considering the special features of the sector, horticultural extension has to be organized differently.

Organizing Horticultural Extension

Table 1 illustrates the nature of challenges in horticulture and its implications for organizing extension for horticulture.

Status of Horticultural Extension in India

There are different types of extension providers in the horticultural sector. These are as follows:

a) State Directorates/Departments of Horticulture: At least half the number of states in India has a separate Directorate/Department for Horticulture. However their, scope, resource and commitments vary widely. In the state agencies, senior officers oversee the administrative functions and extension work is left to the lower level functionaries. Many of these lower level functionaries lack knowledge of advances in the field of mechanization, post harvest management, processing and marketing. As a result, they lack confidence in addressing to field level problems faced by farmers.

Some of the states such as Karnataka, Maharashtra & Kerala have robust horticultural programmes. In Karnataka, the Horticultural Producers Co-operative Marketing and Processing Society (HOPCOMS) help farmers in obtaining remunerative prices for their produce. It also supports farmers in scientific production of

fruits and vegetables through supply of quality inputs and technical advice. The horticultural farmers can obtain prices of horticultural produce through SMS service of HOPCOMS. In Kerala, the Vegetable and Fruit Promotion Council, Keralam (VFPCCK) supports horticulture extension through organizing farmers into self help groups and facilitates their access to technology, credit and markets. In Maharashtra, the Government has been actively supporting formation of farmer groups and marketing co-operatives. Establishment of Floriculture Park (Pune) and Wine Parks (Nashik and Sangli) and Food Parks (Pune and Nagpur) are all expected to strengthen the value chain in horticulture in the state.

b) Central agencies & Mission Directorates:

There are many central agencies involved in horticultural development. National Horticulture Board (NHB), Coconut Development Board (CDB), Directorate of Cashewnut and Cocoa Development, Directorate of Arecanut and Spices Development; Spices Board, Tea Board, Coffee Board and Rubber Board have their own field offices for implementation of their schemes. Apart from this some of the recent missions such as Horticulture Mission of North East and Himalayan States (HMNEH); National Horticulture Mission (NHM); National Mission in Micro Irrigation (NMMI), and d) National Bamboo Mission (NBM) etc provide grants to states for horticultural development. Each of the Mission Directorate has an ad hoc Technology Support Group (TSG) which consists of outsourced experts most of whom are retired senior functionaries from ICAR/SAUs.

c) ICAR SAU, KVKs and ATMA: ICAR institutes and SAUs basically concentrate on research and extension education and they have limited funding and manpower for carrying out extension work in the field. So their services are mostly utilized for capacity building of line department extension staff. KVKs are organizing a number of trainings on horticulture but again lack of sufficient operational funds constrains their effective reach. Agricultural Technology Management Agencies (ATMA) at the district level do focus on field extension programmes, but again their activities are also limited due to funding constraints and capacity gaps related to horticulture.

d) Agribusiness Firms: Several agribusiness companies are engaged in procurement and processing of horticultural produce. Many of them have introduced new varieties and brought better production and processing technologies. The examples include: Pepsi in West Bengal and Punjab, ITC in Madhya Pradesh, TATA Khet se in

Table 1: Issues in Horticulture and its implications for organizing extension

S. no.	Issues in Horticulture	Implications for organizing horticultural extension
1	Technology intensive: Horticultural sector is technology intensive. With demand for fresh fruits and vegetables increasing even during lean season, poly house cultivation of horticultural crops is gaining importance. Urban and peri-urban horticulture has been expanding over the past one decade .New poly houses are coming up to meet the increasing demand for horticultural produce round the year.	Specialist extension functionaries who can advise farmers on hi-tech horticulture are needed
2	Availability of quality seed and planting materials: Seed and planting material are the basic foundation on which agriculture and horticultural growth can be achieved. Good quality seed and planting materials especially of fruit crops are often not available in sufficient quantities to meet the demand.	There is a need to train more farmers/ farmer - entrepreneurs for production of quality seed and planting material.
3	Poor extension coverage: The ratio of farmer to extension agents is very poor in horticultural sector. This ratio needs to be narrowed down by strengthening the state level horticultural departments with more human resources. Several positions remain vacant in the Department of Horticulture (GOI, 2011). For instance, in Karnataka, out of the 5390 positions in the Department of Horticulture (DoH), only 3678 positions are filled. The vacant positions in the DoH in other states are as follows: Andhra Pradesh (49 %), Gujarat (53%), Madhya Pradesh (35%), Tamilnadu (16%), West Bengal (75 %), Haryana (31 %), Bihar (44 %), Uttar Pradesh (35 %) and Kerala (6%).	Number of extension officials in horticultural sector needs to be increased by way of recruitment, contractual employment or deputation.
4	Increasing concerns around food safety: With the growing awareness on health issues, the demand for pesticide residue free safe produce is growing. Adoption of IPM (Integrated Pest Management) and INM (Integrated Nutrient Management) practices can considerably improve food safety standards but promoting these types of technologies would require requires intensive extension efforts including approaches such as farmer field schools.	Promotion of IPM and INM technologies through farmer field schools should be an important priority in horticulture.
5	Predominance of small and marginal farmers: Most of the vegetable farmers fall under small and marginal farmer category and they require regular advisory support. Input dealers and neighboring farmers are their main source of information and these arrangements are largely unsatisfactory.	Extension should reach out to service the needs of small and marginal horticultural producers
6	Marketing: Being perishable, fruits and vegetables need to be marketed or processed quickly. Rural roads, collection centres, cold storage facilities, well functioning markets are all required if farmers have to gain adequate income from horticulture.	Extension should focus on organizing producers and strengthening their links to various actors across the value chain
7	Post Harvest Management: Value addition will help to overcome the problem of seasonal variations in production and demand and realize better incomes. Post harvest technologies are a must for the development of horticultural sector.	Specialists dealing with post harvest management should be part of the horticultural extension team.
8	Mechanization in Horticulture: With increasing rural wages, farmers especially those who are growing vegetables are looking for mechanizations of farm operations to save on labor costs. But with shrinking landholding size, it is difficult for the small and marginal farmers to have individual ownership of agricultural/ horticultural machinery.	Custom hiring centres and hi-tech machinery banks, from where small and marginal farmers can hire required agricultural machinery may be established. Setting up of demonstration units at the district level to help farmers experience different types of farm machinery might also help.
9	Entrepreneurship development: For horticulture to develop, entrepreneurship needs to be nurtured among rural youth. Production of seed and planting materials, bio agents, bio-pesticides, biofertilizers, foliar nutrient products; installation of drip irrigation systems, promotion of protected cultivation are some potential areas for entrepreneurship development.	More support has to be given for entrepreneurship development in horticulture.

Punjab, McAins in Gujarath and Adani in Himachal Pradesh. Organised retailers such as Reliance fresh, Heritage, Spencers, More, Food world, Nilgiris have entered into vegetable procurement and they do provide limited technical advisory support (Ravikumar, 2013). Farmers selling their produce to organised retailers are found to benefit by way of higher prices and some of these organised retailers have set up demonstration farms, nurseries and formed technical support teams to offer extension services (Sulaiman et al, 2010). Buyers who enter into contract production programme of horticulture crops for exports, processing or domestic marketing do supply seed and planting material, farm inputs and relevant technologies. This group is a very effective in transfer of technology in respect of certain specific horticultural crops like cut flowers, export quality grapes, wine variety of grapes, green peas, exportable mangoes, gherkins etc.



e) Growers Associations: A number of growers associations have been successfully providing extension support in horticultural crops like pomegranate, grapes and mango especially in states such as Maharashtra and Karnataka. However many of the growers associations started with public funding have not been successful. For instance, during the last one decade, the National Horticultural Board has promoted some 19 Growers Associations and provided seed money and grants for meeting initial administrative expenses. But these associations are not engaged in field extension work, and they also failed to expand the membership base, (GOI, 2011).

f) Consultants: There are a number of hi-tech operations in respect of commercial horticulture projects which require certain amount of expertise/skill like pruning, grafting, poly-house operations, maintenance of fertigation system etc. Consultants are generally engaged in rendering this kind of extension services by farmers

especially those growing high value commercial horticultural crops like roses, gerbera, colour capsicums and exotic vegetables.

g) Input Suppliers: Seed, pesticide and fertilizer companies are engaged in limited extension services. Most of them organize events to promote their inputs among farmers.

h) ICTs: Most Radio and Television stations air programmes on horticulture. Mobile service providers such as IKSL, RML etc are offering weather, crop and price advisory services through SMS or Voice mail to the subscribers for their farm service. Some of the KVKs have also stated providing SMS advisories to the farmers who are registered with them for this service.

Way Forward

Over the years, horticulture has emerged as one of the potential agricultural enterprise in accelerating the growth of the Indian economy. Apart from this, it contributes to achieving nutritional security, poverty alleviation and employment generation. The horticulture sector is currently going through a period of significant changes. The current emphasis on urban and peri-urban horticulture, precision farming, hi-tech horticulture, organic farming, horticultural processing & export and expansion of organized retail in fruits and vegetables all indicate the new momentum in this sector. Considering the high perishability of the produce and volatility in prices, an efficient supply chain that links the different actors in the horticultural value chain is critical for horticultural development.

Extension services are generally weak in the horticultural sector. Lack of co-ordination among the different service providers is very common in this sector. Increasing the number of extension staff as well as enhancing their capacities to deal with the evolving demands of farmers



need priority attention. Horticultural extension should embrace a value chain approach where the capacities of different actors in the value chain (from provision of quality planting material, quality inputs, advisory services, production, processing to marketing) should be continuously enhanced. Apart from strengthening the capacity of extension staff in the public sector, there

should be a provision for enhancing capacities of commodity groups, grower associations, input suppliers, contract buyers, agribusiness firms all need new capacities. ATMA, SAMETIs, KVKs, SAUs, NHB, NHM and ICAR institutes can play a major role in this endeavor. Convergence of different schemes and programmes in horticulture also need emphasis.

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BEYOND THE FIRST STEP: EXPLORING THE COMMITTEE REPORT ON EXTENSION AND DOUBLING OF FARMERS' INCOME

The Eleventh Volume of the Report of the Committee on Doubling Farmers' Income (DFI) examines the status and reforms needed in the agricultural extension system in India.

Though a first step in the right direction, this report warrants more discussion and debate in order to address omissions and to develop an implementable plan of action, argues RM Prasad.

The Government of India in April 2016 constituted a committee on 'Doubling Farmers Income' under the Chairmanship of Ashok Dalwai. Six out of the 14 volumes prepared by the Committee are currently available online (<http://www.agricoop.nic.in/doubling-farmers>). The committee submitted its report "Empowering the farmers through extension and knowledge dissemination" (Vol. XI) in November 2017. The committee is seeking comments and suggestions on these draft reports including the one on extension.

What the Report says

The report is organised in eight chapters. The first chapter covers the role, importance, and status of Extension. The DFI Committee defines 'Extension' as "an empowering system of sharing information, knowledge, technology, skills, risk and farm management practices, across agricultural sub sectors, all along the agricultural value chain, so as to enable the farmers to realise higher net income from their enterprise on a sustainable basis". The definition covers two outcomes of the extension process at the farm level: getting higher income from farming; and realising the income gains on a sustainable basis. The report draws specific attention to some important facts –even though currently agricultural extension services are available on a pluralistic platform, the quality of extension tends to suffer given its tendency to repeat a limited set of extension activities, as well as from procedural bottlenecks.

The second chapter deals with the changed role of Agricultural Extension. The DFI Committee is guided by the fact that more than 85 per cent of farm holdings in the country are small and marginal and are economically challenged, and there is need for deploying scales of operation. Psychological counselling is intended to be an integral part of extension advisory. The report indicates that a team of researchers are presently working on creation of a 'Stress Index' (SI) for farmers and preparing a training module for village level volunteers. The Committee argues that for meeting the new challenges, broadening the extension perspective is crucial for efficient and cost effective extension, real time extension, location specific extension, and extension for sustainability. The report recognizes *intensification* and *diversification* of agriculture as strategies that can significantly contribute to doubling of farmers' income. Both the strategies are based on existing resources available with farmers, wherein efficient utilization is the key need. It also mentions the reduced focus of extension on horticulture, dairy, livestock, poultry and fishery sub sectors as shortcomings of the current agricultural extension system. These warrant greater attention from



the extension service systems so as to meet the objective of doubling farmers' income.

Another observation of the Committee is that University Extension has an important function to perform as 'concept nursery and think tank', while organically integrating with mainstream extension when covering their service area. The report also touches on PPP in extension service delivery and recommends that a progressive National Level Ranking Framework (NLRFW) for extension service providers, both public and private, needs to be put in place.

Chapter 3 describes the roles, responsibilities and models of the extension system. The report proposes the establishment of an 'e-national bank for Agricultural Technologies (e-NBAT) as a national level repository of knowledge, converging all standard practices and technologies on a common extension platform to be owned and managed by MANAGE. The report also suggests that the role of Directorate of Extension (DoE) of the Ministry of Agriculture, which is currently serving as a subordinate office, needs to be changed and more autonomy granted to it. DoE and MANAGE will need to work in tandem to help enhance the delivery capacity of the agricultural extension system across the country. The linkages among MANAGE, EEIs and SAMETIs are also discussed in this chapter. The extension model for doubling farmers' income is provided in page 44 of the report. But it is debatable whether this can be considered as a model. The technology flow proposed in page 59 of the report also needs to be further debated and discussed for further refinement.

The human resource use efficiency in Extension is covered in Chapter 4. The extension manpower

density in the different states of India is presented in the report. In view of the changed scenario, the DFI Committee is of the opinion that minimum ratio of extension service providers to farming families can be revisited and recommends the ratio as: a) Hilly areas - 1:400; b) Irrigated areas - 1:750; and c) Rainfed areas - 1:1000. The report highlights the need for incentivizing for effective extension delivery. The need for performance-linked incentives for field functionaries and the concept of 'one village-one farmer friend' is also projected.

The Committee observes that ATMA remains a platform of relevance to meet DFI challenges, and that it is necessary to refresh the institutional mechanism and implementation procedures so as to harvest the advantages of a platform that aims concurrently at both public-public partnership and public-private partnership. Essentially, both models of PPPs need to function with a spirit of synergy. The report also indicates that the outcomes realised from ATMA have not been up to its potential, due to some dilutions which are discussed in the chapter. The Committee observes that commercial agriculture requires additional extension services for which reorientation of the existing extension system is necessary, including incorporation of banking and financial institutions, co-operatives, etc., as extension platforms.

The fifth chapter deals with ICT in Extension. The report indicates that digital technology has the potential for creating a virtual extension platform that is available to farmers 24x7 – anytime, anywhere – for fastest and cheapest transfer of technologies. It is clearly mentioned that both farmers and extension workers are to transform as e-farmers and e-extension workers in the days to come by appropriately utilizing ICT tools. "Access to information" and "information to access" of

appropriate location-specific content and advisory system in languages understandable by farmers, is highlighted in the report.

Though there are many ICT interventions in agriculture in both public and private domains, only major ICT interventions of the DoA& FW are listed in the report. Suggestions for promoting ICT in Agricultural Extension are also given in the report. Areas requiring immediate ICT interventions are also indicated.

Chapter 6 covers issues and concerns relating to the empowerment of women for income enhancement. NSS data indicate that there has been steady decline of men in agriculture over the last three decades, with the percentage of men coming down from 81 per cent to 63 per cent as compared to women, in whose case, it has come down from 88 per cent to 71 per cent. This trend is referred to as "feminization of Indian agriculture". According to reports by FAO, if women farmers in developing countries have equal access to production resources as men, their productivity can be enhanced by 20-30% and agricultural production could be raised by 2.5 to 4%. Hence there is a need to create an alternative system for empowering women.

The report indicates that it is important to significantly increase overall allocation for women

in agriculture by making it to at least 50 per cent (from the current 30 per cent) or more across all schemes of the Ministry. The need to formulate new schemes specifically to suit the needs of women farmers in different agro-ecological contexts is also specified.

The seventh chapter focuses on strengthening technology backstop institutions. The report indicates that an institutional mechanism for promoting partnership between, and among, related labs on common farmer-related problems would be highly useful, if put in place. (An element of doubt about establishment is reflected here.) The report also points out that there is need for developing operational guidelines for implementing individual social responsibility initiatives in public and private institutions. (But the report is silent on institutional social responsibility.) Technological backstopping can be strengthened by establishing a four-way mode of communication: between labs, from lab to land, and land to lab, and between farms. The scope of AC and ABC scheme of MANAGE for technological backstopping is also provided in the report.

Chapter 8 presents the recommendations of the report under three heads – Redefining Agriculture Extension, Key Recommendations, and Other Recommendations. Some of the major recommendations are given in Box 1 (below).

Box 1: Major Recommendations

- Agricultural Extension has to be redefined with focus on income security of farmers. Income security is both a challenge and an opportunity.
- Focus areas that demand strengthening of the extension system are listed out, which have to be addressed.
- Extension should follow a 'project approach' through projects of suitable sizes to provide full support and facilitation to farmers, including backward linkages (production) and forward linkages (marketing), along with an integrated farming systems approach through convergence.
- ATMA has to be retained with reforms and a strong monitoring mechanism to ensure adequate compliance with implementation procedures.
- Capacity building of extension functionaries should concentrate on the principles of agri-business extension.
- A one-time catch up grant may be provided for upgrading the performance of training institutions in the country, after identifying gaps.
- A Central Board of Studies has to be constituted at the national level to review and regulate changes in curriculum across all the 74 Agricultural Universities of the country so that the standards and content of education in agriculture address the field level problems of farmers.
- A national and state e-Agricultural policy has to be formulated to explore and outline the possibilities of leveraging ICT for agricultural extension.
- Setting up of an integrated portal on Agricultural marketing by integrating websites of e-NAM, AGMARKNET, APEDA, APMCs, MPEDA, etc.
- The public and private extension system should be synergised through win-win PPP models, aligned with state and district plans, and promoted through outcome linked incentives.
- Situation-specific protocols are to be developed for building more transparency and trust into the partnerships with private extension services known for their aggressive marketing strategies vis-a-vis the public extension system, to avoid conflicts of interest.
- The extension system should promote and support the agricultural value system by guiding the farmers appropriately, for which extension functionaries also need to be suitably oriented.

What the report doesn't say

The report is silent on the need for developing an appropriate field extension system in line with the T&V system. This is all the more relevant in the context of doubling farmers' income.

The role of extension in the wider agricultural innovation system (AIS) is not addressed in the report. Extension services have to widen the agenda and emerge as a "bridging organisation" linking several actors, rather than just being an intermediary between researcher and farmer. This is not reflected in the report.

Information, knowledge, and skill are identified as the three faces of Extension in the report. Wisdom is another important concept which is not included in the report. The traditional wisdom of farmers must be effectively used by the extension system.

Though the pluralism of the extension system is highlighted and the need for convergence is mentioned in the report, the dynamics and mechanism of convergence are not properly addressed. A separate chapter on Convergence would have been ideal.

The most important skill to be learned today is "Learn to self-learn and fast-learn". This will not be easy for farmers who do not have the requisite mind set and attitude to accept digital technologies. This is not seriously taken into account in the report.

The need for attracting and retaining youth in agriculture is a greatly felt need. However, the report has not given due importance to this. Extension services for skill development, entrepreneurship development, incubation centres, and agri ventures could have been presented in detail as a separate chapter in the report.

Governance of the extension system covering appropriate monitoring and evaluation tools, issues related to implementation of programmes, capacity development efforts for professionalism, etc., has to be discussed in greater detail in the report.

Extension for sustainability is an important issue that needs to be properly addressed. The report only makes passing mention of this critical issue.

There is no mention about extension research in the report, which is a serious limitation. The need for promoting extension research for strong extension service delivery is critical, which is not addressed in the report.

A protocol for scaling up of successful pilots titled "From pilots to projects" is very much needed in the report. There is a critical need to move from

project (pilots) to systemic interventions (scales). It is observed from the field that many of the successful pilots are not upscaled, the reasons of which have to be probed into and addressed.

The report makes several sweeping generalisations without proposing any action plan. For instance, the report talks about emphasising targets that focus on outcomes that result in profitability enhancement at the farmer end. It also mentions that there is scope for on-farm, off-farm and non-farm activities, which can generate additional job opportunities, which is very important from the point of doubling farmers' income. It talks about the need for the Directorate of Extension and MANAGE to work in tandem to enhance the delivery capacity of the agricultural extension system across the country, without exploring the reasons for why they are not working / or should work in tandem.

Way Forward

I appreciate the efforts of the Committee in preparing a report on extension and doubling farmer income. The report clearly indicates that the current extension service system has so far been largely co-ordinated for input marketing and associated services, besides farm management. The report discusses a suitable architecture for the extension network needed in the country.

However, based on my reading of this report, I feel that it is a half-baked attempt to reform the extension service delivery in India. Many useful documents that should have been consulted for a report like this are missing. For instance, Report of the 12th Plan Working Group on Agricultural Extension (Planning Commission, 2012) which presents detailed analysis on extension and has made several relevant recommendations seems to have not been consulted while drafting this report (as this is not listed in the References section on page 123). Otherwise also, only very few documents are included in the references which has affected the completeness and totality of a report like this.

While the DFI Committee Report "Empowering the farmers through extension and knowledge dissemination" is a first step in the right direction, it warrants more discussion and debate among the extension fraternity in the country. This is important for addressing the lapses in this report and for reorienting the current extension system to make it more vibrant, realistic and field-oriented.

ISN'T IT TIME TO SET UP AN INDIAN INSTITUTE OF ORGANIC AGRICULTURE?

Demand for organic food is increasing at 20-22% per annum in India. Its time India invests in organic research and education to develop specialized human resources trained to further the organic movement in the country, argues Sabyasachi Roy.

More and more farmers across the world are turning to organic agriculture. There is a growing consciousness about benefits of organic agriculture as a means to ensuring sustainability and true food security in long run. The World of Organic Agriculture 2013 survey by Research Institute of Organic Agriculture (FiBL) and International Federation of Organic Agriculture Movements (IFOAM) reported that in total 69.7 million hectares (agricultural and non-agricultural areas) were organic and there were 1.8 million organic producers worldwide in 2011. The global market for organic food sales was US \$ 63 billion in 2011 and it has expanded 170% since 2002.

Box 1: Organic agriculture in India

In India, the area under organic farming has been increasing exponentially from 0.04 million hectares in 2003-04 to 5.55 million hectares of cultivated land under certification in 2011-12, and produced 3.9 million MT of certified organic products in 2010-11 that included Basmati rice, other cereals, pulses, honey, tea, spices, coffee, oil seeds, fruits, herbal medicines, processed food and value added products and also organic cotton, etc. with involvement of around 10 million farmers.

As per the Agricultural and Processed Food Products Export Development Authority (APEDA), India exported 300 organic items with a total volume of 115,417 MT and realization of INR Rs. 8.39 billion in 2011-12 and the export market for Indian organic products is expected to grow at 60-70% per annum in the coming years. Further, with growing consumer consciousness in India the demand for organic food is increasing at 20-22% per annum (Yes Bank, 2013)

Need for a New Paradigm

United Nations Development Programme (UNDP) in 1992 noted that practicing organic agriculture involves managing the agro-ecosystem as an autonomous system, based on the primary production capacity of the soil under local climatic conditions. Agro-ecosystem management implies treating the system, on any scale, as a living organism supporting its own vital potential for biomass and animal production, along with biological mechanisms for mineral balancing, soil improvement and pest control. Farmers, their families and rural communities, are an integral part of this agro-ecosystem. In other words, shifting to organic agriculture involves a change in the current paradigm of agricultural development.

Research in sustainable and organic agriculture is inherently different from conventional agricultural research. The traits, attributes and benefits of

Box 2: Paradigm shift?

FAO (2011) in its guide book "Save and Grow points out that the present paradigm of intensive crop production cannot meet the challenges of the new millennium. The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) in 2008 reported that the way the world grows its food will have to change radically to better serve the poor and the hungry if the world is to cope with a growing population and climate change while avoiding social breakdown and environmental collapse. The same report also pointed out that while the agricultural research enterprise has fulfilled its promise to improve productivity, significantly improving the livelihoods of millions of people, it has been less attentive to the unintended social and environmental consequences of research achievements.

organic agriculture research and education are measured in a different way than in conventional methods. It needs more perseverance, involvement of the farmers themselves, social innovation and understanding of their ecosystems. The Planning Commission Working Group on Agricultural Research and Education for the 12th Five Year Plan (2012-17) of the Planning Commission has recommended organic farming as a major research priority area under horticulture sector.

The Working Group on Horticulture, Plantation Crops and Organic Farming for the 11th Five Year Plan (2007-12) recommended introduction of formal education in organic farming practices, through Agricultural Universities/specialized institutions and developing human resources in the fields of organic production, quality assurance, extension, value addition, trade and marketing. National Commission on Farmers in 2006 recommended organic farming as one of the potential options to help solve the agrarian crisis.

Key Initiatives in Organic Agriculture in India

The organic sector in India has been mainly driven by NGOs, farmer organizations (supported by NGOs), agripreneurs and private business groups. Government too has been playing an important role in promoting organic agriculture.

Government support to organic research, education & extension in India:

Recognizing the fact that requirements for organic production systems differ from those for conventional chemical-based production systems, Natural Resource Management (NRM) Division of Indian Council of Agricultural Research (ICAR) during 10th Five Year Plan period (2004-05) initiated the multi-partner inter-disciplinary research project – the Network Project on Organic Farming at Modipuram with Project Directorate for Farming Systems Research as Lead Institute and 13 cooperating centers. A major intervention to promote organic farming by the Central Government was the launch of the Central Sector Scheme "National Project on Organic Farming"

(NPOF) in April 2004. The National Centre of Organic Farming (NCOF), Ghaziabad and its six Regional Centres at Bangalore, Bhubaneswar, Hissar, Imphal, Jabalpur and Nagpur implements the NPOF and works towards promotion of organic farming in the country.

The Indira Gandhi National Open University (IGNOU), New Delhi in collaboration with the APEDA has developed a 6-month certificate course on organic farming under the open and distance learning mode for persons with secondary school qualification (i.e. 10+2 pass). The National Centre of Organic Farming has started a month-long certificate course on organic farming for the rural youth having degree or diploma in agriculture at its centre in Ghaziabad. Three such courses would be conducted in 2013-14 and each course is for 30 participants. The Indian Agricultural Research Institute (IARI) and some of the state agricultural universities like Tamil Nadu Agricultural University, G.B. Pant University of Agriculture and Technology, etc. have introduced post graduate courses and farmer training programmes on organic farming – principles & practices, organic vegetable production technology, etc.

Non Governmental Initiatives

Many NGOs/Trusts promoting organic farming, like Morarka Foundation (Jaipur), CIKS (Chennai), etc. provides training of various durations to farmers/rural agripreneurs in organic agriculture. The Amity University, a private sector university, established the Amity Institute of Organic Agriculture (AIOA) in Noida and provides M.Sc. and PhD degrees in organic agriculture. The institute website claims that it is carrying out basic and applied research in organic production management systems, knowledge management, training and advisory services.

Apart from these, the International Federation of Organic Agriculture Movements (IFOAM), Germany, starting 2012, offers an eight months organic leadership course every year for South Asian participants assuming present or future responsibilities in the organic world.

Need for more concerted action

India needs to tap/develop young talent and empower them with knowledge, skill, attitude and energy to work for the organic sector and a sustainable agricultural future. Though there are a few institutes in the public, private and NGO sector conducting training programmes for farmers and agripreneurs and few centres offering few post graduate level organic farming courses, no full- fledged educational programme is available in the area of organic farming in the country. Moreover, without a national level and specialized institute on organic farming, the impact of the organic farming movement will always remain limited.

Indian Institute of Organic Agriculture?

The challenges for development in the new millennium calls for setting up an innovation driven dedicated centre of excellence for research, learning and extension focused solely on sustainable and organic agriculture systems. The mandate and reach of the NCOF is limited with the focus mainly on promotion, production, research and statutory quality control of organic inputs, capacity building of farmers/extension professionals and organic certification through Participatory Guarantee System. The need is for a national institute with broader mission for conducting hands-on research and education producing empowered – educated and inspired young people to strengthen the organic movement. This institute which could be called as the Indian Institute of Organic Agriculture, needs to be established by the Government of India ideally under the aegis of the Indian Council of Agricultural Research (ICAR) in partnership and collaboration with other key agricultural centers in India including NCOF and international initiatives such as International Federation of Organic Agriculture Movements (IFOAM).

Its objectives might include the following:

- **Research & Innovation:** Undertake research on technology development, creative solutions, social innovation and policies for organic farming in agricultural systems comprising crop production, horticulture, livestock and dairying, fisheries.
- **Education:** Develop practical oriented highly skilled professionals as well as leaders, entrepreneurs and change agents on organic agriculture and livelihoods promotion by offering education and research at the post graduate (M.SC and PhD) level and certificate courses (may be in collaboration with other institutes/universities).

- **Capacity Building:** Develop farmer leaders, innovators and entrepreneurs by undertaking capacitybuilding on organic agriculture practices for rural youth, farmers including urban and peri-urban farm households.
- **Extension & Knowledge Management:** Employ participatory extension methods; document goodpractices & standard operating procedures; conduct awareness generation programmes; publish newsletters and journals and create web based portals.
- **Advocacy & Consultancy:** Undertake advocacy for pro-poor and pro-organic agricultural policiesand consultancy projects for & with other research & educational institutes and business houses.
- **Rewards & Recognition:** Encourage and promote farmers, scientists and professionals withoutstanding contribution to organic agricultural development.

Finally, the success of the institute would largely depend of strategic collaboration/partnership with national and international institutes, universities and centers of excellence.



Way Forward

It is important to note that the EU nations have heavily invested in organic research, education and extension. USDA's National Agricultural Library has reported that a literature search in 2006 showed that 68% of world's organic research so far had been conducted in Europe. India needs to catch up fast to corner a share of the increasing demand for organic products world-wide and also to meet the growing domestic demand for organic products. It is time that India invests in organic research and education to develop specialized human resources trained to further the organic movement in the country.



DEALING WITH UNCERTAINTIES

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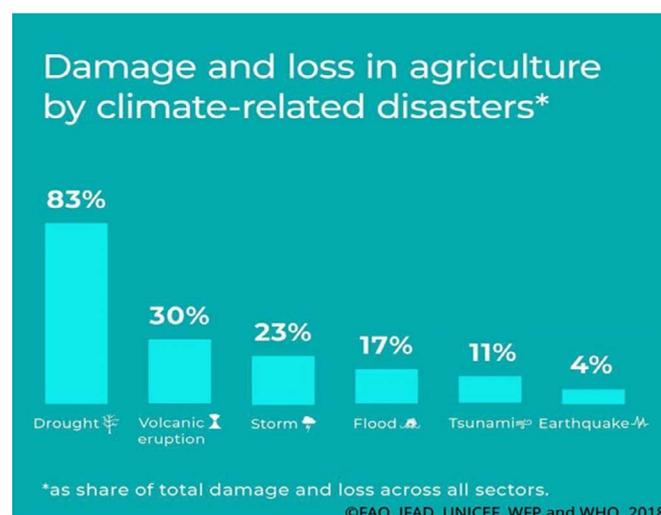
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NATURAL DISASTERS AND EXTENSION & ADVISORY SERVICES (EAS): LESSONS FOR BETTER PREPAREDNESS

Natural disasters, calamities and unforeseen events make farming and farmer lives vulnerable. These events lead to severe loss, crop damage, and human and livestock fatalities, which in turn, cause grave stress to them and their livelihoods. Mahesh Chander reflects here on the roles and responsibilities of Extension and Advisory Service professionals before, during, and after natural disasters, with particular emphasis on the livestock sector.

We often hear news stories on floods, cyclones, hurricanes, tornadoes, hailstorms, landslides, fires, droughts, tsunamis, earthquakes, volcanic eruptions, etc. All these events are characterised as disasters (Box1). According to FAO (2015), of all natural hazards, floods, droughts and tropical storms affect the agriculture sector most, showing the severe impact of climate-related disasters. Drought causes more than 80 percent of the damage in the agriculture sector, especially on livestock and crop production. Tsunamis and storms cause much damage in the fisheries subsector, while floods and cyclones are responsible for most of the economic loss with regard to forestry. Disaster risk reduction and climate change adaptation are closely intertwined, and in agriculture they should be addressed in an integrated manner (FAO 2018).

No one disaster is exactly the same as another, therefore impact and consequences vary from region to region and community to community. In developing countries, the agriculture sector attracts about 22 percent of the total damage and loss caused by natural hazards. In developing countries alone, these disasters have brought about US\$ 550 billion in estimated damage and affected 2 billion people. Such disasters often undermine overall national economic growth and development goals, and agriculture sector growth and sustainable sector development in particular (FAO 2015). Alongside humans, their shelters, their livelihoods, including crops and livestock, all suffer damage and loss in varying degrees due to any of these disasters. Therefore there is critical need to prepare ourselves to deal effectively with such events in terms of reduction, preparedness, response and recovery from its harmful effects.



In India, during 2001 to 2015, 33,291 human deaths were reported against 12,58,353 cattle heads lost, 1,97,35,686 houses damaged, and 581.50 lakh hectares of cropped area affected (GOI 2016). Farmers, including livestock owners, suffer during disasters in multiple ways.

Box 1: Disasters

A disaster is a serious disruption, occurring over a relatively short time, in the functioning of a community or a society, involving widespread human, material, economic or environmental loss and impact, which exceeds the ability of the affected community or society to cope using its own resources. The World Health Organization defines disaster as 'any occurrence that causes damage, economic destruction, loss of human life and deterioration in health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area' (WHO, 2007). It is an event, concentrated in time and space, which causes social, economic, cultural and political devastation, which affects both individuals and communities.

Between 2003 and 2013, disasters triggered by natural hazards caused US\$ 1.5 trillion in economic damage worldwide (FAO 2015). Disasters significantly impede progress towards sustainable development and must be prevented or mitigated in order to achieve the Sustainable Development Goals by 2030. Countries at lower levels of human development, in particular, having higher levels of poverty, are likely to suffer especially large socioeconomic setbacks as a consequence of disasters. For example, an estimated 94 percent of the human population killed by disasters between 1975 and 2000 were from low or lower-middle income groups (UNISDR 2008). Disasters challenge efforts to reduce poverty, undermining sustainable development, so it calls for our active involvement in efforts to tackle these disasters.

Box 2: Disasters in the Asia-Pacific Region

The Asia-Pacific Region is particularly susceptible to all the major types of natural disasters. Over the 10-year period ranging from 2005 to 2014, 426,991 lives were lost in the region as a consequence of natural hazards, 52 percent of the global total. An estimated 1.4 billion people were affected by natural hazard events, representing 85 percent of the global total. Reported direct physical losses reached over \$0.7 trillion, equivalent to an average US\$ 198 million loss per day. The region accounted for 49 percent of total global losses over the same period, far higher than the region's share in global gross domestic product. Asia and the Pacific now face a collective average annual loss of \$157 billion as a consequence of natural hazards. *Source: Benson, 2016*

Ideally, EAS being responsible for serving the farming community should be the primary stakeholders in helping out farming communities during disasters. It is well known that many developing countries, including India, are not always well prepared to deal with disasters. Lack of a well-developed disaster management plan leads to considerable loss of human life, animal life and property, which could be avoided if the necessary mechanisms were in place. A lot needs to be done to improve the situation, particularly with regard to livestock. Can we as extension professionals, contribute meaningfully to better climate change and disaster management so as to minimize farmer suffering?

Livestock & Disasters: An Overview

Disasters not only cause loss of life, damage to environment and properties, but have immediate and progressive impact on animals as well, resulting in animal deaths, suffering and economic losses. A large number of animals, including poultry, is affected during disasters such as drought, cyclones, earthquakes, landslides, floods, and ensuing epidemics. For instance, "in the recent floods in Kerala as many as 1.76 crore poultry, 46,000 cows and 20,000 goats were washed away. Officials of the Kerala Agriculture Department said the department was able to rescue at least 50,000 cattle and house them in relief shelters across eight districts. "These cattle had been left behind by their fleeing owners when the water levels rose. There is also widespread fear about a breakout of communicable cattle diseases. There

is a huge scarcity of roughage, including straw and green fodder," said officials (Kumar 2018). A holistic approach along with collective efforts is required to address the issues of animal disaster management more effectively. This may contribute greatly towards avoiding or minimizing animal suffering, save many animal lives and the livelihood of millions of people through protection of animals in disasters.

My Personal experience

While reviewing various types of natural disasters and their impact on livestock, we outlined different preparedness, response, recovery, and mitigation strategies as well as the roles of different agencies, including veterinarians (Sen & Chander 2003). We also conducted an ex post facto study (Ganguli 2004 and Ganguli and Chander 2007) during 2002-03, using the super cyclone that struck the Indian state of Orissa in October 1999 as a case. This case study could help us understand the impact of natural disasters on livestock farmers in general, and the preparedness, response and recovery with respect to livestock management under disaster situations in particular.

The super cyclone affected the human and livestock population, causing 4.41 lakh livestock mortality against 9,885 human deaths. The preparedness, response and rehabilitation mechanisms primarily focused on human beings, but inadequate attention to livestock management in such a situation led to heavy losses. Moreover it delayed and caused poor recovery from livestock-

related damages. The total loss arising from cyclone-related damage to livestock could have been reduced with better preparedness, timely response and well-designed rehabilitation efforts. The authors, based on their findings, argued a case for better attention to livestock during natural disasters, such as cyclones, since the majority of Indian small, marginal and landless livestock farmers depend heavily on livestock – and it is often the only livelihood source for them.

The welfare measures in the wake of disasters mainly concentrate on human beings with little thought given to livestock, thus causing maximum casualty in animals leading to huge economic loss for livestock farmers. For instance, cyclonic storm '*Phailin*' which hit the coastal belt of Orissa in 2013, resulted in extensive damage not only to human life and property but it also had high impact on livestock farmers as well. These farmers faced several problems with sheltering, feeding, and treatment of animals as well as marketing of milk and other products, disposal of carcasses, restocking of animals, etc. The study undertaken on *Phailin* (Sunita Bara & Ganguli 2016) revealed that the preparedness, response and recovery mechanism were inadequate, resulting in poor recovery of losses for livestock farmers in the affected area. It concluded that considering the contribution of livestock to local and national economy and the dependence of poor farmers on livestock for their livelihood, the preparedness, response and recovery mechanism should be given greater attention – both by the government as well as NGOs – so as to minimize the economic, social and psychological loss to livestock farmers from natural disasters.

In 2013, I attended a two-day National Conference on Animal Disaster Management¹ with the theme 'Animals matter in disasters', organized by Federation of Indian Chambers of Commerce and Industry (FICCI) in association with National Disaster Management Authority (NDMA) and World Society for the Protection of Animals (WSPA) at New Delhi, India, that highlighted the importance and relevance of animal disaster management. The conference suggested establishing 'veterinary emergency response units' all over the country in order to minimize the loss of livestock as well as to reduce the economic impact on livestock farmers. This conference emphasised

that the preparedness culture is to be inculcated in animal disaster management through awareness, effective information sharing, appropriate education and efficient communication.

In June 2013, the North Indian state of Uttarakhand witnessed the country's worst natural disaster since the tsunami of 2004. A multi-day cloudburst caused devastating floods and landslides leading to much sufferings and loss, including more than 5,700 people presumed dead. Among several agencies that joined in response and relief operations, the Indian Council of Agriculture Research (ICAR) too took some proactive steps in analysing the disastrous situation that affected agriculture and allied sectors. I represented the Indian Veterinary Research Institute (IVRI) at the workshop held at the Central Soil and Water Conservation Research & Training Institute, Dehradun, on 1-2 August 2013, wherein, an action plan² was drafted for the agriculture sector in the state under the leadership of Dr S Ayyappan, the then Director General, ICAR.³ As an outcome of this workshop, IVRI brought out a 'Status Paper on natural disaster in Uttarakhand: Strategy and Action Plan on relief measures for livestock'.⁴ This status paper details the measures and actions required to be taken up by stakeholders in the livestock sector in terms of preparedness, response, recovery and mitigation strategies in such natural calamities.

I also happened to be part of the IVRI team that surveyed tsunami-affected areas in Tamil Nadu, Kerala and Andaman & Nicobar Islands to assess the economic losses in livestock, and strategies for their improvement. We saw that the small scale farmers who had reared goats, pigs and poultry lost their animals in large numbers, which adversely affected their livelihood. Swift action could have protected animals during these disasters, thus not only preventing their suffering but also helping protect the livelihoods of the people who depend on them. Animal protection starts with people, so it is essential to arm animal owners and communities in vulnerable regions with specialised training so that they are ready and able to protect their animals in an emergency. Appreciably, some agencies in India are now conducting emergency disaster drills for preparing communities to protect animal lives, and thereby local livelihoods.⁵

¹<https://www.unisdr.org/we/inform/events/32047>

²<https://drive.google.com/file/d/1T6sUUIboXk4Gz0IdJ3ICM-QHgCdJAnbC/view>

³<http://www.cswcrtiweb.org/Vision%20&%20Newsletter/NEWSLETTER/2013/OCT/Newsletter.pdf>

⁴<https://drive.google.com/file/d/1Xrx7MdByMpdmiNpkuOqKDgwxJXWSy0S/view>

⁵<https://businesswireindia.com/news/news-details/emergency-disaster-drill-tamil-nadu-preparing-communities-protect-animal-lives-local-livelihoods-/44638>

Lessons

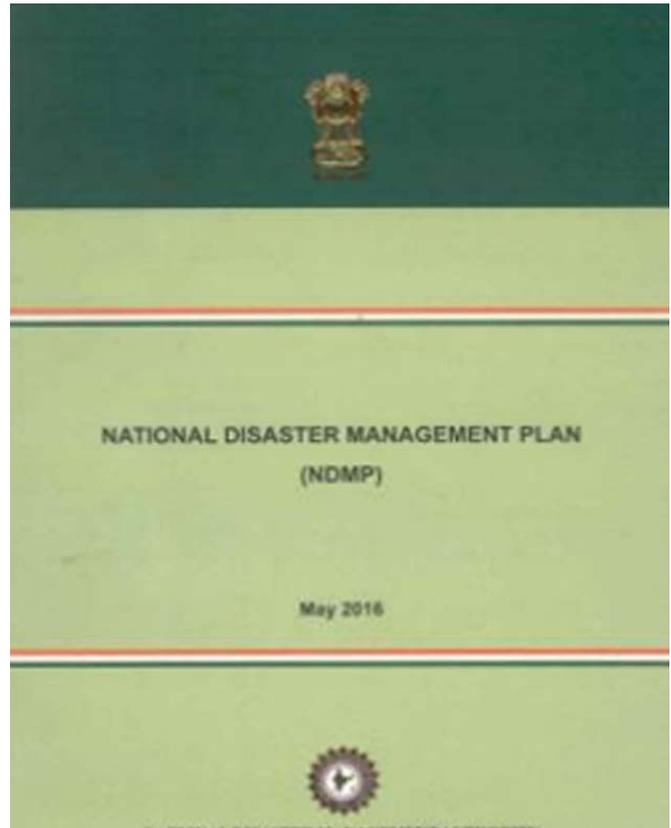
Lessons from these disasters demonstrate that national governments, aid agencies, and international/non-governmental organizations (I/NGOs) are effective primarily at distributing short-term products (e.g., food packages and tarpaulin) to cities (Chapagain and Raizada 2017). Such products are inexpensive, simple to procure, and easily quantifiable for donors. Unfortunately, the literature suggests that many national governments and foreign NGOs are ineffective at assisting rural farmers in both the short- and long-term. Given that the global community is somewhat effective at distributing short-term products, Chapagain and Raizada (2017) have suggested that a similar strategy should be developed for rural areas, but focusing on products that can assist farm households.

To minimise the gap in knowledge of effective products that can target such households after a disaster, they proposed an emergency sustainable agriculture kit (eSAK) framework⁶ for disaster relief in rural areas. The eSAK involves a comprehensive list of products that can be combined into packages to address the needs of shelter, hunger, first aid, seeds, preservation of indigenous crop varieties, and post-disaster labour shortages. The EAS can work out strategies elucidating their roles in different types of disasters and emergencies, which will not only help reduce the stress and sufferings of farmers but also improve the visibility of the profession in the eyes of the public at large.

Livestock Disaster Management: Some Key Initiatives

On 3 March 2016, the National Institute of Disaster Management (NIDM), World Animal Protection and Policy Perspectives Foundation (PPF) together with Department of Animal Husbandry, Dairying & Fisheries (DADF), Ministry of Agriculture & Farmers Welfare, Government of India, reached the landmark of integrating animals into the National Disaster Management Plan of India.⁷ The plan ensures, for the first time, that animals will be included in disaster preparations, potentially saving millions of animal lives and building the resilience of the communities that depend on them. With the launch of the National Disaster Management Plan

2016,⁸ India has also aligned its National Plan with the Sendai Framework for Disaster Risk Reduction 2015-2030,⁹ of which India is a signatory.



Disasters: What EAS could do?

To discuss issues of development in the area of disaster management in agriculture, the National Academy of Agricultural Sciences (NAAS), India, organized a one-day brain-storming session on 27 February, 2004. The role of the Government of India, International agencies, Non-governmental organisations, Panchayati Raj institutions including those in education and training within disaster management, were deliberated upon (NAAS 2004). A number of recommendations emerged at this session, some of these have been studied since then. The role of disaster management education and training was emphasized in planning and implementation of disaster management strategies. The workshop recommended that education should be designed so as to provide comprehensive knowledge on different types of hazards, disaster management techniques, and impediments in the way of disaster reduction, and should directly address community needs.

⁶<https://link.springer.com/article/10.1186/s40066-017-0116-6>

⁷<https://www.worldanimalprotection.org.in/news/india-launches-first-national-disaster-management-plan-animals>

⁸<https://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf>

⁹https://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf

Often response to disasters is addressed by the local and state development administration, including designated disaster management authorities. But this does not mean other organizations have no responsibility or can't do anything in disaster situations. Extension is one among a few other organizations that is well positioned to assist affected communities with long-term disaster recovery. Recovery programming falls well within Extension's wheel house; it can provide swift response to local needs with research-based educational outreach and direct engagement, often accomplished through synergistic work with community partners. Extension's engagement in disaster preparedness and recovery benefits communities because no other entity has the geographic distribution, access to research-based practices, local credibility, capacity, and mission to address the depth and breadth of community needs after such events. Additionally, the goodwill and relationships forged during such trials can go on to facilitate extension programming in an area long after recovery is complete (Kerr, Sanders, Moulton & Gafney 2018).

Given that it is embedded in communities, and has programming visibility, along with existing partnerships, Extension can be a valued, trusted, and effective participant in community-based recovery efforts. In the time of a disaster, a state's Extension Service has the opportunity to be a local beacon of recovery while working side-by-side with others in the community. Serving in this way helps Extension Service grow stronger (Boteler 2007; Cathey, Coreil, Schexnayder & White 2007). Moreover, citizens trust Extension as a credible source of locally relevant information and appreciate Extension's effective connections with other organizations (Eighmy, Hall, Sahr, Gebeke, & Hvidsten 2012). As trusted members of the communities they serve, Extension professionals are strongly positioned to share mitigation and adaptation strategies with their clients (Prokopy et al. 2015). The major strengths of Extension are the dedicated Extension personnel and the Extension model that includes partnerships, state-wide networks of offices, and a unique focus on assessing human and community needs (Cathey, Coreil, Schexnayder & White 2007). Extension staff may consider becoming members of the local emergency preparedness teams and work toward establishing Extension as a valuable resource before, during, and after a disaster (Washburn 2006).

Considering the importance of disaster management, one compulsory non-credit course entitled 'Disaster Management' was introduced in 2009 by ICAR at the Master's level of agricultural

education in Indian universities. This course aims to: introduce learners to the key concepts and practices of natural disaster management; equip them to conduct a thorough assessment of hazards, and risks vulnerability; and build capacity to deal with disasters. Many would argue that such courses are important not only in agriculture but across all disciplines so that all citizens are ready to face, or assist others, as and when required. In Veterinary Education too, such a course would help develop capacities of veterinarians to handle emergencies better.

EAS can join disaster management agencies to contribute in:

- i. Understanding disaster risk, enhancing disaster preparedness for effective response and to 'Build Back Better' in recovery, rehabilitation and reconstruction, and strengthening disaster risk governance to manage disaster risk better;
- ii. Training and education on disaster risk reduction, including the use of existing training and education mechanisms and peer learning;
- iii. Promoting the incorporation of disaster risk knowledge, including disaster prevention, mitigation, preparedness, response, recovery and rehabilitation, into formal and non-formal education, as well as in professional education and training;
- iv. Promoting national strategies to strengthen public education and awareness in disaster risk reduction, including disaster risk information and knowledge, through campaigns, social media and community mobilization, taking into account specific audiences and their needs;
- v. Enhancing collaboration among people at the local level to disseminate disaster risk information through the involvement of community-based organizations and non-governmental organizations.

The EAS can disseminate tailored climate forecasts prepared by meteorological agencies to support farmers' seasonal needs through mobile phones, information centres, community radio, etc., and thus help farmers protect themselves from climate shocks and changes. These advisories, however, have to be context specific and relevant to local situations since generalized messages often prove to be wrong, leading to lack of confidence in them by farmers. RAS can also motivate farmers by enabling them to buy index-based insurance giving them a measure of protection in the event of extreme weather. In this new paradigm,

insurance pay-outs are pegged to easily-measured environmental conditions, or an 'index', that is closely related to agricultural production losses. Possible indices include rainfall, yields, or vegetation levels measured by satellites. When an index exceeds a certain threshold, farmers receive a fast, efficient pay-out, in some cases delivered via mobile phones.¹⁰

In recent times, the instances of social media

use in emergency situations, such as disasters, are increasingly being noticed (Box 3). Social media can act as one potential disaster management tool. A social media platform, such as Twitter, combines human efforts and machine computation to process highly accurate tags and labels for subsets of micro tweets. It coordinates the role of humans and smart-technology to work together and improve disaster response efforts (Anbalagan and Valliyammai 2016).

Box 3: Social Media and Natural Disasters

Those who experienced heavy rain/flash flood in Chennai in the first week of December 2015, also, saw the power of social media in such a crisis situation (Pradnya 2015). Again, the Andhra Pradesh Chief Minister Mr M Chandrababu Naidu used social media and technology to steer the relief work in Vizag which was hit by the devastating cyclone Hudhud in 2014 (Naidu 2014). The use of social networks started right after the city was struck by the cyclone. People started sharing pictures of affected areas on social media, prompting the government to come forward and speed up relief measures. The pictures submitted by the people on social media were collected by the AP government's crowdsourcing project and sent to the National Remote Sensing Centre for geo-tagging locations and putting them on the satellite map to directly identify them. The government, with the help of NRSC, also launched an Android app for a crowdsourcing project where people could upload photos from their smartphones. The Android app had more than 3000 downloads. Mr Naidu also directed NRSC to use GIS, GPS, and remote sensing technologies to spot the damage and put them on the satellite through geo-tagging.

Extension functionaries should have knowledge and skills on the subject of social media and its uses, including the current tools, methods, and models to properly make use of social media for crisis communication. Extensionists need to be equipped with capacities on the use of social media tools, such as Facebook, WhatsApp, Twitter, Youtube, etc. They need to learn and master skills to disseminate information and monitor, track, measure, and analyse social media traffic. Extensionists should be able to use social media as a method to identify warning signs when a crisis is developing, so that they can communicate with stakeholders on handling disasters. Livestock owners may need advisories of various kinds related to feeding, housing and health of their livestock. Creation of awareness for disaster reduction is a felt need for improving preparedness among communities. A good communication network is required to keep all the agencies involved in a state of preparedness in order to manage the disaster as efficiently as possible (Gnanasekaran 2018). In recent times, WhatsApp has become very popular among farmers to share information on farming practices (Chander 2016), which could be even more useful during natural calamities.

We can look for successful initiatives taken around the world, where extension personnel

are well integrated with disaster management efforts. Extension has gained ground in helping communities prepare and recover from disasters in the USA. For instance, the Extension Disaster Education Network (EDEN), created in 1994, is a collaborative multi-state effort by Extension Services across the USA to help extension personnel facilitate preparedness and response services for citizens. Land-grant institutions across the United States and its territories are members of this organization, with each institution appointing EDEN representatives. The EDEN website¹¹ serves as a disaster-related resources portal for extension personnel to share with their clientele to help them prepare for, and stay safe during, and then recover from disasters. Several disaster-related educational programs are available through EDEN.



¹⁰<https://ccafs.cgiar.org/themes/index-based-insurance#.U6A2hPm1a-0>

¹¹<http://eden.lsu.edu>

One example is the Family Preparedness training, a classroom program developed to teach families and individuals how to make family disaster kits, develop a family disaster plan, and be informed about and prepared for various disasters. These resources should be used to help organizations and government fill some of the family- and child-oriented gaps in state and local disaster plans (Black 2012). EDEN has opened the door for extension personnel to work in the emergency management field, since extension through the resources available from EDEN can serve their stakeholders in times of need (Koch 1999). The Extension Disaster Education Network links land-grant institutions with disaster management. The efforts of EDEN representatives have provided the necessary 'foot in the door' attribute needed to work in the field and it serves as a portal for disaster-focused resources.

Way Forward

To sum up, Extension's engagement with disaster management efforts can effectively contribute by:

- Increasing literacy among extension professionals in every sector on potential regional impacts and adaptation strategies with regard to climate change. This is key to producing high-quality relevant programs for addressing climate-related risks. Given the urgency of addressing climate-related issues and the range of climate-related perspectives among extension professionals, thoughtfully designing programs to build climate literacy across and within climate-perspective groups are a critical path forward (Clifford & Monroe 2018). EAS need to develop capacities so that extension professionals can assist effectively

in all stages of disaster management, viz., preparedness, response, recovery, and mitigation. EAS can promote disaster resilient practices among farmers, facilitate rural / local agriculture innovation systems to mitigate disaster, and educate farmers on standard operating procedures (SOPs) to get post-disaster relief services and in-kind materials. EAS can also scout around for relief materials, aid and other contributions, through corporate social responsibility (CSR). To revive human and livestock habitats, health and agriculture, EAS can train and facilitate the people – involving faculties, scientists including students of agricultural research and academic institutions, and other stakeholder institutions.

- EAS could be of great help in disseminating correct information about safe places, rescue operations, ways to safeguard people and animals, first-aid methods, and in-kind relief material distribution places, through authorised institutions using personal communication, public address system, mass media, social media, flyers, and other appropriate mass media to people. Also, developing simple extension literature, such as 'Do's & Don'ts' during disasters could be a big help to affected communities.
- Extension is uniquely positioned to assist with community disaster preparedness, mitigation, and response efforts; so this needs to be outlined in the National Preparedness Goal. We need to document examples of Extension's involvement in disaster management and its contributions in the many aspects of community emergency preparedness.



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DEMONETISATION AND AGRICULTURE: LESSONS FOR EXTENSION AND ADVISORY SERVICES

The recent demonetization exercise by the Indian Government has impacted farmers adversely, at least in the 'short run'. At the same time, has it also opened up new possibilities of digitizing money handling in the agricultural value chain? Arun Balamatti explores these issues in this blog.

In 2016, the Indian government decided to recall all 500 and 1000 rupee notes, the two biggest denominations in its currency system; these notes accounted for 86 per cent of the country's circulating cash. With little warning, India's Prime Minister Narendra Modi, announced to the citizenry on November 8, that those notes were worthless, effective immediately – and they had until the end of the year to deposit or exchange them for newly introduced 2000 rupee and 500 rupee bills. In his address, the Prime Minister cited multiple justifications, including (a) eliminating black money; (b) reducing the prevalence of counterfeit currency, which is allegedly used to fund terrorism against India itself; and (c) curbing corruption and criminal activity of various kinds that have been facilitated by the 500 and 1000 rupee notes. Although none of these reasons have much to do with agriculture, the sector seems to have been impacted rather harshly.

Effect of Demonetization on Agriculture

Transactions in the Indian agriculture sector are heavily dependent on cash and were adversely affected by the 'demo' of 500 and 1,000 rupee notes. Due to scarcity of the new banknotes, many farmers had insufficient cash to purchase seeds, fertilisers and pesticides needed for Rabi crops usually sown around mid-November.

Box 1: Demonetisation

Demonetisation ('demo') is essentially a financial tool used by the government for specific reasons. 'Demonetization' is defined as the act of stripping a currency unit of its status as legal tender. It occurs whenever there is a change of national currency; the current form or forms of money is pulled from circulation and retired, often to be replaced with new notes or coins and sometimes, a country completely replaces the old currency with new currency. There are multiple reasons why nations demonetize their local units of currency and these include, combating inflation, corruption and crime (counterfeiting, tax evasion); discouraging a cash-dependent economy and facilitating trade.

Source: Investopedia (2017)

The demonetization came at a time that coincided with the end of the Kharif season (harvesting) and the beginning of Rabi (sowing). Therefore, the effect of demonetization hit all the farmers, those who were selling their produce and those who were about to buy seeds, fertilizers and other inputs.

The 'demo' led to unavailability of cash to pay for food products. The reduction in demand that arose in turn, led to a crash in the crop prices. Farmers were unable to recover even

the transportation costs from their fields to the market, due to the low prices offered. The prices dropped as low as 50 paise per kilo for tomatoes and onions. This forced the farmers across the country to dump their products in desperation. Some farmers resorted to burying unsold vegetables. Agricultural produce such as vegetables, food grains, sugarcane, milk and eggs were dumped on roads. Some farmers dumped their produce in protest against the government. Farmers and their unions conducted protest rallies in Gujarat, Amritsar and Muzaffarnagar against the 'demo' as well as against restrictions imposed by the Reserve Bank of India on district cooperative central banks, which were ordered not to accept or exchange the demonetised banknotes.

The predictions, prophecies and volatile sentiments were laden with anxiety, caution, frustration as well as optimism with one common 'caveat'; demonetization would cause short term discomfort but bring benefits in the long term. The varied perceptions on 'demo' were largely in the form of informed as well as ill-informed opinions on what might happen rather than certainty of such effects.

Shepard (2017), writing for Forbes, describes the impact of demonetization thus far: Modi's demonetization initiative caused a sudden breakdown in India's commercial ecosystem. Trade across all facets of the economy was disrupted, and cash-centric sectors like agriculture, fishing, and the voluminous informal market were virtually shut down, with many businesses and livelihoods going under completely—not to mention the economic impact of millions of people standing in line for hours to exchange or deposit cancelled banknotes rather than working or doing business.

Shaffer (2017) quoting Faraz Syed, an associate economist at Moody's Analytics, pointed to a reason that demonetization might lay less of a cold hand than expected on the economy. Syed said, "Because of demonetization, while lending rates have come down, bank deposits have increased; if those lower lending rates can be translated into higher investment, then there's certainly going to be less risk from demonetization."

Bansal (2017) wrote, after demonetization, only the agriculture sector showed some positive improvement while the manufacturing and service sector both crashed down and these are likely to affect the whole Indian market in 2017 also. Discussing the impact of demonetization on agriculture sector, Bansal said, there are short-term and long-term impacts of demonetization on different sectors of economy. Agriculture sector

typically sees high cash transactions and therefore near-term impact could be seen till liquidity is infused in the rural areas. As farmers face a temporary shortage of cash in hand, it could lead to a delay in payment, which in turn would hurt the related companies in the short term. As liquidity eases and cashless transactions gain acceptance, the fundamentals would be driven by the longer-term drivers of normal monsoons and positive traction in acreage. Presenting the findings of his study of impact of demonetization on agriculture, he noted the following -

Agricultural growth in India contracted by 0.2 per cent in 2014-15 and grew no more than 1.2 per cent in 2015-16, largely because of back-to-back droughts. It was expected to grow at 4 per cent this year, but due to demonetization, this forecast has not materialized as farmers are running out of cash to buy seeds, fertilizer, equipments and pay wages to workers, commission to agents, etc. Because of cash shortage, the daily supply from the transport system has also suffered, which has resulted in 25 to 50 per cent reduction in sales. The main reasons being,

- Farmers are not well educated and are not aware of how to make use of the E-Payment System; a recent study by RBI shows that 78 per cent of the population do not use internet of which almost 80 to 85 per cent are farmers.
- In most villages a proper banking system has not been developed and hence villagers needed to go to the cities for exchanging the old notes.

However, there is some light at the end of the tunnel if one were to believe what Srinivas (2016) says, "It is a myth that farmers refuse to accept cheque payment. Small dairy farmers in Andhra Pradesh accept cheques. Sugarcane farmers accept cheques from sugar factories. Moong farmers are accepting cheques from government procurement agencies. Apple farmers accept cheques from large buyers. Potato contract farmers accept cheques from food companies. Maize farmers in Nabrangpur, Odisha's poorest district and coconut farmers in Karnataka took cheques from state agencies. The list is growing."

In Karnataka and Andhra Pradesh, which have adopted the Rashtriya eMarket Services-run Unified Markets Platform, produce worth Rs39,000 crore has been sold with cheque payment in the last four years. The 250 *mandis* in 10 states that have adopted the electronic National Agricultural Market (eNAM) platform for sale of primary produce are designed for cheque payment. So far, 1.60 lakh farmers, 46,000 traders and 26,000

commission agents have been registered on the e-NAM platform.

Food Corporation of India tried but failed to pay Punjab and Haryana farmers by cheque for wheat, only because the powerful commission agents want to first deduct the loan repayment amounts. Direct benefit transfer for seeds has been a success even among the small and marginal farmers of Uttar Pradesh. Moreover, of the seven

crore Kisan Credit Cards issued in India, more than one crore are ATM-enabled debit cards. Farmers accept insurance and disaster relief cheques. So to portray the farmer as a Luddite is both unfair and untrue.

Chand and Singh (2016) have looked into the possible effect of demonetization on agriculture in a more comprehensive way (Box 2).

Box 2: Potential impact of demonetisation on agriculture

Demonetization can affect agriculture directly in four ways. These include area sown, crop pattern, productivity and market.

Effect on Sown Area: According to the tentative estimate of area sown up to 11 November, at the start of demonetization, Rabi sowing was completed on 14.6 million ha area which was 5.7 per cent lower than the normal crop coverage. The gap between area sown this year and normal area steadily declined almost every week since the announcement of demonetization. During the week ending 30 December, 2016, net sown area under Rabi crops exceeded the normal area by 2.77 per cent and area sown last year by 6.86 per cent. There was a delay of 1-2 weeks in sowing this year in the beginning of Rabi season, but it picked up pace subsequently. Normally, Rabi sowing is completed on 88 per cent area by 30 December. This year (2016) it has been completed in more than 91 per cent area. The data on progress of sowing of Rabi crops clearly indicate that, at the country level, there is absolutely no adverse effect of demonetization as far as sowing of major crops is concerned.

Crop-wise effect: The progress in area sown remained uneven across regions and crops. Wheat, which accounts for 47 per cent of total area under the reported Rabi crops, showed a big shortfall of 41 per cent in area at the time of demonetization. The gap declined to less than 1 per cent by mid-December, 2016 and crossed normal area by 2.12 per cent by the end of December. Compared to the corresponding period last year, wheat has been sown in 7.7 per cent greater area. Area under pulses and oilseeds is higher than normal for the corresponding period by 11.2 and 1.7 per cent, respectively. The shortfall in area is reported for Rabi rice and coarse cereals. This shortfall is much smaller (6.6 lakh ha) compared to the gain in area under wheat, pulses and oilseeds (22.3 lakh ha) resulting in net increase in area under Rabi by 15.7 lakh ha over normal area and 37.4 lakh ha over last year.

Among major Rabi crops growing states, overall shortfall in sown area is about 20 per cent in Tamil Nadu and Karnataka and 8 per cent in Gujarat and Andhra Pradesh. Similarly, Jammu & Kashmir and Himachal Pradesh also show major deficit in Rabi sowing. Largest shortfall is seen in Kerala. All other major states indicate small to large increase in crop sown area this year over normal area. Even Uttar Pradesh, which was persistently showing shortfall in area, has reached higher than normal figure.

Effect on Productivity: Farmers use cash to buy quality seed, fertilizers, chemicals, diesel and to hire labour and machinery. More than 7 per cent seed used for Rabi crops are self-produced while the rest is purchased from public sector agencies, research institutes and private sources. Sale of seed this year by public institutions is reported to be much lower than normal sales. This can have small impact on productivity.

The major impact on productivity is going to happen due to change in use of fertilizer. According to the Ministry of Agriculture source, fertilizer off-take during the current Rabi season (till 21 December 2016) was lower than the fertilizer off-take in the corresponding period, during 2014-15 and 2015-16 by 7.47 per cent and 7 per cent. If fertilizer use at farm level faces the similar shortfall as reported in fertilizer sales at first point, it will affect productivity. It is estimated that current shortfall in fertilizer consumption if it persists till the end of Rabi season, which constitutes half of annual agricultural output, can result in 1.05 per cent decline in crop output and 0.75 per cent decline in agricultural output.

Effect on Prices: No effect of demonetization was seen on prices of major crops like paddy, soybean, and maize in the month of November and their wholesale prices in Agricultural Produce Market Committee (APMC) mandis of the country were around 3 per cent higher in November as compared to the month of October. While the prices of maize and soybean fell in the month of December, paddy prices ruled higher than previous two months and also as compared to last year. There might be some delays in payment to the farmers due to cash crunch but that is a temporary phenomenon.

The perishables, vegetables and fruits, in most markets and states, showed a drop in market arrival as well as in prices, post demonetization. Wholesale prices of banana, apple, tomato and cabbage in the month of November in the APMC mandis of the country, taken together, were 3.80, 3.86, 8.47 and 5.6 per cent lower, compared to the month of October, respectively. These changes indicate that income of producers of perishable commodities suffered due to fall in prices in the month of November. Seasonal glut and bumper

crops seem to be the major reasons for crash in vegetable prices in the month of December 2016 in some states.

Effect on Output Growth: The situation prevailing at the end of December 2016 implies that Rabi crop output will increase by 6.02 per cent over last year, due to higher area sown. Lower use of fertilizer, as observed from the first point sale, can cause 1.06 per cent decline in output during Rabi season. These two factors put together, imply that Rabi output in 2016-17 could be 4.96 per cent higher than in 2015-16. Lower sale of quality seeds due to cash crunch can also affect growth but this impact is expected to be small.

The growth rate in farmers' income is projected to be slightly lower, due to drop in prices of perishables during the months of November and December. The net effect of fall in prices on the farmers' income, is estimated to be -0.26 per cent. Factoring this change, farmers' income in year 2016-17 is projected to witness increase of 5.8 per cent in real terms. The above discussion shows that growth story of agriculture is intact as demonetization is found to cause small and insignificant effect on growth of output, as well as on farmers' income. Agriculture, which is the largest informal sector in Indian economy, has shown strong resilience to the effects of demonetization.

Source: Chand and Singh (2016)

Renu Kohli (2016), an economist, predicts, "Production in 2016-17 could drop if sowed acreage (Rabi) reduces for want of enough seeds, on time to exploit the adequate soil moisture. Yields could fall from late sowing and subsequent exposure to rough spring weather, the lack of sufficient or timely application of fertilizers, pesticides, etc. Farm labour, vital for this period, is reported to be unpaid as farmers have no cash. Many of them are reported to be returning from some northern parts to homes in Uttar Pradesh and Bihar. Labour shortages and wage-spikes may follow with a lag.

In a complete contrast to the fears of economic slowdown, expressed by both critics as well as supporters of the demonetization idea, the government's demonetization program barely dented India's economic momentum in Q3 FY 2016, according to recently released data by the Ministry of Statistics and Programme Implementation (MOSPI). GDP expanded a healthy 7 per cent annually in the October to December period, below the 7.4 percent expansion reported in the previous quarter, but nearly a full percentage point above market expectations (Bouzanis, 2017).

Here is the latest critique on 'demo' by Langa and Sriram (2017), who wrote in The Hindu, "In addition to low prices, what has aggravated the situation is the Central government's demonetisation move late last year that has adversely hit the rural and agrarian economy". They go on to add, "Note bandi has almost finished us in the rural areas. Even after selling our produce, we don't get money in our hands for at least two-three weeks and sometimes even a month," quoting Lalchand Mali, a farmer from Barkheda Panth. While the critics, during the early days of 'demo' were saying the cash crunch could lead to reduced investments on seeds, fertilizers etc., and hence reduced production, the criticism is now directed at bumper crops, causing market gluts and price crash.

The delayed payments could be hurting farmers when they sell their produce, but the same authors, Langa and Sriram (2017), in the same article, seem to contradict themselves by saying, "From a persisting cash crunch due to demonetisation to a price free fall because of a bumper produce, it's a big bag of woes for farmers in Madhya Pradesh and Maharashtra. Agricultural expert Devinder Sharma, on the other hand, doesn't blame it on 'demo', but says, "Over the years, the government has deliberately impoverished the agriculture sector. Our economic policymakers are pushing people in agriculture to cities to get cheaper labor for industrial infrastructure and to keep food prices low so inflation does not increase (Firstpost, 2017)".

As it always happens with every ambitious policy, more so with a policy causing an impact of the magnitude that 'demo' has caused, there will be fierce criticism as well as appreciations, depending upon which side of the fence one wants to choose. But reality is that, there is a need for preparing the farmers to live in the 'post demonetization era'.

Lessons for Extension and Advisory Services

Extension and Advisory Services (EAS) have a crucial role to play in helping farmers deal with challenges of all sorts, including those that have emerged due to demonetisation.

Discussing post 'demo' ways of handling agricultural transactions in a workshop with the farmers, the author could experience the real and the perceived problems that could challenge the pace at which the digital economy starts rolling. It is not just the shortage of small currencies, power cuts and server breakdowns; rather, there is a huge psychological barrier and cultural baggage to deal with before the cash-dependent working class starts using banks, credit-debit cards, e-wallets and so on (Box 3). It is not a comfortable feeling at all, going to the bank in the first place,

the farmers may not say it but it is no secret - the ignominy they face from the banking staff, more so if they happen to be illiterate, poor and ill-clad.

The farmers are now fearing handling large monies, when they are selling their produce in the wake of limits on daily/ weekly transactions; they do not understand it is legitimate money earned out of their farming, for they are clueless on making black money from white; they do not feel comfortable going to banks with wads of currency; they fear their privacy is compromised the moment they deposit the money into bank accounts; culturally, they are used to keeping out their financial transactions from their friends, neighbours and relatives.



Box 3: Behavioural change to adapt to demonetisation

As the demonetization campaign progressed, its narrative gradually transitioned from being a measure to fight corruption, to one to modernize a large swath of India's economy. Prior to this campaign, most of the country was firmly entrenched in the cash economy and there was very little incentive to break the generations-old habits, get bank accounts and go financially digital. But temporarily removing the society's access to cash, pushed millions of people onto India's formal economic grid by all out fiat, wrote Shepard (2017) and he quoted another author Monishankar Prasad, "The unbanked and informal economy is hard hit. The poor do not have the access to structural and cultural resources to adapt to shock doctrine economics. The poor were taken totally off guard and the banking infrastructure in the hinterland is rather limited. The tech class has poor exposure to critical social theory in order to understand the impact on the ground. There is an empathy deficit".

While farmers could benefit from the ICT tools like Loop Mobile App introduced by digital GREEN in Bihar, (digital GREEN 2017), wherein aggregators come in to help farmers sell their produce in markets that offer best price. Srinivas (2016) wrote, "To convince agri-input agents and other merchants, the government should make it easier and cheaper for them to adopt card payment and mobile wallets on a trial basis. Shopkeepers should be educated about how they can expand business by moving from 'cash only' to 'cash and card', because it attracts more customers. Those customers also spend more because they are not hampered by lack of cash. Once village retailers accept digital payments, rural customers will follow. Exactly the way mobile wallets picked up with Ola and Uber. Economists call it the network effect." Srinivas went on to write, "Once the agricultural value chain adopts electronic payments and cleans up its books to align itself with the financial supply chain, benefits will follow. The biggest will be the inflow of private and banking capital, which is waiting to power agricultural growth, and social impact capital to improve rural lives".

That underscores the need for improving farmers' financial literacy, which the EAS haven't addressed so far. EAS will have to target not only farmers, but all other actors in the agricultural value chain not only in terms of educating everyone on

the information and skill requirements related to digital transactions but also on how each stakeholder forms a link in the chain, to help farmers adapt to the new situation.

The banking staff and the government machinery need to be taught to be empathetic and courteous and not merely work on simplification of procedures and reducing paperwork. Similarly the banking and government servants, should enhance the capacities of small traders, commission agents, and whole set of operators at regulated markets etc., as this is of equal importance to complete at least one cycle of digital transactions. Rural infrastructure, especially power and internet services have to get far better than what they are at the moment before digital economy picks up trust from the cash-dependent communities. Without this, not only the banking services but also the delivery of information and technology through ICTs are likely to take the hit.

Way Forward

Results of the latest elections in 5 states, particularly Uttar Pradesh, seem to have silenced the critics of demonetization; ironically, the political triumph of the ruling government, more so in this state of Uttar Pradesh, has reinforced the positive economic indicators of Q3 of FY 2016-17.

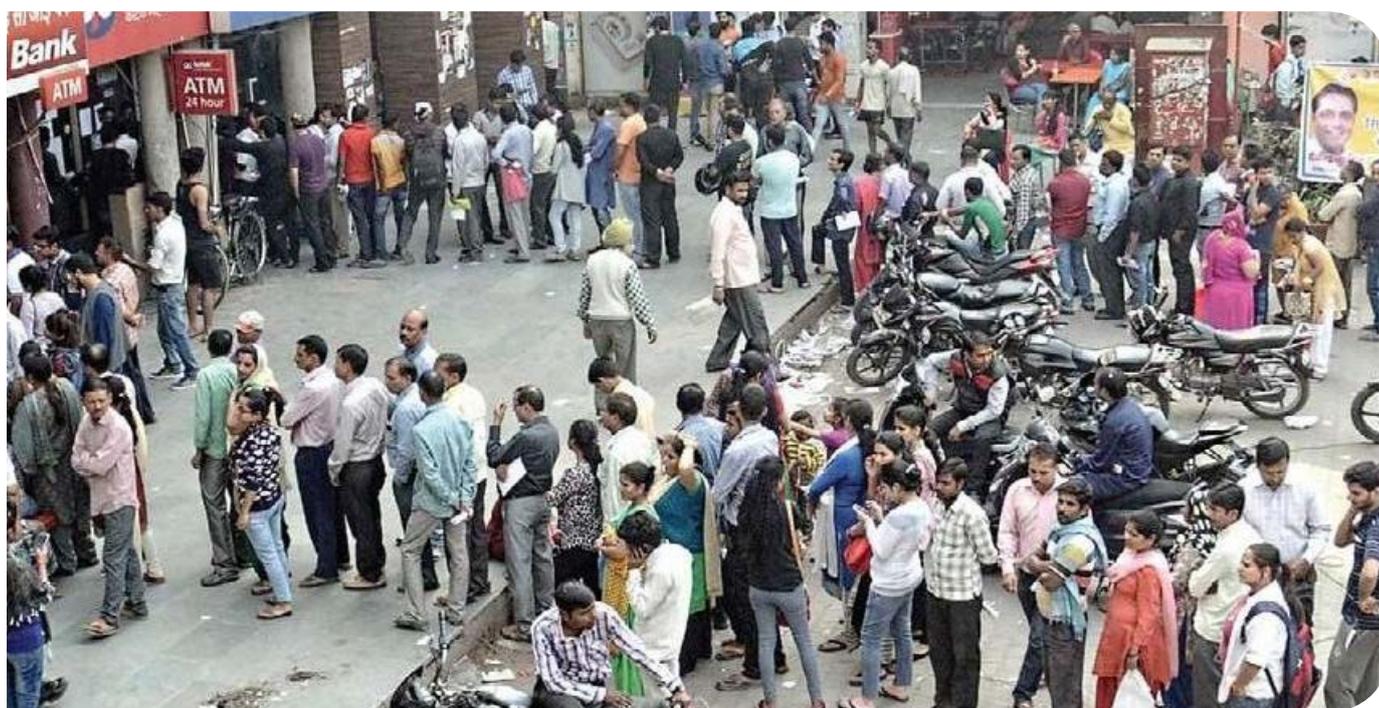
It is true that the small and marginal farmers who

sell off their produce in the village itself are hurt by the 'demo'. Similarly, value chains with minimal processing and direct consumer sales such as fruits and vegetables are hit. Most fresh produce are sold by small hawkers and vegetable mongers in the streets of India. Since they take payment in cash and buy their wares from the *mandi* in cash, their business is down.

Visible difference will come if the government uses 'demo' to persuade two intermediaries in the value chain — the traders and the village shopkeepers — to adopt electronic payments. All the APMC markets are regulated by the state governments and are used by larger traders. They should be made cash-free. Cash is an inefficient medium of exchange. The World Bank estimates that the Indian government can save one per

cent of the GDP annually from digitising current cash-based subsidies alone. Farmers, traders, processors and retailers will never again blindly trust cash. That makes it the perfect opportunity to prise open closed minds and introduce new payment habits in this otherwise opaque part of the economy (Srinivas, 2016).

EAS have an urgent and important role to play in enhancing the capacities of farmers and other stakeholders in the agricultural value chain to adapt to digital transactions. But to do this effectively, the capacities of EAS providers need to be enhanced, especially on the implications as well as opportunities emerging on account of 'demo'. Apparently the agenda or the mandate of EAS should also be broadened to include this topic at the very top of the priority list.



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INSTITUTIONAL CHANGE AND ADAPTATION TO CLIMATE CHANGE

Agricultural extension system has been slow to adapt and communicate climate science to farmers, as there is still limited institutional priority accorded in processing and communicating the scientific knowledge, opines Hemant R Ojha.

Adapting agriculture to climate change has now become a matter of widespread concern among scientific community and policy actors in South Asia. Recent studies have documented various aspects of climate change impacts on agro-ecological and hydrological systems and how it will impact the wider socio-economic system. Along with the growing number of analysis of the meteorological data, farmers' perceptions of climate related risks and their responses are also being documented. However, there is still little knowledge on how the key actors in agricultural systems - the farmers, service providers and regulators - perceive, learn and respond to diverse impacts of climatic change and variability on agro-ecological systems.

Southasia Institute of Advanced Studies (SIAS), Nepal and its India (Centre for Research on Innovation and Science Policy) and Bangladesh (Flood Hazard Research Centre) based partners collaborated with the CGIAR program on Climate Change, Agriculture and Food Security (CAAFS) to study what innovations and challenges exist in the Indo-Gangetic Plains (IGP). We collected evidence from 15 sites in Nepal, India and Bangladesh. One of the questions we looked at was - how and to what extent the different stakeholders (both state and non-state), are helping farmers to adapt to climate risks. The study blended qualitative and quantitative methods – combining case studies with survey research methods. A range of qualitative tools were used, including focus group, key informant survey, interactive field observation, semi-structured interviews and others.

Findings

The study confirms that farmers in the IGP have experienced diverse forms of climatic change in the recent years. This increasing exposure to climate risk is also supported by available scientific evidence. This study identifies diverse adaptive and innovative responses to such climatic shocks that have emerged at individual farms and community levels.

Climate Adaptive Innovation Threads

When farmers have access to services and information, they have resorted to more climate adaptive and innovative practices – such as changing cropping patterns, containing climate induced risks, improving common lands management, and adopting technological options that have become available in the recent years. We have identified 10 different types of what we called *adaptive innovation threads* - involving creative responses to risks as well as opportunities in the changing socio-economic context of South Asia.



While farmers, local communities and locally based NGOs are catalyzing a wide range of adaptive innovations, more established agricultural institutions are yet to be ready to learn from these innovative practices, much less scale up through needed institutional and policy change. On the contrary, farmers' ability to engage in innovative practice is substantially shaped and determined by the stakeholders operating at local and meso levels, whose efforts are in turn affected by state governments and national policy. It is therefore important to see farmer innovation capacity in relation to wider institutional capacity in agricultural system to generate and translate scientific information, offer institutional and technological development advice, and broker resilient change at across multiple scales.

Communicating Climate Science

Strong gaps exist between predicted level of climate change and the actual adaptive actions among both the farmers and other locally based agriculture stakeholders, suggesting the deficit of processes and institutions to facilitate adaptive innovations. By and large, climate science data still remains within the research institutions, not readily accessible to agricultural actors. Agricultural extension system, which is largely within government, is also slow to adapt and communicate climate science to farmers, as there is still limited institutional priority accorded in processing and communicating the scientific knowledge.

In particular, this study shows that the role of NGOs, local governments, agricultural extension and communication agencies, technology service providers are all important, whose capacity is in turn contingent upon the assistance of international organizations, research agencies, government subsidies and funding,

and overall policy environment at state and national levels. Despite information revolution and universal acceptance of participatory strategy in management and policy, channels of communication and interactions between farmers and these agencies are weak, often top-down, driven by an orientation to upward accountability, and having scale bias (with a tendency to plan and act at higher scales than farmers would meaningfully benefit). As farmers are the ones who experience the effect of climate change before other service delivery organizations, it is crucial for other stakeholders to be more democratic and interactive with farmers while formulating strategies for adaptation at district and sub-national levels.

Need for Institutional Change

The dominant narrative of adaptation emerging within the discourse of climate policy appears to 'target' farmers, but fails to appreciate the crucial need to adapt institutions at higher scales of agricultural governance. There is now an urgent need to transform agricultural institutions, not only because farmers' capacity to adapt is determined by the responsive and accountable regulatory and service providing institutions, but also because it is through these institutions that the short term and farm level adaptation actions of farmers could be integrated with the large scale agricultural landscape management and adaptation. The current adaptation narrative has a tendency to leave the burden of innovation to farmers, while overlooking the massive restructuring needs of external institutions, including extension. This is also related to a question of how farmers' contributions of environmental and public goods – in terms of enhancing food security, soil conservation, agro-biodiversity management - are compensated in a fairer way.

Way Forward

Given the uncertainty around the future effects of climate change on agriculture, compounded by fluctuating market trends of agricultural commodities, questions persist as to how agricultural actors will be able to integrate 'a comprehensive and dynamic policy approach, covering a range of scales and issues, from individual farmer awareness to the establishment of more efficient markets. The evidence from South Asia now clearly shows that the 'unfinished' agenda of green revolution has now met with a new imperative of adaptation.

In order to consider such issues in adaptation planning and policy process, we need to consider 'adaptive innovation' thinking, integrating both adaptation and innovation in a single work

package. This view can offer a new conceptual tool to understand how agricultural system can adapt to climate risks on the one hand, and improve production and equitable benefit sharing, on the other. The adaptive innovation thinking also needs to recognize cross-scale and inter-sectoral processes of extension, learning and communication.

Both adaptation and innovation happen in particular institutional context, and therefore it is now time to think more fundamentally about how institutional structures change and become part of adaptive innovation dynamics. Those who aim to catalyze adaptive innovation must identify and act upon actionable opportunities for reshaping institutional boundaries and nurturing innovative agency for climate-smart agriculture in the developing countries.



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FARMERS' SUICIDES IN INDIA: TRENDS, RISK FACTORS AND PREVENTION

Increasing farm distress and the resulting farmer suicides are areas that need urgent attention. A key aspect of any suicide prevention strategy is our ability to understand the suicide process and manage the predisposing, protective, and precipitating factors so as to prevent these suicides. Extension services should play a crucial role in preventing farmers' suicides – by assisting them to fathom the stress and suicide process, identifying vulnerable groups, providing telephonic advice and counselling, and creating community-based institutions that can educate and help farmers, argue P Sethuraman Sivakumar and P Venkatesan here.

Despite its substantial presence and contribution to rural livelihoods, Indian agriculture faces several challenges. These include: shrinking size of landholdings, unstable markets, erratic climatic conditions, and a gradual decline in the availability and productivity of natural resources, which has currently led to a distress-like situation, which adversely affect the farmers. Farmers' suicides (Box 1) are becoming a major socioeconomic issue in India, leading to farmers' agitations and political debates. Farmers' suicides result in immeasurable social, psychological, and economic costs to families and rural communities (Lovelock and Cryer 2009). At the family level, farmers' suicides have caused breaks in children's education, development of anxiety and stress disorders in family members, reduction in household income in the Vidarbha region of Maharashtra (Kale et al. 2014), and in Punjab it has led to reduction in the size of operational holdings, loss of dairy animals, and significant yield reduction in high value crops (Singh and Singh 2016).

Agriculture as a Stressful Occupation

Agriculture is considered as a stressful occupation (Keating 1987), operated in complex, diverse and risk-prone environments. It also makes farmers vulnerable to physical, biological, chemical, mechanical, and psychological hazards (Gerrard 1998; Fraser et al. 2005). The National Safety Council, USA, sited agriculture as one of the leading occupations producing high stress among farmers (National Safety Council 2016) while farming was identified as the fourth highest risk occupational group in the UK (Kelly et al. 1995). Studies in the USA (US Dept. of Labor 1999), Canada (Pickett et al. 1999), and Australia (Fragar and Franklin 2000) have identified farming as one of the most dangerous industries (Gerrard 1998; McCurdy and Carroll 2000), and as being associated with high rates of stress (Simkinet al. 1998). Research studies conducted in several countries indicated that farmers are more vulnerable to stress and other psychological hazards which lead to suicide (Box 2).

Agriculture is a risky and stressful occupation mainly due to the following factors:

- 1. Multiple Uncertainties** - Farmers are subject to the uncertainties of climate and other natural forces, unstable market conditions, changing consumer demands, fluctuating interest rates, and changing global agricultural conditions and policies.
- 2. Diverse working conditions** - Farmers work for long hours in physically demanding environments under a range of varying light and weather conditions (McCurdy and Carroll

Box 1: Farmer Suicides in India

Official estimates indicate that over 11,000 farmers are committing suicide every year, which is 11.2% of all suicides reported in India (National Crime Records Bureau 2015). The United Nations Commission on Sustainable Development (UNCSD) indicates that one farmer committed suicide every 32 minutes in India between 1997 and 2005. The details of farmers' suicides in recent years (2015, 2016) as compared with 2001 is displayed in Table 1.

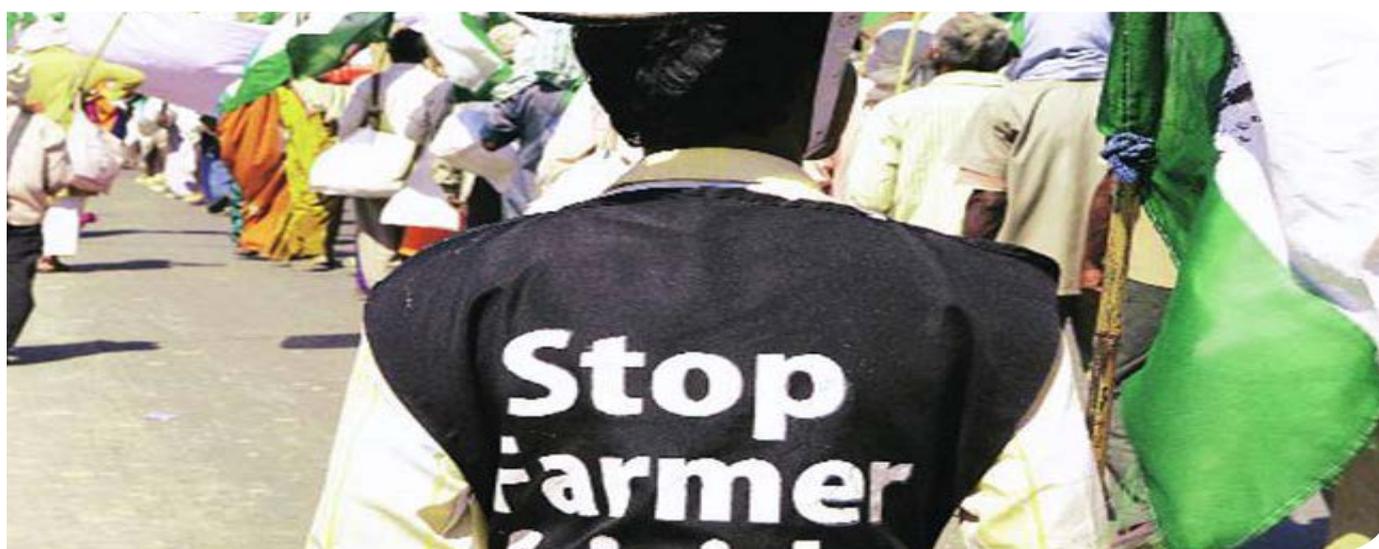
Table 1: Farmers' suicides in India

No	State	Total No. of farmers' suicides			
		2001	2015	2016	% Change between 2001- 2016
1	Punjab	45	124	271	502.22
2	Haryana	145	162	250	72.41
3	Karnataka	2505	1569	2079	-17.01
4	Gujarat	594	301	408	-31.31
5	Madhya Pradesh	1372	1290	1321	-3.72
6	Telangana	0.00*	1400	645	-
7	Maharashtra	3536	4291	3661	3.54
8	Andhra Pradesh	1509**	916	804	-46.72
9	Chhattisgarh	1452	954	682	-53.03
10	Other states	5257	1595	1249	-76.24
	Total	16415	12602	11370	-30.73

Analysis of data presented in Table 1 indicates that farmer suicides are decreasing over the years, but showing an increasing trend in a few states like Punjab, Haryana and Maharashtra. Among the farmer suicide deaths reported in 2016, nearly one-third of these deaths were reported from Maharashtra (3661), followed by Karnataka (2,079), and Madhya Pradesh (1,321), as per data shown (The Hindu Business Line 2018). These states, together with Chhattisgarh, Andhra Pradesh and Telangana, have over 80% of the farmer suicides reported from India.

**Data not available for 2001; **Data for undivided Andhra Pradesh.*

Source: National Crime Records Bureau, 2001; 2015; The Hindu Business Line, 2018.



2000), with work practices involving high health risks including chronic exposure to pesticides and other chemicals (Von Essen and McCurdy 1998; Rautiainen et al. 2005) along with handling heavy farm machinery.

3. Multiple work roles - Farmers also hold multiple work roles in farms, households and off-farm responsibilities that are performed with limited time, resources and energy.

Box 2: Suicides: Are farmers at a higher risk globally?

Farmers' suicides are reported as socio-economic problems in several countries, including Australia (Fragaret al. 2008; Andersen et al. 2010; Perceval et al. 2018), Brazil (Meneghelet al. 2004), Canada (Pickett et al. 1998), China (Law and Liu 2008), France (Bossardet al. 2016), New Zealand (Gallagher et al. 2007; Walker 2012; Beutrais 2018), Switzerland (The Local Ch 2018), UK (Charlton 1995; Thomas et al. 2003; Johnswire 2018), Japan (Nishimura et al. 2004), and USA (Kposawa 1999; Ivanova 2018).

There is growing evidence that farming is an occupation with a higher risk for suicide than other occupations (Milner et al. 2013). Two studies conducted among farmers of UK (Gregoire 2002; Thomas et al. 2003) found that the suicide rate among farmers was higher than in other occupational groups. Field survey revealed that the feeling of hopelessness in present life was two-and-a-half times higher among farmers than non-farmers. The suicide rate for Australia's male farmers is about double the general male population, sitting at 32.2 compared with 16.6 per 10,000 (Bryant 2018). Analysis of farmer suicides in Australia indicated that agricultural labourers and farmers/farm managers were identified as having higher suicide rates than those in other occupational groups (Fragaret al. 2008; Kennedy et al. 2014). Similarly, the New Zealand farmers engaged in crop farming, fisheries, and forestry had higher suicide rates than those in other occupations (Gallagher et al. 2007). In the UK, during the period 1993-2008, the relative suicide rate among farmers was 1.5-2.5 times higher than among the non-farming population (Hounsome et al. 2012). Farmer suicides are about 11% of the total suicides reported in India (National Crime Records Bureau 2015). The study conducted by University of Bern among 1.8 million Swiss men aged 35 to 74, estimated that farmers are 37% more likely than other men in rural communities to commit suicide (The Local Ch 2018). Similar trends were observed in China too (Law and Liu 2008). A recent study conducted by the Centers for Disease Control and Prevention (CDC), USA, found that workers in farming and related industries have the highest rate of suicide at 84.5 per 1,00,000 as compared to those in other occupations (McIntosh 2016).

These factors make farmers vulnerable to hazards and mental problems such as high levels of stress (Booth and Lloyd 2000), depression and anxiety (Eisner et al. 1998), diseases like heart and artery disease, hypertension, ulcers, and nervous disorders (Fetsch 2018; Grant et al. 2009), physical injury and suicide (Booth et al. 2000; Page and Fragar 2002).

Socioeconomic Risk Factors and Processes associated with Farmers' Suicides

Considering the nature of agriculture as a stressful occupation associated with high vulnerability of farmers to physical and psychological hazards, the suicidal behaviour of farmers need to be assessed. Several studies indicate that the suicidal behaviour of farmers is a context-based phenomenon caused through interplay of multiple biological, psychological, family, social, cultural, and environmental factors (Moskoset al. 2004; Bridge et al. 2006; Consoliet al. 2013). These factors are largely influenced by country-specific production trends, demographic shifts, trade reforms and policy changes. The macro-level trends in Indian agriculture which influence farmers' conditions are as follows:

Suicide is the act of intentionally ending one's own life (Nock et al. 2008), which is essentially an outcome of harmful psychological processes. Suicide is seen as an extreme end to a continuum of psychological stress, distress, and tragedy for individuals, their families and communities

(Boulanger et al. 1999). The suicidal process has several interlinked factors and events, such as a pre-disposition to risk or stress factors, onset of stress, poor coping ability of such individuals to manage stress, vulnerability of individuals to psychological hazards, occurrence of precipitating factors which trigger suicidal ideation (thoughts), which then leads to inhibition due to protective factors or suicide guided by facilitating factors.

Based on a critical review of studies conducted on farmers' suicide in different countries, a suicide model is proposed (Figure 1) integrating various predisposing, protective and precipitative factors of farmer suicides into the popular Clinical presentation of suicidal behaviour model (Shaffer and Pfeffer 2001) and the Model of stress, distress, and psychiatric illness (Terluinet al. 2004). The proposed suicide model presents a sequential view of various factors or events leading to a farmer's suicide. The various suicide factors depicted in the model are compiled from various studies conducted in India and abroad.

According to the Farmers Suicide Model (Figure 1), stress is the major reason that makes farmers vulnerable, leading to suicide. Various predisposing factors affect farmers in the long-term and create stress in them. Prolonged stress makes them vulnerable to physical and psychological hazards like depression. The vulnerable group of farmers are affected by unexpected precipitating factors, which influence their decision to commit suicide; it also depends upon the absence of protective factors.

Box 3: Unfavourable trends causing stress to Indian farmers and agriculture

• Predominantly smallholder farming

Small and marginal farmers play a significant role in the Indian agriculture setup. In 2015-16, the population of small and marginal farmers was estimated as 126 million, who owned 86.21% of total landholdings representing 47.34% of the total agricultural area in the country (Govt. of India 2018). As the average landholding of small and marginal farmers is just 0.6 ha, maximising productivity of farming through input intensive agricultural technologies is a tedious task. The smallness of the holding straightaway denies the farmers the benefits of mechanization, modern irrigation, and other investment-based technological improvements. As a result, productivity is suboptimal leading to agrarian distress.

• Indebtedness

Farmers' prolonged indebtedness and shrinking ability to repay loans are predominant factors that create farmer distress in India. A NABARD survey indicates that the Incidence of Indebtedness (IOI), which is a proportion of households having outstanding debt on the date of the survey, was 52.5% and 42.8% for agricultural and non-agricultural households, respectively (NABARD 2018). The average amount of outstanding debt for indebted agricultural households was INR 1,04,602 in 2018, which was higher than the outstanding debt for indebted non-agricultural households (debt – INR 76,731).

• Reduction in agricultural income

Data from 2015-2016 show that the rural sector earned INR 8,059 as net household income during 2015-16 from cultivation, livestock, non-farm sector activities, and wages/salaries (NABARD 2018). The highest portion of the net monthly income was from wage labour (both farm and non-farm - INR 3,504), followed by government or private service jobs (INR 1,906), and agriculture (INR 1,832). For agricultural households, which accounted for 48% of rural households, the share of average income from cultivation and livestock farming was about 43%, with the remaining 57% of income coming from non-agricultural sources (NABARD 2018).

Factors

(i) Predisposition to risk factors

Predisposing factors are those conditions or situations that increase the likelihood of farmers' suicides. Predisposing factors induce long-term psychological stress in farmers which make them vulnerable to suicide. The predisposing factors associated with farmers' suicide include: genetic and biological factors, social and demographic factors, family characteristics and childhood experiences, socio-economic factors, presence of diagnosable mental disorders like depression and mood disorders, along with alcohol and substance abuse; psychological factors such as egoistic tendencies, impulsivity/aggressiveness, loss of control/stoicism; previous suicide attempts and presence of multiple stressful life events, long work hours, conflicting roles of work and family, poor access to health care services, social isolation and lack of social support; regulatory and industry factors beyond the farmer's control; and prolonged periods of climate variability with heat stress and drought (Fig. 1).

(ii) Precipitating factors

Precipitating factors are stressful events that can trigger a suicidal crisis in a vulnerable person. These factors cause or trigger the onset of a disorder, illness, accident, or behavioural

response. A few precipitating factors which trigger farmers' suicide are: sudden crop failure, high job demands, breakdown in family relationships, current financial hardship, prolonged illness and pain, failure in business/politics, hopelessness, fall in social reputation, non-realization of expected market price, and unexpected disaster or sudden climatic change (Fig. 1).

(iii) Protective factors

Protective factors are those that decrease the probability of an outcome in the presence of elevated risk. Some of the protective factors which prevent farmers' suicides include: family and social support, social resources, religious beliefs, peer support, personality traits, coping skills, and a sense of belonging (Fig 1).

Processes

Psychological stress

The psychological stress refers to the emotional and physiological reactions experienced when an individual confronts a situation in which the demands go beyond their coping resources. It is created due to occurrence of unexpected stressful situations.

Distress

Distress is an aversive, negative state in which the coping and adaptation processes fail to return an

organism to physiological and/or psychological homeostasis (Carstens and Mober2000).

Coping

Coping is the sum of cognitive and behavioural response of individuals to stress, which are constantly changing, that aim to handle particular demands, whether internal or external, that are viewed as taxing or demanding (Lazarus and Folkman 1984).

Vulnerability

Vulnerability refers to the inability of a person to withstand the effects of a hostile environment. It indicates physical and psychological deterioration including stress/distress conditions.

Suicidal ideation/suicidal thoughts

Suicidal ideation is thinking about or having an unusual preoccupation with suicide. Hopelessness, mood swings, anxiety, emotional pain and depression are a few symptoms of suicidal ideation.

Facilitation

The suicide facilitation factors include easy access to suicide methods, acceptance of suicidal behaviour, isolation, impulse, and evading treatment.

These factors and processes together determine a farmer's decision to commit suicide.

Suicide Risk Assessment Approaches

Farmers' suicides are caused by a complex interplay of various factors and occur at different stages of their life. An important aspect in preventing farmers' suicides is identification of the vulnerable population in advance, and helping them overcome their psychological stress.

Suicide risk assessment refers to the establishment of a clinical judgment of suicide risk in the near future, based on the weighing of a very large mass of available clinical detail (Pokorny 1983). Risk assessment is carried out in a systematic, disciplined way by qualified professionals.

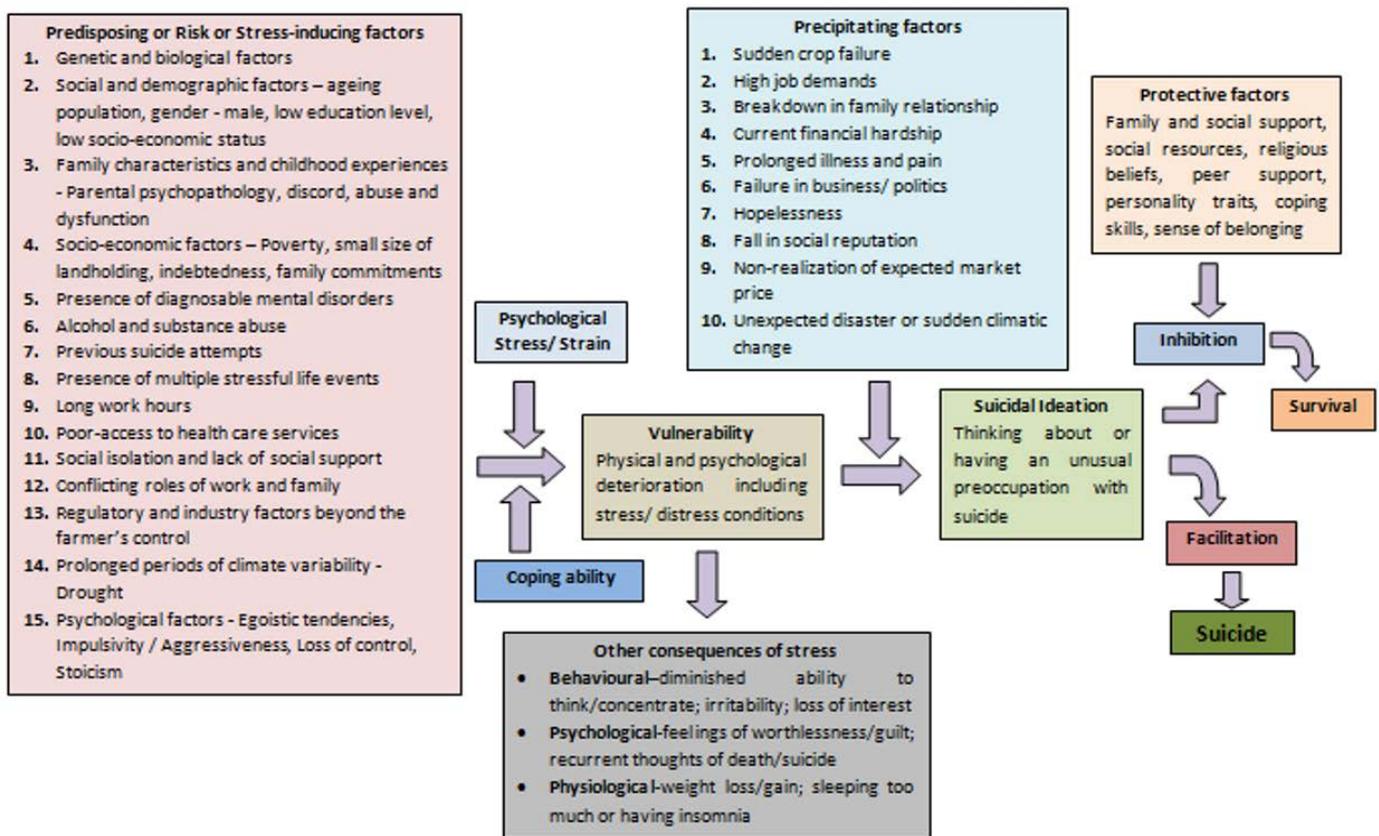


Fig. 1: Farmer's Suicide Model

Adapted from:

National Crime Records Bureau (2015); Behere and Behere (2008); Bhise and Behere (2016); Kureshi and Somasundarm (2018); Dandekar and Bhattacharya (2017); Anneshi and Gowda (2015); Macharia (2015); Mohanty and Shroff (2004); Mohanty (2013); Meeta and Rajivlochan (2002); Judd et al. (2006); Tonna et al (2009); Judd et al. (2006); Hossain et al. (2008); Fraser et al. (2005); Mc Shane et al. (2016); Hanigan et al. (2012); Kunde et al. (2017); Manjunatha and Ramappa (2017); Sher (2006); Boergers et al. (1998); Eskin et al. (2007); M. T. Y. Lee et al. (2006); Wild et al. (2004); World Health Organisation (2018); Hawton et al. (1998); Judd et al. (2006); Ramesh and Madhavi (2009)

The assessment of suicide risk is based on identification and appraisal of warning signs, along with predisposing and protective factors that are present. Several methods, instruments and diagnostic tools are developed to assess farmers' stress factors, coping behaviour, vulnerability to suicide, and suicide ideation. A few resources are available

to support the suicide risk assessment process, including clinical guides (Jacobs 1999; Rudd et al.2004) and best practice guidelines (American Psychiatric Association 2003; Heisel andFlett 2006; Registered Nurses' Association of Ontario 2009). A few suicide risk assessment scales and methods are displayed in Table 2.

Table 2: Farmers' suicide risk assessment scales and methods

No.	Name of the scale/ method	Responsibilities	Source
1	Beck's Scale for Suicide Ideation	A 19-item rating scale measures active and passive suicidal desire as well as suicidal preparation.	Beck et al. (1988)
2	The Modified Scale for Suicidal Ideation	This scale measures the presence or absence of suicide ideation and the degree of severity of suicidal ideas. The time frame is from the point of interview and the previous 48 hours.	Miller et al. (1986)
3	Hospital Anxiety and Depression Scale (HADS)	To determine the levels of anxiety and depression that a person is experiencing.	Zigmond and Snaith (1983)
4	Kessler Psychological Distress Scale	A 10-item measure of general distress during the previous 4 weeks.	Kessler et al. (2002)
5	Farm Stress Inventory	A 61-page inventory measures farm stress in six dimensions, i.e., 1. Financial; 2. Weather; 3. Work overload; 4. Social; 5. Hassles; 6. Worry.	Walker and Walker (1995)
6	Edinburgh Farming Stress Inventory	Assessing farm-related stress In six dimensions, i.e., 1) Farming bureaucracy; 2) Financial issues; 3) Uncontrollable natural forces; 4) Time pressures; 5) Personal farm hazards; and 6) Geographical isolation.	Deary et al. (1997)
7	The General Health Questionnaire (GHQ-12)	Screening device for detecting various sources of distress and other minor psychiatric disorders in the general population and within community or non-psychiatric clinical settings.	Goldberg (1972)
8	The Farm Stress Survey	A 28-item Likert-type summated rating scale measures farm stress in five dimensions, i.e., 1) economics; 2) geographic isolation; 3) time pressure; 4) climatic conditions; and 5) hazardous working conditions.	Eberhardt and Pooyan (1990)
9	Farm/Ranch Stress Inventory	A 28-item scale which measures farm stress in three dimensions – farm-related factors, financial factors and social factors.	Kearney et al. (2014)
10	Stress Vulnerability Scale	A 20-item Likert-type summated rating scale, measures the individual's vulnerability to stress, that is, how much a person is prone to physical and psychological stress.	Miller and Smith (1985)
11	Scale to measure resilience in relation to farmers' life (RFL-Scale)	A summated rating scale which measures Resilience - degree to which farmers can bounce back in relation to their life after a national calamity.	Lalet al. (2014)
12	Psychological or verbal autopsy	It is a retrospective reconstruction of the life history of a suicide victim, which involves the examination of physical, psychological and environmental details of the victim's life in order to more accurately determine the mode of death and get a better knowledge of the death process and the victim's role in hastening or affecting his own death.	Behere and Behere (2008); Bhise and Behere (2016); Gajalakshmi and Peto (1997).

Conducting a farmer's suicide risk assessment, either for research or extension purposes, is a tricky process. It is important to pursue the following guidelines while conducting a farmer's risk assessment:

- The farmers' suicide risk assessment process involves collecting sensitive information from human subjects and this call for approval from Institute Ethics Committees. It is important to follow the ethical guidelines laid out by the Indian Council of Medical Research (ICMR) (2017) to avoid problems in the future.
- Many assessment scales are copyrighted and involve costs in procuring and using them. Unauthorised use of assessment scales or other measure will invite legal issues.
- It is essential for researchers to undergo formal training before conducting a suicide risk assessment. It is a specialised process which needs deeper/sensitive understanding of the entire suicide process.
- Many suicide risk assessment scales or measures are standardised and have adequate reliability and validity across cultures. The suicide risk assessment is conducted by a psychiatrist, registered psychologists, or people who are adequately trained for this purpose. Indiscriminate use of these measures by unqualified persons will attract legal issues.
- When a researcher is interested in developing a scale or measure to determine any aspect related to farmers' suicides, it is essential to study all available measures or scales which have already been standardised. Developing a measure or scale for assessing risk factors of suicide is a complicated process as it requires Ethical Committee approval, and needs to be carried out under the supervision of a psychiatrist or a registered psychologist.

Extension Strategies for Prevention of Farmers' Suicides

Considering the magnitude and negative consequences of farmer suicides, many countries have opened up specialised services for preventing suicides. The extension services in USA, Australia and New Zealand provide stress management services to farmers. They provide the following services for reducing farm stress:

Information and campaigns on managing farm stress

This service is aimed at educating farmers about farm stress – its sources, identifying the symptoms, and measures to cope with stress. They provide links to various distress and suicide-related services in the county/state/country. The extension services also conduct campaigns to educate farmers about stress management and suicide prevention.

Suicide prevention hotline

This service provides opportunities for farmers to discuss their farm-related problems, which induce stress, and get advice through telephone or one-to-one counselling. The Iowa Concern programme of Iowa State University Extension and Outreach (<https://www.extension.iastate.edu/iowaconcern/>) provides stress counselling, telephonic advice on stress-related queries, managing legal issues of farmers and helping them to cope with stress in crisis situations.

Agricultural mediation services

Here the extension agency voluntarily acts as a third party insolving farm-related disputes outside the legal process. This service greatly reduces the stress involved in conflict resolution among farmers. For example, The Kansas Agricultural Mediation Services of Kansas State University Extension (Web: <https://www.ksre.k-state.edu/kams/services/mediation/index.html>) helps farmers to solve disputes in a peaceful manner. Likewise, the K-State Farm Analyst programme provides educational services to farm families to manage their finances and business planning.

Capacity building on crisis, risk and stress management and suicide prevention

Several extension services in USA, Australia, New Zealand, and in Europe conduct capacity building programmes for various clientele in managing stress and preventing suicides. Various academic and continuous education programmes are offered to many stakeholders for farm stress management and suicide prevention.

Single window system for farmers' health management

Under this system, the specialised agencies created for farmers' health management provide integrated services to farmers including counselling, stress and suicide-related education, capacity building, conducting workshops on stress and suicide prevention, conducting research on farmers' health and safety, and offering certificate courses on farmer health to develop a workforce for grassroots interventions. The National Centre for Farmers Health, Australia (<https://www.farmerhealth.org.au/>) and Farmstrong programme of New Zealand (<https://farmstrong.co.nz/>) are a few examples of this approach. Some farmers' federations like Victorian Farmers Federation, Australia (<https://www.vff.org.au/>), also provide integrated services for farm stress management.

Community-based suicide prevention programme

Community-based suicide prevention programmes are aimed to help communities to create interventions/projects to reduce farm stress and prevent self-destructive behaviours and conditions that lead to suicide, and to increase individual, family, and community health. These programmes offer grants, subsidies and bursaries to create infrastructure and facilities to develop competencies in farm stress management and suicide prevention on a community level. They also provide peer support services and counselling services for the community.

The Vidarbha Stress and Health Programme (VISHRAM) in Vidarbha region of Maharashtra, India, (<http://www.sangath.in/vishram/>), the Alaska Suicide Prevention Programme, United States of America (<http://dhss.alaska.gov/dbh/Pages/Prevention/programs/suicideprevention/default.aspx>) and Project Utshah, an initiative of the Department of Agricultural Journalism, Punjab Agricultural University (PAU), Ludhiana, under National Agricultural Science Fund (NASF) of Indian Council of Agricultural Research (ICAR), New Delhi, are a few examples of community-based intervention models for preventing farmer suicides.

Way Forward

Farmers' suicides are increasingly becoming a public health crisis in India. As agriculture is a relatively stressful occupation managed predominantly by small and marginal farmers with smaller operational holdings, stress factors both at the macro and micro levels have a severe impact on farmers' health. Suicide is not a discrete event caused by a sudden tragedy; it is rather an outcome of long-term accumulation of various stresses over a period of time. A key aspect of any suicide prevention strategy is our ability to understand the suicide process and manipulate the predisposing, protective, and precipitating factors so as to prevent the suicide. As a field-oriented profession directed towards farm households, extension services play a crucial role in preventing farmer suicides – by assisting farmers in understanding the stress and suicide process, identifying vulnerable groups, providing telephonic advice and counselling, creating community-based institutions to educate and help farmers, along with policy changes to help vulnerable groups. To conclude, these are a few strategies for preventing farmers' suicides in India.

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LEARNING FROM THE KERALA FLOODS OF 2018: HOW EXTENSION AND ADVISORY SERVICES COULD SUPPORT FARMERS TO DEAL WITH NATURAL CALAMITIES

The unprecedented floods of August 2018 adversely affected Kerala's agriculture.

Rema K Nair, in this blog, reflects on how extension services came forward to support farmers to deal with the flood damage to crops, and how it is currently supporting farmers to deal with its long-lasting impacts.

Kerala witnessed an unprecedented flood last August that critically affected the lives of people belonging to every walk of life. It goes without saying that farmers were the most affected as their houses and livelihoods were completely lost. It is estimated that an area of around 57,000 ha with standing crops of various types were lost in the deluge. Apart from the loss of machinery, farming implements, harvested and stored produce and damage to warehouses, irrigation channels etc., the incalculable loss of top soil and soil nutrients, are almost always overlooked.

Kerala floods: August 2018

With the exception of 1924 and 1961, in the last 118 years Kerala received the highest amount of rainfall in 2018. From May to August the State received rainfall that was 53% higher than normal, and all dams were almost full at that time. The incessant rains in catchment areas of the dams turned the situation into a nightmare. Kerala received a rainfall of 254.2 mm in just three days in mid-August. All these factors together created the greatest catastrophe in the history of Kerala. Landslides and cloudbursts were reported from several districts. The floodwater receded only after one week. Lots of silt, sand and other debris got deposited in many of the fields and in some places it was not possible to clear such fields manually.

Impact on Farms

Crops worth more than INR 5600 crore were lost, affecting around 400,000 farmers. Approximately 150,000 ha of cropped land was affected. In August most of the flooded fields remained inundated for eight to ten days. The weight of 1 m³ of water is around 1 ton, and this water remained above the soil to a height of about 2 to 2.5 m. That means around 2 to 2.5 tons of mass exerted pressure over the soil making it compact. This made the soil impervious to air, and under anaerobic conditions the respiration of roots was affected. Plants, therefore, failed to take up water, and as a result once the floodwater receded the crops appeared to have completely dried up.

The nutrient status of the deposited soil varied from place to place. Nutrients, such as nitrates, and potash, along with micronutrients were washed off from the topsoil, especially from places at a high altitude. Some of these were partially deposited near banks and the rest had washed away into the sea. Under anaerobic conditions mostly pathogenic microbes flourish, whereas beneficial microbes, such as Vesicular Arbuscular Mycorrhiza (VAM) and Trichoderma, cannot survive. Gases such as nitrous oxide methane, and carbon dioxide, which are

produced under flood conditions, accelerate the decay of roots. Anaerobes make use of these gases and grow. Most of the soils in Kerala are acidic. The post-flood analysis of soil has confirmed that acidity has increased several folds. This further

creates problems in nutrient assimilation by soils. Loss of soil micro flora and macro flora, like earthworms, ants, etc., is a very serious problem that needs to be addressed urgently.

Box 2: Impact of the flood on crops

Rice being a semi-aquatic plant could survive inundation, especially during the vegetative phase. However, crops at the flowering stage were seriously affected. The grains were partially filled and the appearance and acceptability of the grains were affected.

The major commercially important varieties of bananas, such as *Nendran* and *Poovan*, were completely destroyed. It is to be noted that varieties of *Palayankodan* and *Njalipoovan* survived the flood. But spices like ginger, turmeric, and pepper could not withstand the flood, and all vegetables were completely lost. Nutmeg seedlings below 5 years failed to survive, whereas older plants could be saved with proper care.

Coconut seedlings were lost in the flood but adult palms were generally unaffected. The impact of flood on all perennial crops and trees are yet to be completely understood. There are chances of occurrence of new diseases. It is to be noted that the root disease of coconut was first noticed in Kerala at *Erattupetta* after a major flood.

Incidence of pests was another major problem. Post floods, attack of *Spodoptera* (Armyworm) was seen severely on all crops, like paddy, vegetables, and banana. Timely scientific intervention successfully controlled the attack. *Alternanthera spp*, *Cyperus*, and other grassy weeds are seen growing wild in many places. A change in weed flora was also noticed.

Extension's Response to the Floods

Dealing with the damage

Our first concern was how to protect the lives of farmers from a likely epidemic of leptospirosis, a distinct possibility due to a rise in the rodent population as a result of floods. The immediate response of the extension staff, especially of the State's Department of Agriculture, was to inform farmers on the need to take doxycycline as advised by the Health Department.

Flood debris were removed by the farmers themselves. In places where the quantity of debris was too high, farmers were given assistance to the tune of INR 12,500 per ha. In several places, government agencies like Kudumbashree (<http://www.kudumbashree.org/>) were engaged in de-silting activities. Support from schemes such as MGNREGS were also used to implement these activities.

On a war footing extension functionaries visited each and every farmer to assess crop loss. This helped the farmers to get government aid at the earliest. During the visits individual farmers were given instructions on how to save their remaining crops, and how to get income from their fields.

Farmers were advised to plough the topsoil so as to open up the soil's pores and allow the soil to breathe. This was essential to prevent the formation of hard impermeable aggregates that could affect soil aeration further. The silt and clay that was deposited above the topsoil was broken

down by the farmers and mixed with the soil.

As regaining soil health was vital to restart agriculture, soil test campaigns were conducted in almost all panchayats to know the nutrient status of soil. In several places water-soluble nutrients, such as potash, calcium and magnesium, got dissolved and leached into the water. Soil acidity had increased considerably in most of the soils. Dolomite, gypsum, slaked lime and other soil ameliorants were supplied to farmers at a subsidised rate to regain soil health.

Farmers were encouraged to enrich the microbial activity in soil by ploughing in lots of green matter, farmyard manure and compost. Adding paddy husk was also adopted by farmers as this too can help in improving soil aeration. Moreover it adds to the silica content of the soil.

Beneficial microbes like *Trichoderma*, and *VAM*, were supplied to farmers to enhance the population of helpful microbes in soils that can aid in root growth and nutrient uptake. On-farm multiplication of *VAM* and *Trichoderma* was taken



up as a front line demonstration in progressive farmers' fields. These microbes help in control of soil-borne pathogens as well.

Cultivation of cover crops, especially leguminous crops, is promoted wherever possible as it will help in adding more organic matter to the soil and thus improve soil aeration and moisture retention as well as nitrogen fixation. Seeds of these crops were supplied to farmers.

Farmers were advised to allow the growth of naturally occurring weeds as they have a deep root system that can improve soil porosity. They were also encouraged to adopt mulching of soil with organic matter, such as dried leaf and crop residues as this helps in moisture retention, ensure soil porosity, and improve microbial activity.

Short duration vegetable crops particularly amaranthus and cucurbits – can help the farmer to get some income immediately after the flood. So seeds and seedlings of these crops were supplied to farmers free of cost.

Extension staff convened campaigns under the title Punarjani (meaning 'rebirth') on the worst affected farmer fields to clear the debris, and add soil ameliorants. Seeds and seedlings were planted in these fields by extension staff.

Building Resilience

The Department of Agriculture Development & Farmers' Welfare (Kerala) had launched a crop insurance programme a few years back. But farmers were reluctant to spend the initial premium even though it was nominal. But the floods have changed their attitude. Farmers currently recognize the importance of insurance as these types of unpredictable calamities and crop damage are likely to increase due to changing climate. Wide publicity is currently being given to the crop insurance scheme so that farmers can take up agriculture confidently. More farmers are currently approaching the extension staff to help get their crops insured.

Under the leadership of the Agricultural Technology Management Agency (ATMA), farm schools, farm field schools, capacity-building

meetings, kisan gosthis were conducted in all panchayats to popularize scientific intervention in agriculture and allied fields. Apart from this, since a lot of nutrients were lost in floodwater, we are carefully assessing nutrient deficiency symptoms.

Crops like pepper, nutmeg, and other spices need a comprehensive package for rejuvenation. Perennial crops also need periodical surveillance given the incidence of new pests and disease. Under the crop health programme, extension staff are deployed to keep a vigil on the occurrence of pests and diseases.

Farmers are also being encouraged to take up additional activities, such as fisheries, animal husbandry, and value addition so as to ensure a steady income.

Way Forward

Despite this staggering calamity agriculture continues to be the biggest employment generating sector in Kerala even today. So the revival of this primary sector is vital in rebuilding Kerala in the post-flood scenario. This would necessitate more coordinated efforts from the Kerala Agricultural University and the State Department of Agriculture Development and Farmers Welfare. The greatest challenge facing the extension community is how to cope with the unpredictable situations that will continue to develop as a result of climate change.

It's high time that we shift to crops that demand less water and have high water use efficiency. Moreover, wetlands and paddy lands play the most important role in containing floodwaters. Deforestation in the hills and unscientific cultivation of soil-eroding crops on slopes have to be checked in order to increase the soil binding capacity and water retention. Simultaneously, the remaining wetlands and paddy fields have to be preserved through flood reservoirs that can avert loss to people and their belongings. Stringent action has to be taken against those who violate existing wetland preservation laws.

The crop insurance scheme has to be revamped to suit each agroecological zone. Agroecological zones – coastal, plains, hilly —have to be



differentiated based on their soil and climatic characters. Based on the special features of each agroecological zone suitable crops and cultivars are to be identified. An integrated farm-based approach will be helpful in increasing farmers' incomes and reducing the associated risks instead of a crop-based approach that's being adopted now. Certain varieties of spices, such as pepper, nutmeg, ginger and turmeric, showed significant abilities to withstand adversities. Studies have to be conducted to identify and multiply these varieties.

Disaster risk reduction has to be included in the curriculum, not only in agriculture but in allied sectors as well, as we envisage a change in climate

that would trigger cyclones and storms more often. Training is to be imparted to extension officials using national level training agencies, like the National Institute of Agricultural Extension Management (MANAGE), and it has to be ensured that the knowledge imparted through such trainings percolate down to target groups.

Agriculture should be the main focus of efforts at rebuilding Kerala as the floods have proved beyond doubt that food is the most important commodity for human survival. "Annadatha Sukhibhava". Therefore, society has a grave responsibility to ensure the well-being of the farming community.



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SIX YEARS OF AESA WEB PORTAL: A CRITICAL REFLECTION

As sixth year of AESA draws to a close, Onima VT and Sreeram Vishnu analyze the contents generated by the AESA web portal over the past six years (2013-2019). While the AESA web portal brought a new culture of managing knowledge on extension, a lot more could be done to improve its effectiveness, they argue.

AESA (Agricultural Extension in South Asia) Network was established initially as a virtual platform around its web portal (www.aesa-gfras.net) and its facebook group¹ during the late 2012. It turned into a more professional network subsequently, with its first governance meet held at Kathmandu in January 2014. The First face-to-face meeting of AESA finalized the vision, mission and functions of AESA, its governance structure and also identified the short-term and long-term priorities of AESA. Over the past six years (2013-2019), the AESA Network expanded its contributions to the extension profession by strengthening knowledge management, organizing capacity development workshops, holding policy dialogues and strengthening the networking capacity at the country level². The Centre for Research on Innovation and Science Policy (CRISP-<http://crispindia.org/>) has been hosting the AESA Secretariat since its inception.

The most visible and successful initiative of AESA so far has been its knowledge management through the AESA web portal and AESA facebook group (which has more than 19,450 members currently). The AESA web portal maintains both certified content and co-created content (Fig 1 & Fig 2). Certified contents include manuals, facilitators' guide, working papers, updates, policy briefs and reports which AESA developed as an output of workshops/seminars conducted in partnership with other institutions and are available on the web portal. On the other hand, the co-created content include those contributed by the AESA user community and published through the AESA portal and these include blogs, good practices, meeting notes, face to face interviews and book reviews. All these products are also promoted through its facebook group. Users could comment on these products either on the website or by sending an e-mail to AESA Network or in the AESA facebook group. Some of these have led to interesting discussions.

Analysis of the content contributed by various stakeholders to AESA so far and the interest it evoked among the user audience would give important insights to improve its reach. To this end, this study was framed (Box 2) to explore in detail the contributor profile, the nature of co-created content and the user response to it.

¹<https://www.facebook.com/groups/428431183848161/>

²AESA.2019. AESA: The first six years 2013-2019, Hyderabad, India.

Box 1: Agricultural Extension in South Asia (AESAs)

AESA is currently the only regional network available for extension stakeholders in South Asia to share knowledge and experiences on extension and advisory services (EAS).

Vision

Improving food and nutrition security through efficient and effective extension and advisory services

Mission

Sharing, learning and networking for building efficient and effective extension and advisory services

Objectives

1. To facilitate appropriate and up-to-date knowledge on modern and innovative EASs.
2. To build the capacities of EAS providers in South Asia at individual, organisational and enabling policy level.
3. To strengthen agricultural extension research, facilitate curricula reforms and engage in policy dialogue through sharing, learning and networking.

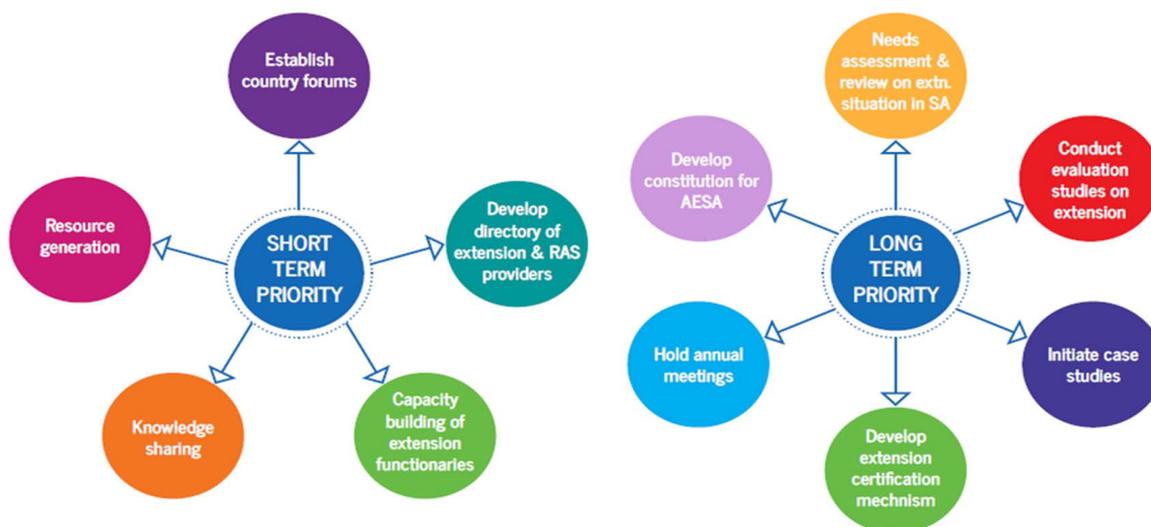


Fig. 1: Short term and Long term priority of AESA

Box 2: AESA- A one stop shop

AESA website (<http://www.aesnetwork.org/>) serves the information needs of the users in varied forms. All the information is compiled and posted under different headings on its website and simultaneously shared on its social media.

- **Resources on EAS**
Publications on EAS are organised thematically across 14 themes and 8 countries.
- **Useful links**
This section has three major categories of information: allied organizations, networks and country-wise information on EAS in the region.
- **New Publications and Events**
Announcements/links to new publications, workshops, conferences and meetings related to EAS and job openings for EAS professionals are included in this section.
- **Social Media**
AESA uses its social media platform actively. All the documents are made available on the social media platforms on: AESA Facebook group (with > 19450 members) | AESA LinkedIn | AESA Twitter handle | AESA YouTube channel.

Findings

Blogs

AESA Blogs are a reflection of the realities, perceptions and opinions of those interested and involved in extension and advisory service provision. Researchers, research scholars, senior managers/professionals and faculty engaged

in extension teaching and training, mainly contributed to the blogs. We categorized the blogs into 12 unique thematic areas and a miscellaneous section. For a better understanding on the contribution of various content and audience interest towards it, AESA blogs were explored in depth. The results are presented and discussed below.

Table 1 and 2 provides an overview of blog contributions according to the institutional affiliation and type of contributors respectively. It could be seen that professionals from research organizations have contributed the maximum number of blogs. They were followed by faculty in universities. We also analyzed the profile of the contributors as well. In general, researchers working at various levels and positions were the leading content contributors followed by faculty from various universities.

Besides it is encouraging to see that, senior professionals have also contributed to AESA, thus sharing their rich experience and valuable knowledge to their fellow professionals. Analysis of the nature of content and comments received for the blogs are presented in Table 3.

It could be seen that most number of blogs were written under the theme, New Approaches and Tools for Extension and Advisory Services & Livestock Extension (14) followed by Capacity Development for Extension Professionals and The Governance of Extension & Advisory Services (12). However the trend in the number of comments

received for the blogs under each theme followed a different pattern. The theme, Strengthening Extension Research received most number of comments (51), followed by New Approaches and Tools for Extension and Advisory Services, Capacity Development for Extension Professionals, The Governance of Extension & Advisory Services with 45, 44 and 42 respectively. On analyzing the number of comments received per blog, it was found most comments (4.64 per blog) were received under the theme Strengthening Extension Research. It is worthwhile to point out here that the blogs on strengthening extension research and the subsequent discussion it generated led to AESA organizing a Workshop on Good Practices in Extension Research and Evaluation and a Manual was developed on this theme in partnership with others. Blogs under Capacity Development for Extension Professionals (3.67) and The Governance of Extension & Advisory Services (3.50) were the other themes that received more comments. In general, each blog was found to be getting 2.56 comments, irrespective of its thematic category.

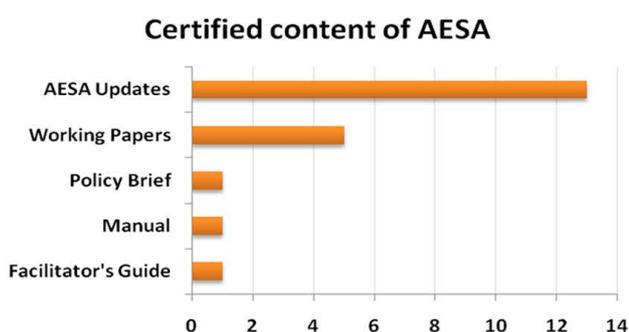


Fig. 2: An overview of certified contents of AESA

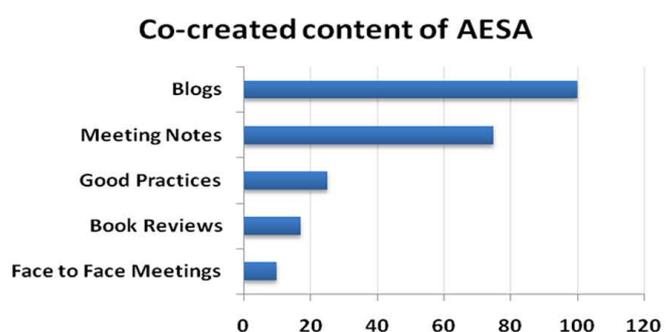


Fig. 3: An overview of co-created contents of AESA

Box 3: Methodology

Three types of co-created content, namely, blogs, good practices and meeting notes published in the AESA web portal including the user comments were tabulated and analyzed to find out the profile of contributors, various content characteristics and user response. Word cloud of various co-created content areas was also generated using the online word art creator, Wordart.com to figure out the emerging prominent concepts under the categories. Further, Chi square test was applied to check the association between the various features of contributors and content categories with discussions generated on user contributed content.

Table 1: Blog contributions from various institutions*

S. no.	Institutional background of AESA contributors	Blogs	Percent
1	Research Organizations	38	38.00
2	Universities	33	33.00
2	Ministry of Agriculture	11	11.00
3	International Organizations	07	07.00
4	Non-Governmental Organizations	07	07.00
6	Farm Science Centers (KVKs in India)	02	02.00
7	Private Organizations	02	02.00
	Total	100	100.00

Table 2: Category of contributors*

S. no.	Content Contributors	Blogs	Percent
1	Researchers	43	43.00
2	Faculty (Education/Training)	23	23.00
3	Senior Professionals	21	21.00
4	Research Scholar	05	05.00
5	Other Professionals	08	08.00
	Total	100	100.00

*Tabulation is made based on the affiliation of the lead author of the publication

Table 3: Thematic area wise AESA blog, comments received and number of comments per blog

S. no.	Thematic Areas	No. of blogs	No. of comments	No. of comments/blog
1	Capacity Development for Extension Professionals (CDEP)	12	44	3.67
2	The Governance of Extension & Advisory Services (GEAS)	12	42	3.50
3	Strengthening Extension Research (SER)	10	51	5.10
4	New Approaches and Tools for Extension and Advisory Services (ATEAS)	14	45	3.21
5	Promoting Agripreneurship and Technology Commercialisation (PATC)	07	16	2.29
6	Information and Communication Technology for Extension (ICTE)	12	08	0.67
7	Skill Development (SD)	03	00	0.00
8	Livestock Extension (LE)	14	28	2.00
9	Engaging Youth, Farm Women and Producer Organisations in Extension (YWPO)	05	06	1.20
10	Influencing Policies (IP)	05	08	1.60
11	Dealing with Uncertainties (DU)	05	08	1.60
12	Others	01	00	0.00
	Total	100	256	2.56

Good Practices

A good practice is simply a process or a methodology that represents the most effective way of achieving a specific objective. For AESA, a good practice is one that has been proven to work

well and produce good results, and is therefore worthy of closer analysis to draw principles behind its apparent success. The essence of identifying and sharing good practices is to learn from others and to re-use knowledge.

Table 4: Good Practice contributions from various institutions*

S. no.	Content Contributors	Good Practices	Percent
1	Farm Science Centers (KVKs in India)	08	32.00
2	Universities	07	28.00
2	Non-Governmental Organizations	06	24.00
3	Research Organizations	02	08.00
4	Ministry of Agriculture	02	08.00
6	International Organizations	00	00.00
7	Others	00	00.00
	Total	100	100.00

Table 5: Category of contributors*

S. no.	Content Contributors	Good Practices	Percent
1	Researchers	08	32.00
2	Other Professional	09	36.00
2	Faculty (Education/Training)	07	28.00
3	Senior Professionals	01	04.00
4	Research Scholar	00	00.00
	Total	25	100.00

*Tabulation is made based on the location of the lead author of the publication

Good practices were contributed by professionals from diverse background. The analysis of the contributors based on their institutional affiliation is presented below (Table 4). It can be seen that research professionals including those from Farm Science Centers (FSC) were leading contributors of good practice notes. They were followed by professionals from various universities and non-governmental organizations. Like in the case of blogs, only the lead authors profile was the focus. Further it was revealed that other professionals (from NGOs, senior research fellows etc.) followed by researchers and faculty from universities contribute the maximum number of good practice notes (Table 5).

Most of the good practices (Table 6) were from the areas of agriculture and animal husbandry. However the number of comments per Good Practice was found to be 1.04, lowest among all the content categories.

Meeting notes

Meeting notes are the written or recorded documentation that is used to inform attendees and non-attendees about what transpired during a meeting like workshop, conference, farmer fairs etc. The participants describe the happenings, their own impression and unique experiences about the event.

Table 6: Analysis of the content of Good Practices (sector-wise)

S. no.	Thematic Areas	Frequency	Percentage
1	Agriculture	14	56.00
2	Animal Husbandry	07	28.00
2	Apiculture	01	04.00
3	Natural Resource Management	03	12.00
	Total	25	100.00

Table 7: AESA contribution from various institutions*

S. no.	Content Contributors	Meeting Notes	Percent
1	Research Organizations	25	33.33
2	Universities	33	44.00
3	Ministry of Agriculture	07	09.33
4	International Organizations	05	06.67
5	Non-Governmental Organizations	02	02.67
6	Others	03	04.00
	Total	75	100.00

Table 8: Category contributors*

S. no.	Content Contributors	Meeting Notes	Percent
1	Senior Professionals	16	21.33
2	Researchers	18	24.00
3	Research Scholar	17	22.67
4	Faculty (Education/Training)	17	22.67
5	Other Professional	07	09.33
	Total	75	100.00

*Tabulation is made based on the location of the lead author of the publication

The overall trend remained the same, with the contributors being from universities and research organizations (Table 7). However there is a different pattern seen in the profile of the contributors here. Researchers followed by research scholars and faculty (education/training) contributed most of the meeting notes (Table 8). However, number of comments per meeting

note was comparatively low (1.26) than blogs (2.56). Events related to Agriculture and Veterinary received most number of comments per blog (1.89 and 1.60 respectively) followed by events on extension (1.72). Majority of the meeting notes were from events related to extension. Also it received a greater audience interest as implied by more number of comments (Table 9).

Table 9: Analysis of the content of Meeting notes

S. no.	Thematic Areas	Number of Meeting Notes	No. of comments	Average no. of comments
1	Agricultural/Veterinary Extension	36	55	1.53
2	Other topics	19	14	0.74
3	Agriculture	09	17	1.89
4	Veterinary	05	80	1.60
5	Social Science/Economics	05	00	0.00
6	Soil Science	01	00	0.00
	Total	75	94	1.26

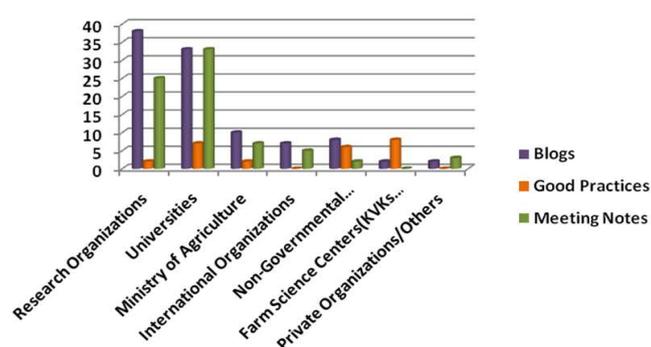


Fig. 4: Institutional affiliation of AESA contributors

The Fig 3 and 4 summarize the co-created content contributions, based on the institutional background and profile of the contributors respectively.

Country-wise contribution of content

Country-wise contribution of content had shown

Table 10: Location wise contribution of content*

Contributors	Blogs	Meeting Notes	Good Practices
Within South Asia			
India	86	71	19
Bangladesh	01	01	06
Nepal	03	00	00
Sri Lanka	03	00	00
Pakistan	00	01	00
Outside South Asia			
Canada	03	00	00
Belgium	01	00	00
Mexico(CYMMIT)	02	00	00
United Kingdom(PLANTWISE)	01	01	00
Switzerland(GFRAS)	00	01	00

*Tabulation is made based on the location of the lead author of the publication

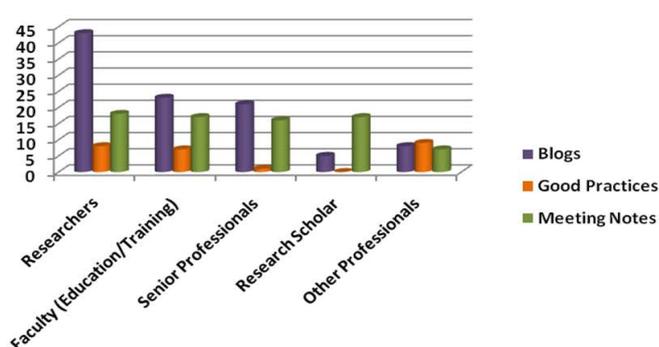


Fig. 5: Profile of the AESA contributors

a skewed distribution, with most of the contents coming from India, among the south Asian countries (Table 11). However, AESA generated interest among a wider audience as evident from the content contributed from even outside the South Asian countries.

Further, the content from the blogs across thematic areas were merged to generate the word cloud. The concepts which were frequently emphasized by the authors emerged in the word cloud. Extension, Farmer, Research and Agriculture

were the common terms emphasized in the AESA blogs (Fig 5). KVK, Farmer, Crop and Product were the major terms emerged from Good practices (Fig 6). Extension, Agriculture, Service etc., emerged under the category of meeting notes (Fig 7).



Fig. 6: Word cloud of blogs



Fig. 7: Word cloud of good practices



Fig. 8: Word cloud of meeting notes

Further we checked the association between the contributor profile and chances of discussion on the content (Table 10). This was done to check, whether the contributors profile had any significance among the audience, making them interested in discussing that topic. Contents were categorized into two based on whether, discussion took place or not. (For the purpose of this study, discussion is operationalized as the content category for which more than two comments were received). Chi square test was applied by classifying the contents for which discussion

took place or not, and the contributor profile into attribute variables. The results indicated that discussions happened under various content categories irrespective of the contributor profile. Also, the contents with one or multiple authors had no influence on the discussions. However a significant association ($p < 0.05$) was observed between the category of content and the occurrence of discussion. This was already evident, as indicated by the more number of comments received for the content category - blogs, than for meeting notes or good practices.

Table 11: Association between the happening of discussion and contributor profile

S. no.	Categorical variables	p value
1	Contributor being Senior Professional	0.886 ^{NS}
2	Contributor being Researcher	0.283 ^{NS}
3	Contributor being Research scholar	0.462 ^{NS}
4	Contributor being High level professional	0.950 ^{NS}
5	Contributor being Academician	0.523 ^{NS}
6	Contributor being Other professionals	0.156 ^{NS}
7	Having multiple authors for the content category	0.502 ^{NS}
8	Categories of content	0.048 ^{**}

** Significant at 5 percent level, ^{NS} Non-significant

Way Forward

This study was conducted with an objective to analyze various content categories of AESA web portal, in terms of the contributors and audience interest towards the content. We could draw the following conclusions from this analysis.

Content: Analysis of various content categories showed that, maximum number of blogs was written on extension tools and approaches. Major areas of contributions under the good

practices category were Agriculture followed by Animal Husbandry and Extension Management. Maximum number of meeting notes was reported on agricultural/veterinary extension related events followed by specific events on topics like climate change and entrepreneurship.

Contributors: Maximum number of blogs was contributed by the researchers from the research institutes including KVKs followed by academicians from the agricultural universities and senior professionals from various international

organizations. Leading contributors of good practice notes were professionals from various international research organizations followed by research professionals from the research institutes including KVKs and academicians from the agricultural universities. Researchers, research scholars, academicians and high level professionals (director/joint director) took most interest in sharing the meeting notes. An overview of the country wise contribution revealed that most of the contents are from India followed by Bangladesh. The contribution from other South Asian countries is marginal at present and has to be improved.

Comments: Overall, average number of comments was found to be highest for blogs (2.56) followed by meeting notes (1.26) and good practices (1.04). Under the blogs, the theme Strengthening Extension Research (4.64) generated most audience interest as indicated by the average number of comments followed by Capacity Development for Extension Professionals (3.67). In case of meeting notes, it was for events related to agriculture (1.89) followed by veterinary (1.60) and agricultural/veterinary extension (1.53).

Interestingly, there is no difference among the audience in engaging in a discussion depending upon the profile of the contributor. Also having multiple or single authors for the content also made no difference to the audience in terms of engaging in further discussion on the content. However, significant difference was observed for their interest to engage in discussion, depending on the category of the content.

Implication and Way Forward

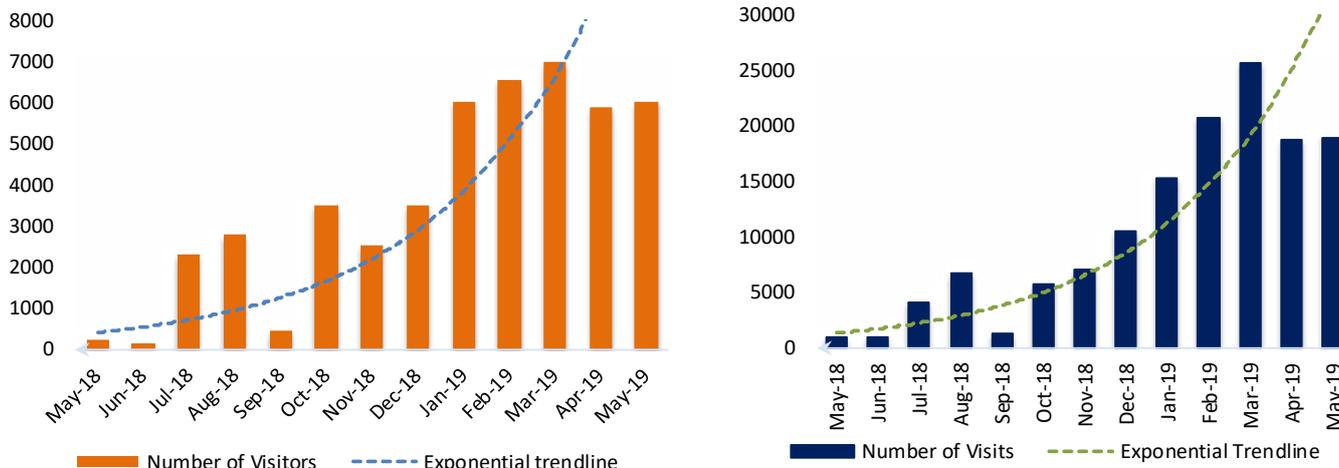
Agricultural Extension South Asia (AESAs) has emerged as a credible platform for those interested and involved in Extension and Advisory Services (EAS) in the region. While knowledge management will have to continue, both virtual interactions through webinars and e-discussions and hosting of face-to-face workshops and policy dialogues need to be promoted among network members to ensure that the new knowledge is applied and used.

Though lot of people are accessing the co-created content from AESA website and AESA facebook group (which has more than 19,450 members) very few are willing to comment on the content and engage in a discussion. Certainly this is something which needs to be improved. There is also a need to initiate and support discussions on professionalising EAS in South Asian countries. With the upgraded version of the web portal launched in November 2018, we hope to see more number of professionals from diverse backgrounds from more countries contributing to the AESA co-created content in the coming years (Annexure-AESA Statistics).

AESA also plans to facilitate policy changes to strengthen extension. AESA will need more support - both human and financial - to address these issues. We look forward to buy-in from more investors, partners and champions to support AESA in this endeavor.

Annexure: AESA Statistics

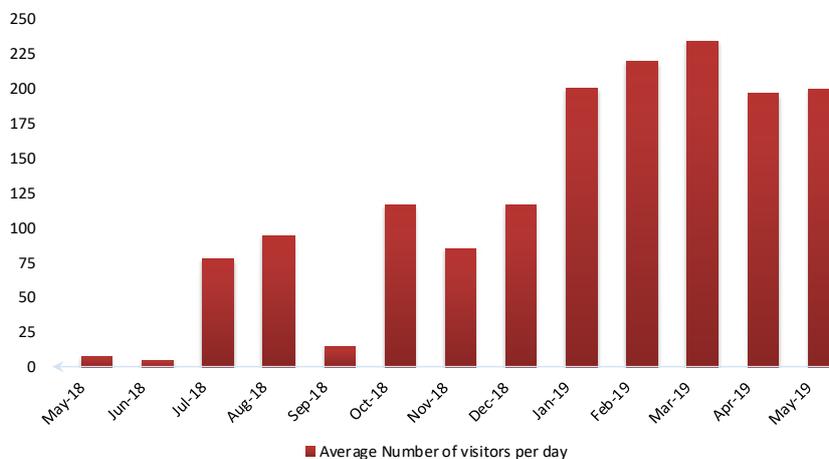
Total number of visitors and visits (May-2018 to May-2019)



This graph shows the total number of individuals who visited AESA website from May 2018 to April -2019 along with the number of times they visited the website in a month. From the above graph it is visible that from last one year the number of visitors in AESA website has increased markedly.

The number increased from 230 to 7000 in twelve months. The major changes in these statistics started after the launch of improved version of AESA website (www.aesanetwork.org) in November 2018. Till now a total of 46858 people had used our website.

Average number of visitors per day in a month (May-2018 to May-2019)



Average number of visitors in a month increased from 8 in May 2018 to 235 in March 2019.

Table1: Number of visitors and visits

	Visitors	Visits
Today	104	284
Yesterday	172	610
Last 7 Days	1,715	5,603
Last 30 Days	6,509	20,384
Last 365 Days	46,658	135,572
Total	46,858	136,162

Final Remarks: Beyond Conversations

Many of us recognise the importance of conversation, but also know its limitations. The dilemma that we face today is whether these conversations are enough to create new capacities and organisational values that can go on to facilitate institutional and policy changes that strengthen EAS.

We at AESA strongly believe that conversations about our profession are necessary, and these can facilitate the generation of incremental changes. Yet these alone are not sufficient to bring about transformational changes (distinguished by radical breakthroughs in paradigms, beliefs, and behaviour) that are needed currently, not only within EAS, but also among other actors in the wider AIS.

AESA blogs were not a one-way communication. There is an inbuilt system for receiving feedback and responding to these. We have been receiving comments – agreeing and disagreeing with the stated positions in the blog – and other feedback providing viewpoints that also needs to be examined. As often said, “Good disagreement is central to progress”.

Some of these conversations also led to new initiatives. For instance, our blog conversations on the weaknesses in extension research in India and subsequent comments and suggestions on these from our readers motivated us to

- undertake an analysis of current research publishing in extension in India;
- organise the first training on Good Practices in Extension Research and Evaluation in 2016; and
- develop a Manual on Good Practices in Extension Research and Evaluation in 2017.

Since then, the demand for such trainings has increased, and together with other partners we could subsequently organise four such trainings for students and faculty in India.

Similarly blog conversations around enhancing capacities among extension led us to organise a capacity needs assessment (CNA) workshop for EAS providers in four South Asian countries. This also led to the Development of a Facilitators Guide on CNA of Extension and Advisory Services.

Several of the AESA blogs have significantly influenced the development of new extension curricula at the MSc and PhD levels in India, and some of these are currently identified as reference materials for the prescribed course content. We are sure many other blogs on the rest of the themes are also contributing to new debates in our profession. Additionally, these conversations have also helped some of our practitioners in better realising the wider scope and contribution of EAS in agricultural and rural transformation.

However, it remains to be seen how these contributions are going to bring about more such changes in the future among EAS and other actors in the AIS. Conversations on EAS will lead to transformational changes only if:

- these lead to reflection, experimentation, and learning among several practitioners at varied levels within the professional knowledge networks in EAS (something which the AESA Network has initiated in Asia and GFRAS globally);
- such conversations also happen among other professionals groups representing other AIS domains (research and education, business and enterprises, the enabling environment); and
- these professional groups representing the different domains interact with each other and jointly reflect, experiment, and learn.

We can't foresee where these conversations are taking us currently and whether we will be able to instigate transformational changes through these kinds of effort. But we firmly believe that we have initiated something interesting, albeit on a small scale. "Big things have small beginnings" goes an old adage and we look forward eagerly to it.

Rasheed Sulaiman V, Onima VT, Nimisha Mittal and Athira E

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Taking Stock and Shaping the Future: CONVERSATIONS ON EXTENSION

During the last six years (2013-2019), the Agricultural Extension in South Asia (AESAs) Network has served as a platform for collating the voices, insights, concerns, and experiences of people in the extension sphere of South Asia. Diverse professionals shared their concerns on the present and future of Extension and Advisory Services (EAS) in the form of blog conversations for AESA. Together, all of these individuals who are involved, interested and passionate about EAS, discussed ways to move beyond some of the seemingly intransigent problems that are hindering the professionalization of EAS. Nevertheless, these blogs also take the time to celebrate and salute the signs of promising new beginnings.

This publication is an effort on our part to compile 100 such conversations on EAS, which were originally published as AESA blogs, starting in February 2013, into this book. Several of our readers have been asking us to assemble all these reflections into a single document so that these are available as a good reference document for a wide spectrum of actors involved in EAS – scholars, practitioners, trainers, faculty, innovation intermediaries, mentors, leaders and managers – all of whom are involved in driving agricultural and rural transformation.



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