INFORMATION AND COMMUNICATION TECHNOLOGY FOR EXTENSION

06

56

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
	Blended	Agrisnet of State Departments
ICT in Extension - Processes	Hub & Spokes Model	e-Sagu of IIIT 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
	Open and Distance Learning (ODL) process	TN Agritech Portal, IGNOU
ICT in Extension - Integration	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.

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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 paribas)* 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".

57

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 22May 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). Jallov (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 (Jallov 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

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 Lankan 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 in100 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 dlialet 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 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 programmmes 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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58

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 provides 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 KVKs, 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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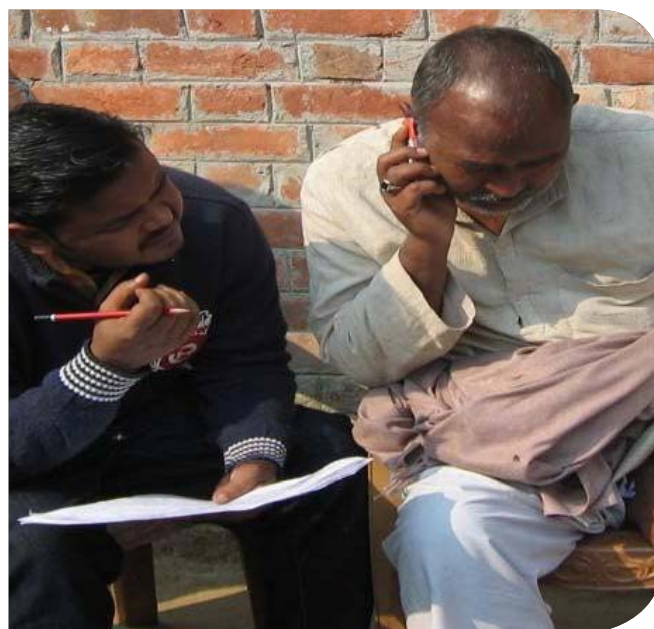
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59

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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60

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: Tipsfor 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.)

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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 ofAgriculture, 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
Use by extension professional networks				
Agricultural Extension in South Asia (AESA) (https://www.facebook.com/groups/428431183848161/)	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 famers 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, hydrophonics are most discussed topics in this group.	Farmers and others those who are interested in agriculture	Tamil Nadu, India	12 118

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 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.

2. **Irrelevant information:** Along with useful things, frequently there is irrelevant

informationalso 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 "agvocacy" (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.
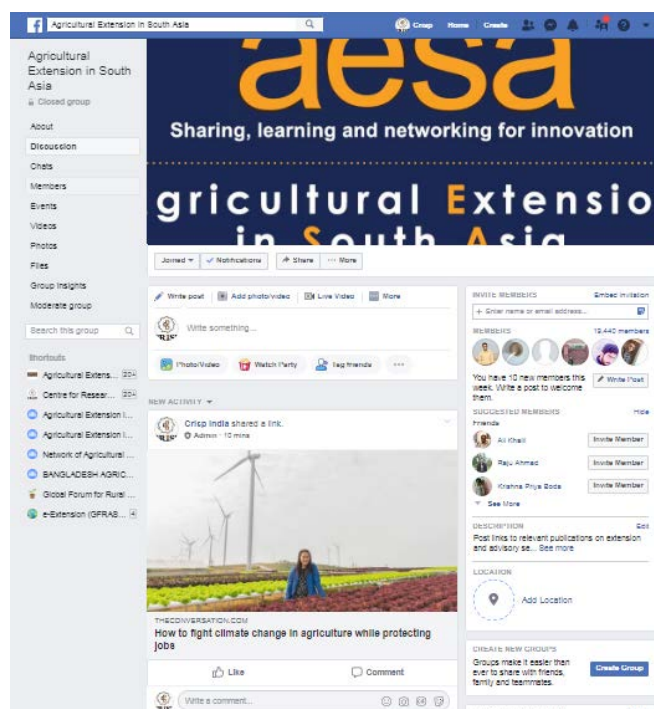
4. **Encouraging self publication and also collective contribution:** Social media platforms facilitate self publication. Also, contribution of agricultural stakeholders from across the globe creates a knowledge pool accessible to many, thus making open access to knowledge and information on agriculture.

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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61

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 Indians use the Internet[1]. 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 hewas 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.comml/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 devices[2]. 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.

[2]Vijay Shankar, Facebook Head of Products, Facebook Lite.
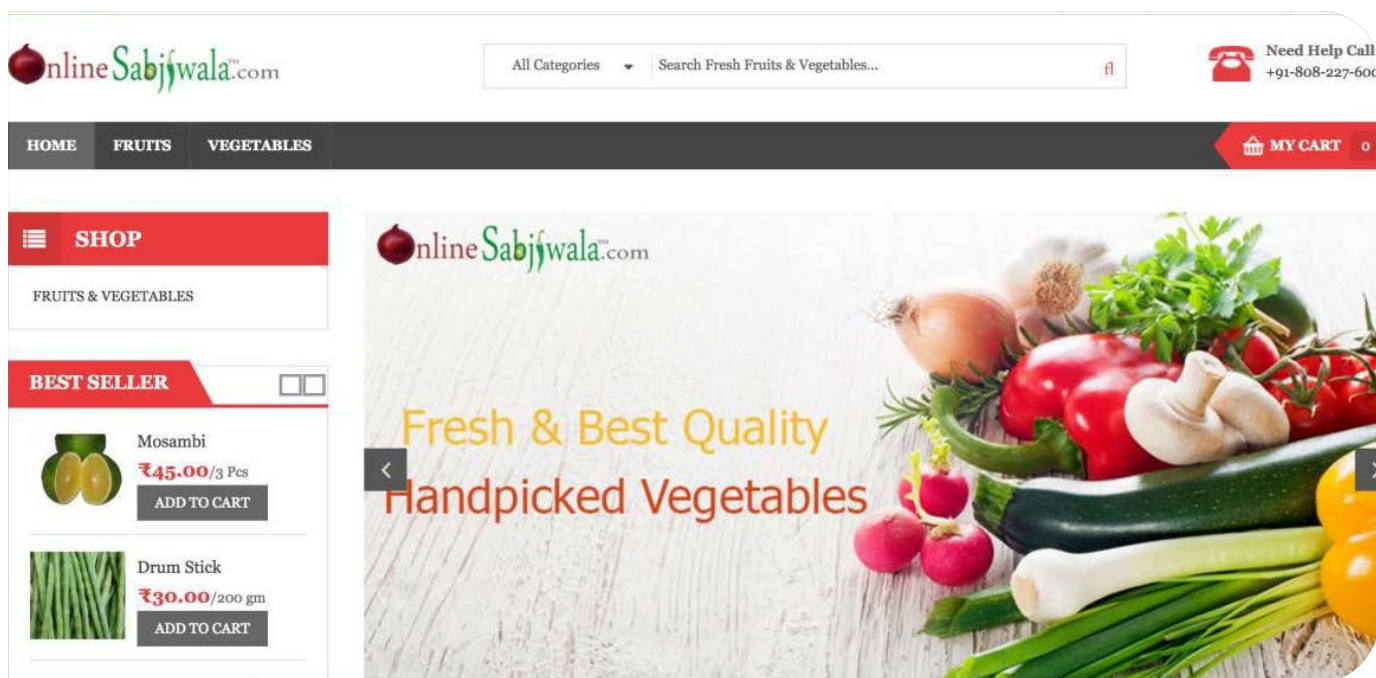
Telling Farm Story Online: Farm Blogs

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.

62

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?

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 Agrisnet 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).
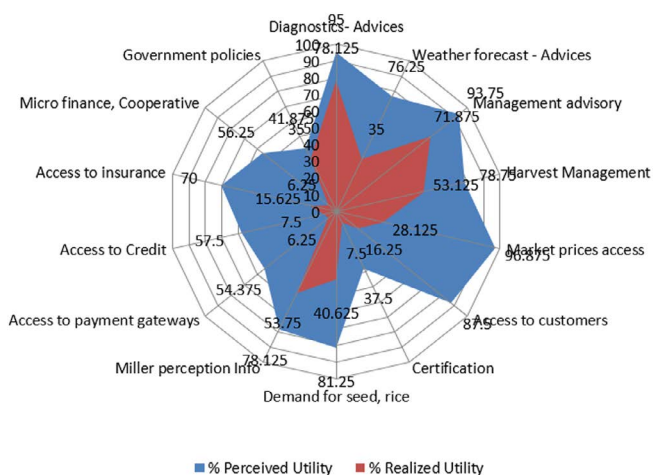
Fig. 1: Radar chart representing Data driven services accessible through mobiles

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, AD	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

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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 of extension systems**	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.,
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 **Field Extension** **Skill Development**	Brining best of the class global experiences to local extension units. Next generation MOOCs, leveraging strengths of 3D printing in extension
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.aesanetwork.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
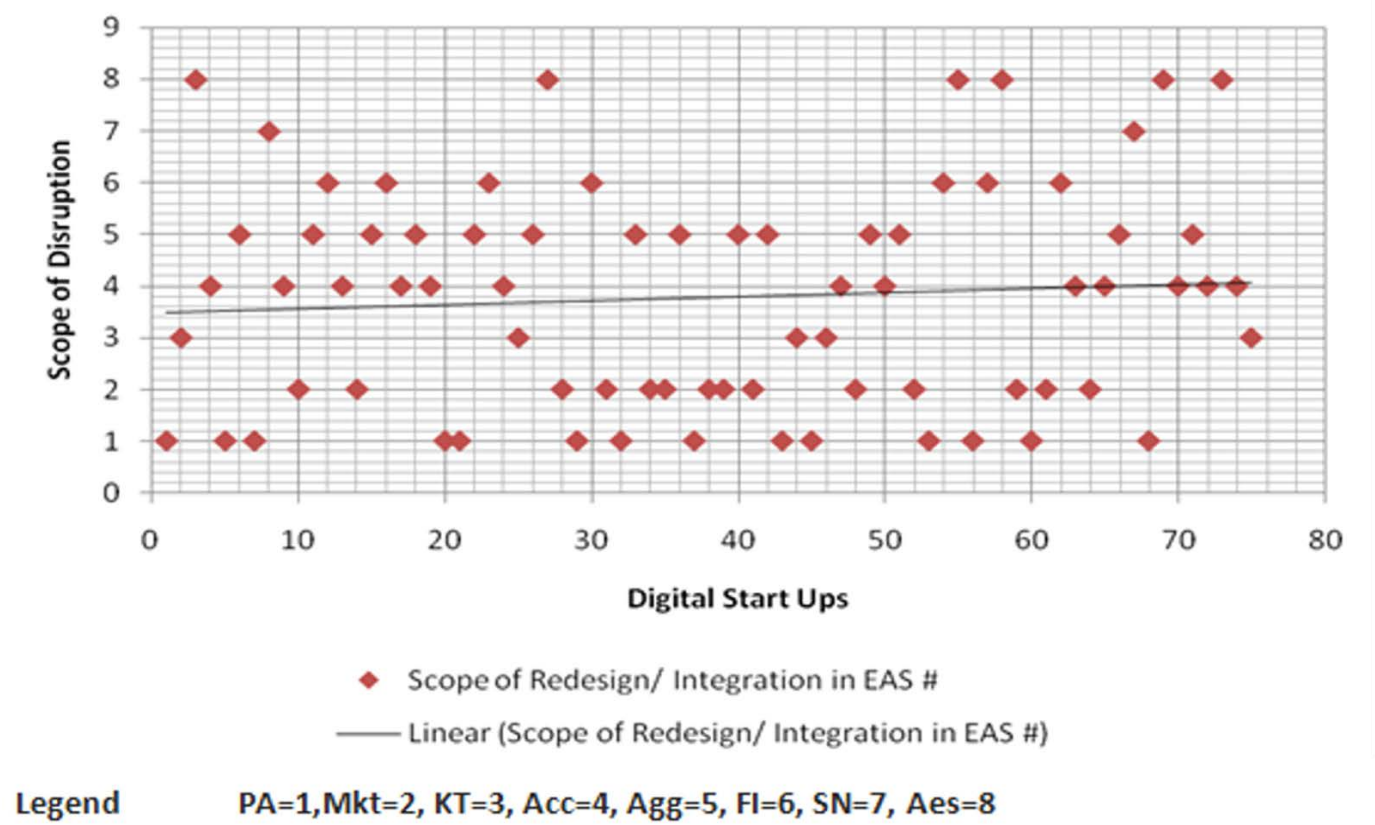
Fig. 2: Scope of redesign/ Integration in EAS from Start ups

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.

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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 (CRRI), 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 isa 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 Innova-tions	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

Name	Description							
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

Name	Description							
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 Innova-tions	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-machnery 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

63

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.

64

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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65

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.vkvk. 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 to300 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.
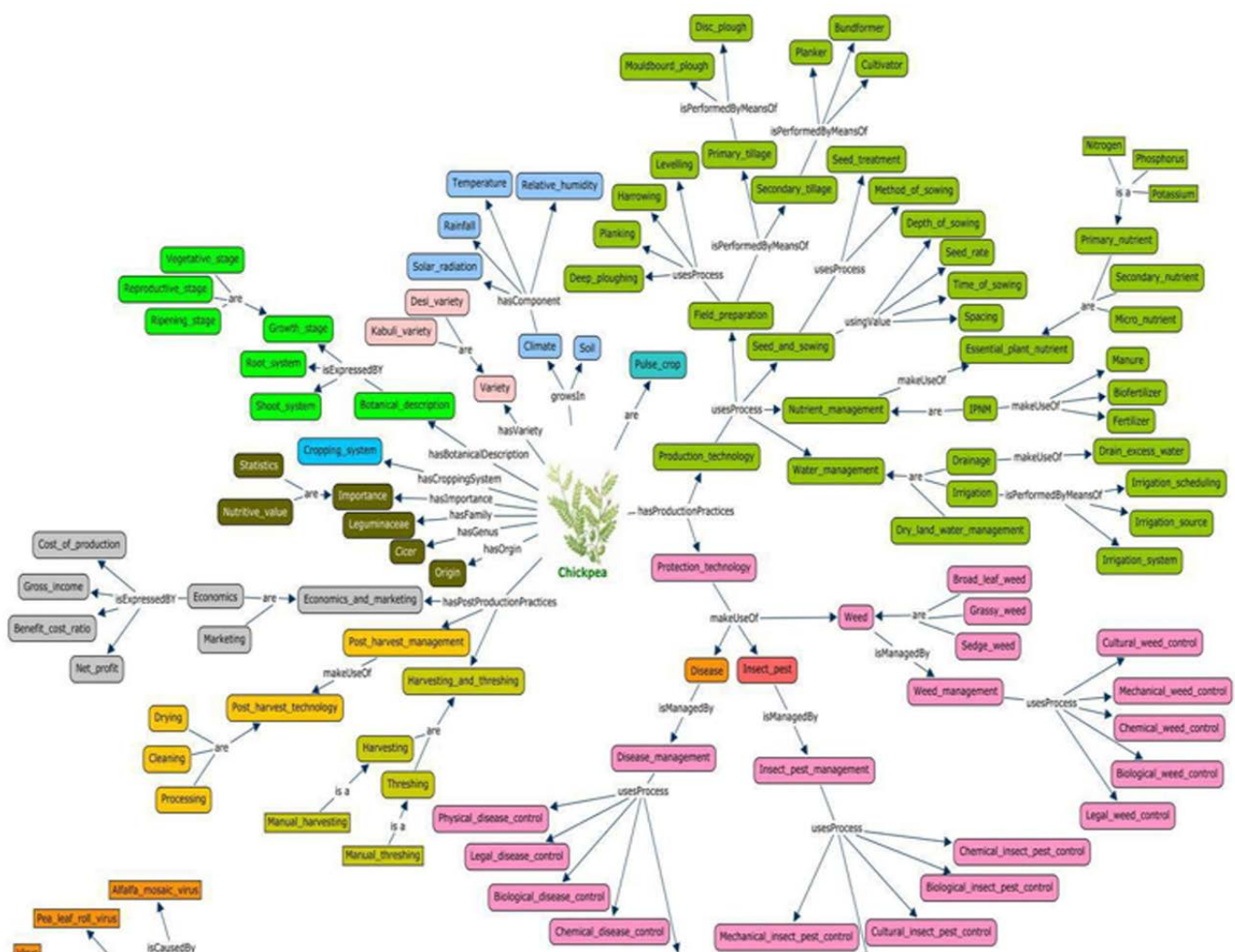
Except a few, most of the NARS organizations have posted very little content on their websites which is often not updated regularly. There is lot of reluctance to share knowledge. The mindset is that knowledge is power and so hold on to it. This is ironical considering the fact that Open Access movement 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

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.

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
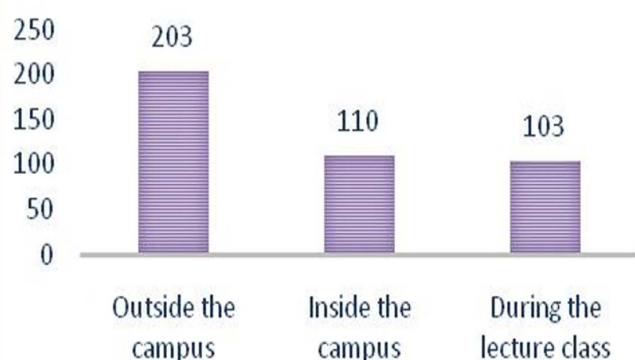
*multiple responses

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).
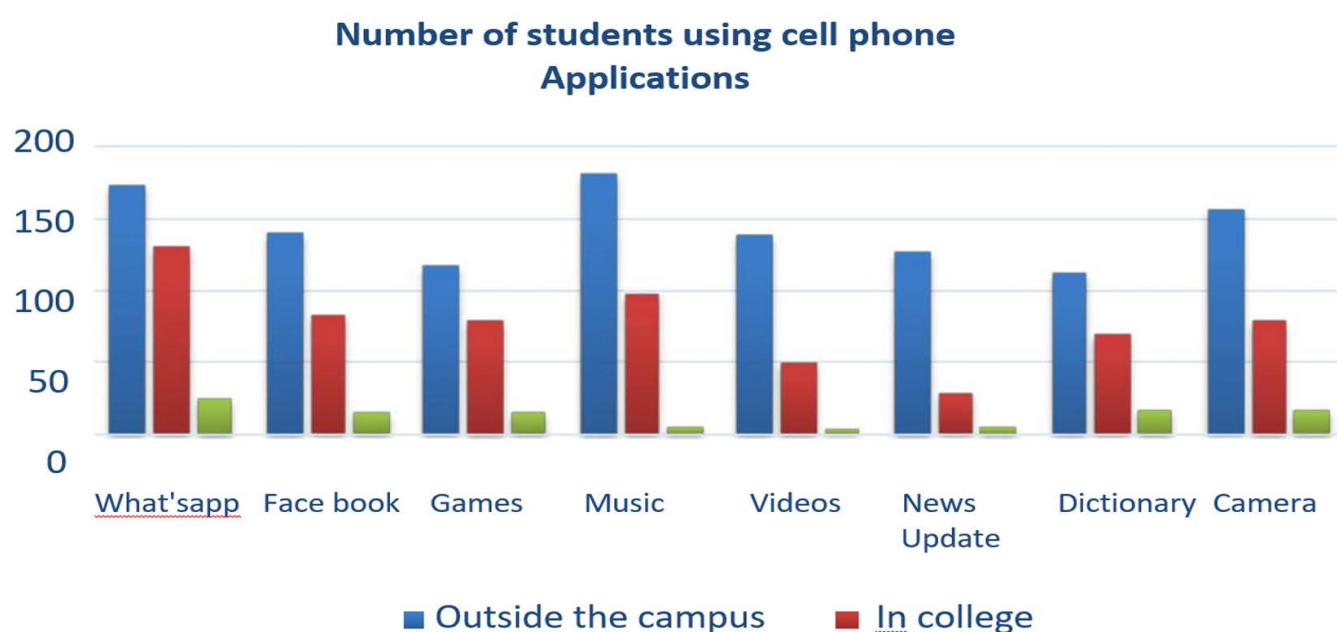
Fig. 2: Number of students using different cell phone applications

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.

multiple responses
* Rounded off to the nearest minutes
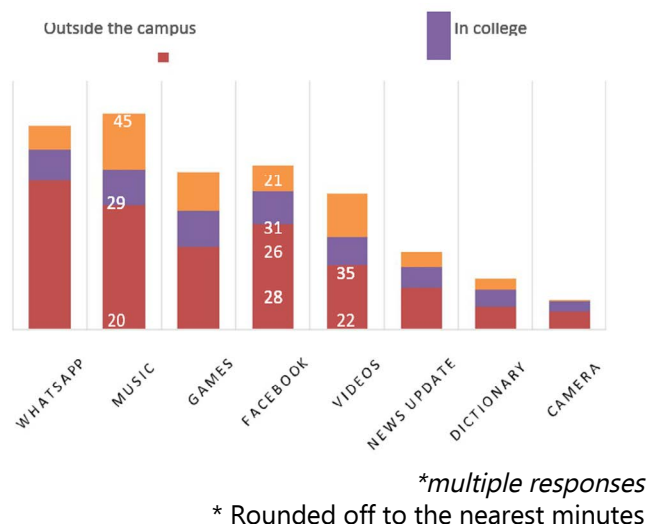
Fig. 3: Average time (in minutes) for which Cell Phones are used for different activities

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 maybe 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.
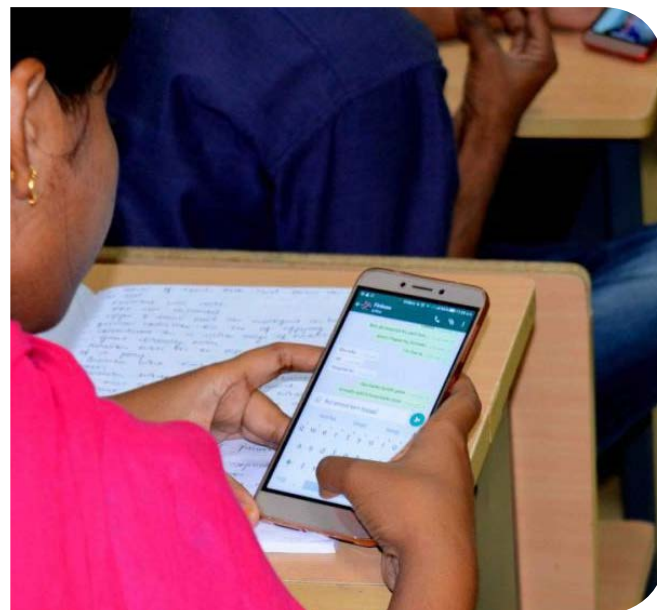
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67

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 Zoona 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: Zoona 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 Zoona, 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 agri-business 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 out breaks 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 agri-commerce 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.
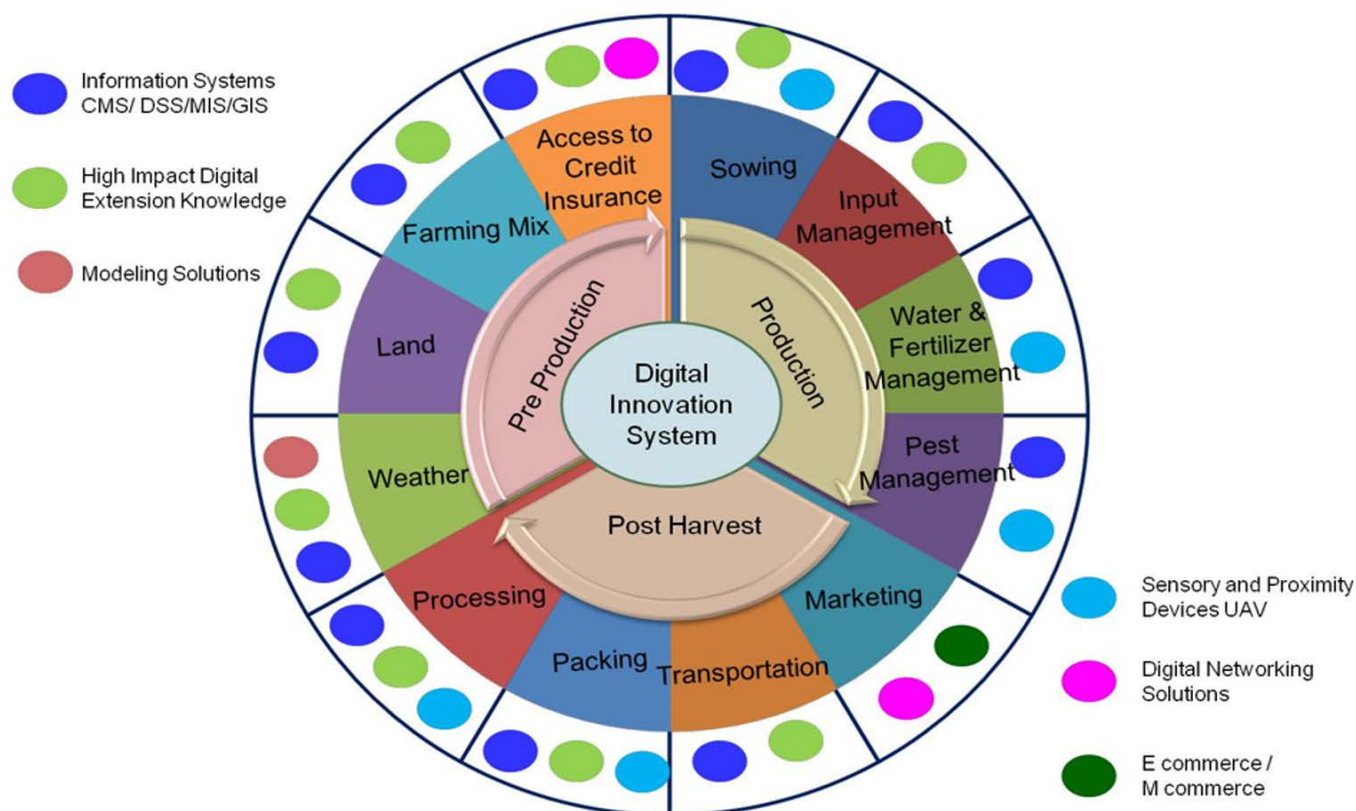
Fig. 1: Digital Framework for Disruption in EAS

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).
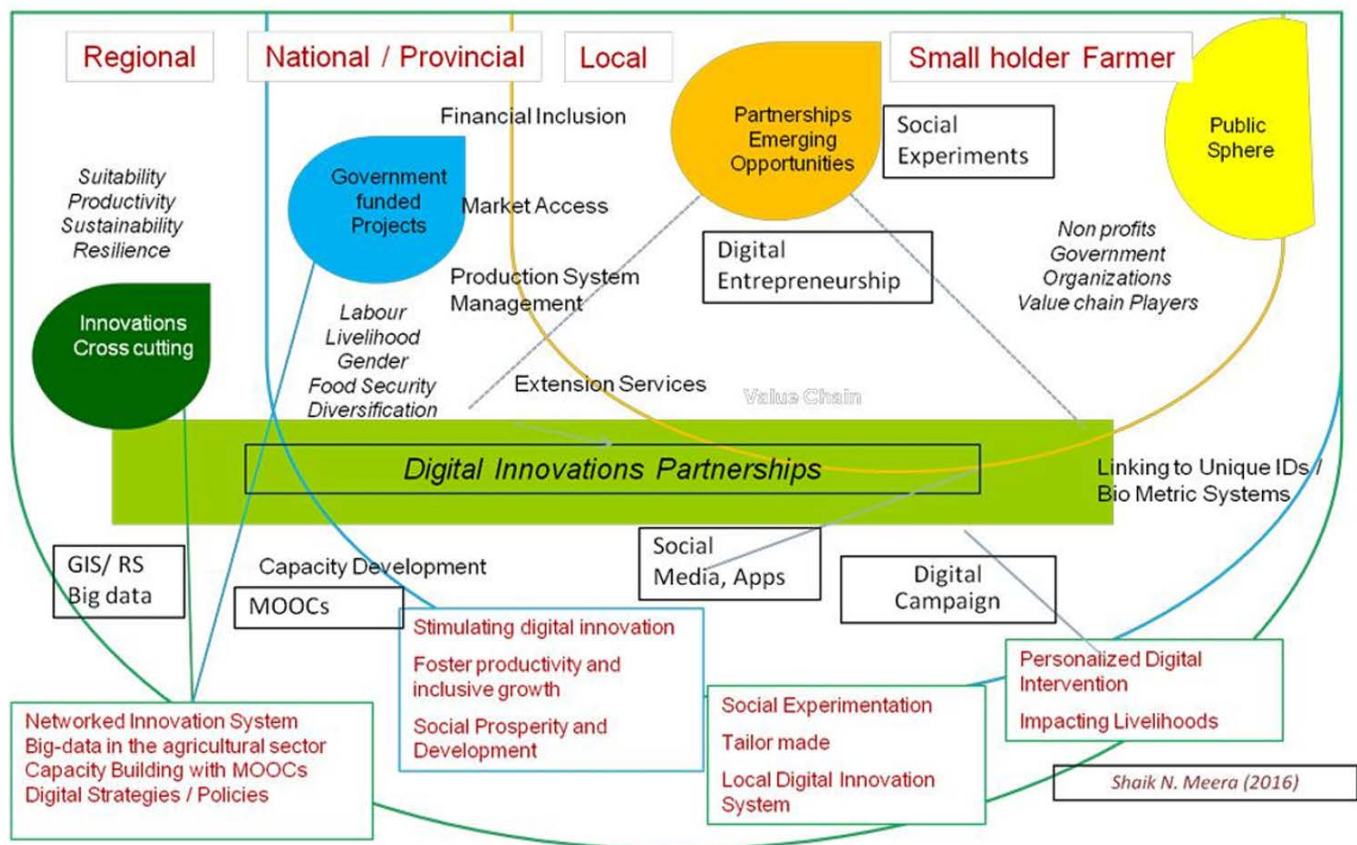
Fig. 2: Digital Framework for Disruption in EAS

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 DEVELOPMENT

07

68

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)

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

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

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 genetalia per rectum (hard skill in TVCC)
4. Skill in determining the stage of heat (hard skill in TVCC)

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 i mpart 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. Theses 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 Normal 0 false
  - ❖ 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.

69

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 (atRural 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** • Water Harvesting and Management • Watershed Management • Watershed Development Technician	• Water Technicians (Turkey planning/installation of water pumping/application systems) • Water Technicians (Maintenance) Handpump Technicians • Microclimate Management: Shade Nets/Poly houses	• Efficient Water Usage • Improving Soil Health
B	**Agriculture/Horticulture** • Crop Planning • Sustainable Agricultural Practices (SAP) • Soil Health Management	**Grafting of Horticulture species** • 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	• Farm Implements Maintenance • Post-harvest handling of farm produce • Crop Intensification / Diversification • Soil Health Management Improved Fertilizer use efficiency
C	**Livestock Development** • Dairy Cattle Management • Goat Rearing Management	• Artificial Insemination and Allied Services • Buck-Rearing for Goat-Keeping • Disease Diagnostics and Preventive Health Care • Milk Handling and Preservation	• Feed/Fodder Security • Economic Milk Production • Clean Milk Production • Reproduction and Nutrition Management of Cattle
D	**Forestry Based Livelihoods** • Planning for NTFP based livelihoods	• 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	• Sustainable Honey Harvesting • Improved Silkworm Rearing
E	**Construction and other Appropriate Technology** • Assessment of Technology needs and Scope	• Operating "Building Centers" • Fabrication and Maintenance of Agricultural Machinery/ Implements • Ferrocement Technology • Bio-energy Technologies	• Basic Construction Skills-Masonry, Plumbing and Painting
F	**Community Mobilisation** • SHG Formation and Management	• 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

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 ofvarious 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.

70

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 quitedisappointing 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 undertakingmassive 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 ismade, 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 iner 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 thatlays 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 minimumlevel 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 isobserved that out of the 340 Modular Employable Skill (MES) courses approved by National Council forVocational 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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