

# Rural Innovations @ Grassroots

Mining the Minds of Masses



R Kalpana Sastry  
O K Tara



National Academy of Agricultural Research Management





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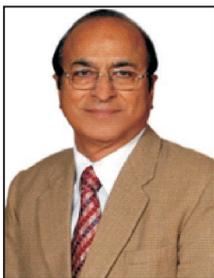
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**Dr.S.L.Goswami**  
Director, NAARM

## Foreword

The Indian Council for Agricultural Research (ICAR)-Vision 2030 envisages ensuring food and livelihood security through technological innovations and sustainable agriculture. The focus is to transform the existing National Agricultural Research System into a vibrant National Agricultural Innovation System by promoting innovations, catalytic action of reclaiming degraded resources in agriculture while conserving natural resources and biodiversity. It also aims at fostering linkages and collaborations with public and private, national and international organizations including the stakeholders across NARS and beyond. Thus, it forms an apt opportunity to explore the initiatives in place at grassroots rural levels and develop sustainable institutional models with suitable linkages to take this forward at broader platforms in the society. There is a need to build an awareness of existing grassroots rural system and look at the perspectives for the uptake of such sustainable solutions into the formal sector with an aim to create commercial opportunities to this sector and also enhance the current efforts for developing sustainability into agricultural systems. I am pleased to know that efforts have been made from my colleagues at the Academy in this direction through this publication titled "Rural Innovations @ Grassroots"-Mining the minds of masses.

I hope that the publication brings more awareness of this silent revolution taking place at grassroots innovation levels and paves way for recognition and institutionalization of rural innovation systems.

A handwritten signature in blue ink, appearing to be 'S.L. Goswami', written in a cursive style.

**S.L.Goswami**



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## Preface

The National Agricultural Research System (NARS) in India is one of the largest in the world with a multitude of stakeholders spread across the system. These include the formal structures of research system at front-end and also the farmers, rural artisans and knowledge holders at the back-end. The latter constitute a major force of grassroots rural innovation system at more informal level but continue to contribute to technology development. The system is driven by necessity and a drive to look at immediate problems encountered by them at their localized situations.

It is in this context that an attempt has been made to undertake this study and understand the innovation processes which are on a continuum providing solutions to challenges faced by the users themselves. As part of project on "Policy studies on agricultural value chains for sustainable rural livelihoods" under Learning and capacity building (L & CB) component of National Agricultural Innovation Project (NAIP) funded by World Bank, the study has attempted to connect with these innovators and formalize the learning from them. This compilation of thirteen case studies across different sub-sectors and backgrounds presents the plethora of problems faced by rural communities especially the agricultural farmers and the practitioners of traditional knowledge and practices in their state. It brings out the 'silent revolution of innovations' happening at grassroots level. Thus, the book titled *"Rural Innovations @ Grassroots" Mining the minds of masses*, reflects the genesis and the painstaking efforts of the rural innovators to come up with the frugal technologies that serve their purpose for a particular region. The various case studies have been presented as interesting stories of rural innovators with their innovations. Each story gives the twists and turns in the lives of the innovator to arrive at the innovation which finally serves the community at large. More often, the technologies and innovations are ecologically sustainable

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initiatives. An understanding of the intricacies in these techno-social products has laid the channel to look at the gaps and the necessary linkages to be focused on to arrive at better livelihood for rural masses. The intent of this study is to disseminate the rich knowledge base in the rural landscape and bring awareness among the formal elite on the existing grassroots system. It also looks at the problems in up scaling and commercialization processes of frugal innovations in the grassroots ecosystem. The scope is not limiting just to understand the rural innovations but to look at them in a sustainable perspective.

The book has its roots as an extension of the internship work of six IIT students and their experiences with the some of the grassroots innovators. It particularly focuses on some of the innovations from the states of Andhra Pradesh, Telangana, Rajasthan and Gujarat. The concluding chapter includes the understanding of various approaches for supporting the grassroots rural innovations with few suggestive initiatives towards sustainable rural development. We do hope that this book keeps up an interesting tempo among the readers as they go through the different anecdotes of rural innovations and realize their importance in the present world.

**Authors**

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## Acknowledgements

Like the progress of any innovation, the path towards this compilation is a result of support from several contributors and supporters. The authors first and foremost acknowledge the innovators who have shared their experiences and helped to capture the failures and successes in trajectories of their innovation paths. But, for their willingness to share and volunteer their valuable time with us, the final compilation would have not been possible.

Grateful thanks are to Dr.S.L.Goswami, Director, NAARM for giving the encouragement to achieve this goal of awareness creation on grassroots innovations. The opportunity given to us by Dr.N.H.Rao, Principal Scientist and Principal Investigator of L & CB Project (NAIP) is duly acknowledged. Special thanks are also due to him for his valuable suggestions in planning the chapters for the book.

We are grateful to Brigadier (Retd.) P.Ganesham, VSM, the Founder of Palle Srujana for his guidance and support in compiling the case studies presented in this book .We owe special thanks to him for conceptualizing the compilation; linking us with innovators and also reviewing the book. We thank Mr.J.Durga Prasad, Mr.J.Srikar and the team of Palle Srujana for rendering their support for the necessary inputs for the book. The technical support given by Dr R.Venkattakumar, Principal Scientist, NAARM in the editing and review of the book is gratefully acknowledged.

It is difficult to mention all the names and capture every individual effort in the preparation of this book; for defining ourselves with certain criteria as grassroots innovations are numerous. Yet, we take this opportunity to thank each and everyone for their support in our small endeavor to recognize the efforts of grassroots rural innovators and take it across and beyond the NARS.

**Authors**



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## Acronyms

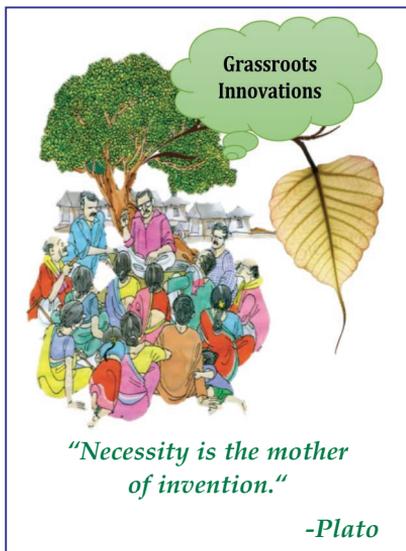
<b>ANGRAU</b>	Acharya N G Ranga Agricultural University
<b>AP</b>	Andhra Pradesh
<b>APSACS</b>	Andhra Pradesh State AIDS Control Society
<b>BBC</b>	British Broadcasting Corporation
<b>BSNL</b>	Bharat Sanchar Nigam Ltd
<b>CAPART</b>	Council for Advancement of Peoples Action and Rural Development
<b>CBMD</b>	Centre for Bharatiya Marketing Development
<b>CCMB</b>	Centre for Cellular and Molecular Biology
<b>CNBC</b>	Consumer News and Business Channel
<b>CRIDA</b>	Central Research Institute for Dry Land Agriculture
<b>CSB</b>	Central Silk Board
<b>CTRI</b>	Central Tobacco Research Institute
<b>DD News</b>	Doordarshan News
<b>DOR</b>	Directorate of Oilseeds Research
<b>DRDA</b>	District Rural Development Agency
<b>FAPCCI</b>	Federation of Andhra Pradesh Chambers of Commerce and Industry
<b>FCI</b>	Food Corporation of India
<b>GHMC</b>	Greater Hyderabad Municipal Corporation
<b>GI</b>	Geographical Indication
<b>GIAN</b>	Grassroots Innovation Augmentation Network
<b>GMP</b>	Good Manufacturing Practices
<b>GRI</b>	Grassroots Rural Innovation
<b>IARI</b>	Indian Agricultural Research Institute
<b>IBN7</b>	International Business News
<b>ICAR</b>	Indian Council for Agricultural Research
<b>IDA</b>	Indian Dental Association
<b>IIM</b>	Indian Institute of Management
<b>IIT</b>	Indian Institute of Technology
<b>IITF</b>	Indian International Trade Fair
<b>KVK</b>	Krishi Vigyan Kendra
<b>LPG</b>	Liquefied Petroleum Gas
<b>MVIF</b>	Micro Venture Innovation Fund
<b>NAARM</b>	National Academy for Agricultural Research Management
<b>NABARD</b>	National bank for Agriculture and Rural Development
<b>NDTV</b>	New Delhi Television Limited
<b>NGO</b>	Non Governmental Organization
<b>NID</b>	National Institute of Design
<b>NIF</b>	National innovation Foundation
<b>NIN</b>	National Institute of Nutrition
<b>NIRD</b>	National Institute of Rural Development
<b>NIT</b>	National Institute of Technology
<b>PMRY</b>	Prime Minister Rozgar Yojana
<b>PPP</b>	Public-Private Partnership
<b>RIF</b>	Rural Innovation Fund
<b>SCDC</b>	Schedule Caste Development Corporation
<b>SEVA</b>	Sustainable Agriculture and Environment Voluntary Action
<b>SIQ</b>	Samsung Innovation Quotient
<b>SNESOR</b>	Sneha Society for Rural Construction
<b>SRISTI</b>	Society for Research and Initiatives for Sustainable Technologies and Institutions
<b>TBGRI</b>	Tropical Botanic Garden and Research Institute



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## Introduction



India is known for its rich traditional culture and heritage with intricate socio-cultural bonding. The essence of the country continues to be in the large rural landscape comprising of several villages. Each village personifies strong value systems of its own kind, and is characterized by simple lifestyle in a naturally healthy environment. Also present in this conglomeration, is a large knowledge base, time-tested traditional beliefs and a distinct culture which has evolved over the centuries.

Following the success achieved during Green Revolution era, the economic contribution from agricultural sector to

GDP suffered a setback and steadily declining after 1990's. This resulted in widespread agrarian distress and impacted the society even though there were rapid strides in other sectors which had positively accelerated the overall broad-based economic growth of the country. It is fact that, more than 55% of country's population is employed in this important sector for their livelihood and sustainability. Agriculture continues to be demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. Several initiatives have been taken by the national government to address the challenge to arrest the decline and reverse the slowing growth of agriculture<sup>1</sup>.

Since the independence of the country, the focus of national planners and policy makers has been to develop and implement suitable plans and programmes to usher enhanced levels of rural prosperity. Top priority to this sector was accorded by the Government of India during all its Five Year Plans and agenda for rural development continues to be the focal issue. The 2013 Science, Technology and Innovation (STI) Policy<sup>2</sup> of the Government of India aims at inclusive growth that ensures access to affordable technologies and solutions across the country including the rural areas. It emphasizes on use of Science, Technology and Innovation as part

of developmental agenda in the country. Towards achieving these targets, the identification and dissemination of best practices of innovations in agriculture and other rural occupations form an important linkage. The conventional approach to achieve this is through the professionally trained technology developers including scientists and researchers working in the various organizations of the national R&D system. In the recent years, new routes towards innovation are shaping up and lending their hand in promoting innovation systems for wider applications across the society. Innovations are also emerging at the rural and grassroots level with this out-of-box thinking and creativity is now recognized as an important force in shaping new dimensions in the innovation systems in the National Agricultural Research System (NARS) through a bottom-to top approach<sup>3</sup>.

Essentially, an innovation means a better way of doing something and which comes from a creative mind of a person located anywhere - in a closed, formal urban environment or in the open informal rural sector. As a rich source of traditions and knowledge, the Indian village ecosystem harbours an active but informal system of innovation. The translation of this innovation system into a sustainable production and manufacturing system can lead to entrepreneurship. In other words, such activity in agricultural and allied sectors would essentially lead to building an environment of “agri - entrepreneurship” in rural sector.

Most innovations in the informal system of innovation are based on real-life experiences and seek to address the challenges faced by the local population in their daily lives. These innovations often lie cocooned in that particular locale only. This isolated feature of local innovation system often blocks its progress and further dissemination. When a similar problem arises in another location, the process of reinvention of the wheel sets in at that place. Lack of connectivity for the dissemination of knowledge also deters its reach to other sectors. This includes the academia and researchers in the formal system of education too; ultimately blocking the progress of the innovation. Thus, the access of such time-tested and creative innovations generated at the local level is necessary for enhancing technology creation activities and for the advancement of entrepreneurship in the country.

### *What are grassroots rural innovations (GRIs)?*

Grassroots rural innovations are the exemplary rural technologies that emerge by addressing the local needs in villages. These are simple and affordable technologies designed at the local level by the local people using the local resources and their set of simple skills. Most of them present practical solutions to the problems faced by them at their individual level. In a nut shell *“The grassroots rural innovations (GRIs) are basically ingenious solutions developed locally to address the system challenges in the long run for improving rural livelihoods and promote sustainability”*.

With the strong base in the villages, India is fortunate to have several grassroots rural innovators in the villages which serve as the nurturing platforms of innovations. This is more applicable in agriculture and its allied sectors. Growing realization of adverse effects of urbanization and climate change demands on the environment, demands for healthy food production with emphasis on use of sustainable agricultural production practices are new challenges facing several engaged in the R&D programmes under this sector. All these developments necessitate exploring other approaches. Some of the grassroots rural innovations have indicated the possibility of building affordable and suitable solutions for many existing problems related in the value chain of food production and security across the country. Working under many constraints such as lack of education, inadequate infrastructure and uncertain financial status, many of these rural innovators and entrepreneurs work to put their ideas, knowledge and age-old practices into tangible processes and products. Such technologies and innovations based on traditional knowledge and practices have proved to be of immense importance to agri-business sector. Many of these have contributed to accelerating economic growth through building of sound business option around the innovation. Therefore, if nurtured properly, these local innovations can be translated for wider applications and made competitive with imported technologies coming into the market.

The realization of this new space in developing new opportunities, several public, private and voluntary organizations, including NGOs, international organizations and multinational corporations have initiated some efforts to scout and identify such technologies through technical and financial support. However, such innovations are silently ‘happening’ in discrete corners and are scattered and often do not percolate to others in the society.

While there may be multiple reasons for this scenario, there is a need to develop proper connecting channels to bridge the gap between the innovators and various other functionaries of the society.

### *The connecting paradigm - Efforts of public and voluntary organizations*

Grassroots rural innovations are simple inventions based on the practical experiences associated by the developers. More than often, these are at the proof-of-concept or very early stage only and need more support from external agencies for commercialization. Since the last decade or so, few organizations have been associated with these initiatives. Most of these function with a primary objective to function as support platforms to grassroots innovators in our country. The section below introduces some of these organizations which work with GRIs in the specific sector of agricultural and rural activities.

*i. Honeybee Network* : Honey Bee Network<sup>4a</sup> is a crucible of like-minded individuals, innovators, farmers, scholars, academicians, policy makers, entrepreneurs and non-governmental organizations (NGOs). The network has its genesis in 1988-89 and is spread in more than seventy five countries around the world today. It upkeeps the philosophy of attributing the knowledge gathered to the contributor protecting their intellectual property, acknowledging the traditional knowledge holders or innovators and accrued share to the contributors from value additions. This philosophy kept the network tight knit for the more than 25 years now. The network intends to bridge the gap between the formal and informal sectors. It has been continuously scouting and documenting the acquired knowledge through the *ShodhaYatras* –a kind of pilgrimage to the remote villages for gathering such knowledge with due acknowledgement to the contributor. The Honey Bee Network constitutes institutional collaborators such as Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI)<sup>4b</sup>, Grassroots Innovation Augmentation Network (GIAN)<sup>4c</sup>, National Innovation Foundation (NIF)<sup>5</sup>, Sustainable – Agriculture Environment Voluntary Action (SEVA)<sup>6</sup>, Prithvi<sup>7</sup>, Palle Srujana<sup>8</sup>, Peermade Development Society- Kerala<sup>9</sup>, Innovation Club-Orissa<sup>10</sup>, Network of Gram Vidyapeethas along with other individual and institutional collaborators from other states.

*ii. National Innovation Foundation (NIF)* : Building upon the Honey Bee network philosophy, the National Innovation Foundation-India (NIF) was

set up by the Department of Science and Technology (DST), Government of India, in February 2000 at Ahmedabad to achieve its goals essentially through a non-government spirit. Prof. Anil Gupta of IIM<sup>11</sup>, Ahmedabad has been the guiding force behind this organization. This is perhaps, the only 'national initiative' presently working with a mission to strengthen the grassroots technological innovations and outstanding traditional knowledge.

*iii. Honeybee AP and Palle Srujana :* HoneybeeAP<sup>12</sup> is a component of Honeybee network which pursues the mission in the states of Andhra Pradesh and Telangana. It is coordinated by Brigadier (Retd.) Pogula Ganesham, VSM<sup>13</sup>. He is the Founder President of Palle Srujana -a voluntary organization and Chief Editor of Palle Srujana, a bi – monthly magazine that projects grassroots and rural innovations in Telugu language. Palle Srujana is an organization exclusively started in these two states to pursue philosophy of Honeybee and NIF with extended ideology of (i) supporting any unaided literate or illiterate rural individuals and their innovations and (ii) creating awareness about rural technologies and traditional knowledge and to build a synergistic network among the academicians, students, parents, government organizations and public institutions. The organization has been actively supporting, mentoring and sustaining the innovators endeavors with moral, financial and social back up needed for GRIs. It has been working towards identification and transferring of rural technologies while collaborating with a number of institutions and organizations. In this process, they conceived an organization "Creative Minds"<sup>14</sup> mentored by Palle Srujana *Sangham* that works on a "unique business model" for the innovators and by the innovators" which is detailed in the coming up chapters. Palle Srujana has brought out 146 grassroots rural innovators into lime light from Andhra Pradesh and registered them with NIF. About 2000 traditional knowledge practices have been scouted, documented and forwarded to NIF. Palle Srujana also provides a platform for innovators to show case their innovations at exhibitions, food festivals and conferences organized by various organizations.

*iv. Research and Development Organizations in Public Sector :* R&D organizations like National Academy of Agricultural Research Management (NAARM)<sup>15</sup>, National Institute of Rural Development (NIRD)<sup>16</sup>, National Bank for Agriculture and Rural Development

(NABARD)<sup>17</sup>, Council for Advancement of Peoples Action and Rural Development (CAPART)<sup>18</sup> and several others in public sector and autonomous bodies are providing technical or financial support and contributing to building of an 'enabling ecosystem' of innovation for grassroots rural innovations (GRIs).

### *The purpose of this book*

Rural innovations emerge out of the need of the people at grassroots rural level to overcome the immediate local problems faced by them. An understanding of the emergence and existence of these innovations is essential for exploring them as applied in the entire agricultural production and consumption system. This book epitomizes the importance of such innovations in the rural landscape where in the process of idea translation to a product or service for local use takes place and which immediately serves the purpose of the people. The primary objective of this book is to create an awareness about the existing rural grassroots innovations and voice the felt needs for an institutionalized process to be in place. It also seeks to identify the constraints encountered by them during up scaling and commercialization processes. Further, it suggests a model to connect all players inside and outside the rural realm for creating sustainable rural livelihoods.

To achieve these objectives, this book describes the journey of some grassroots rural innovations and the support they could get from associated organizations. Undertaken as a research study at the National Academy of Agricultural Research Management (NAARM) through a project, "Policy studies on agricultural value chains for sustainable rural livelihoods" under L&CB of National Agricultural Innovation Project (NAIP)<sup>19</sup> funded by World Bank-ICAR, an attempt has been made to connect with the "Grassroots Innovators" and learn about the innovations coming from their creativity and thinking. The final compilation of thirteen case studies spread across different sectors and sub-sectors of the agricultural systems presents the successes and problems of these rural innovators and communities. The innovators include several farmers, rural artisans and the practitioners of traditional knowledge and practices.

### *The approach*

A case study approach was taken up to understand the genesis and impact of the grassroots rural innovations on agricultural and allied sectors in

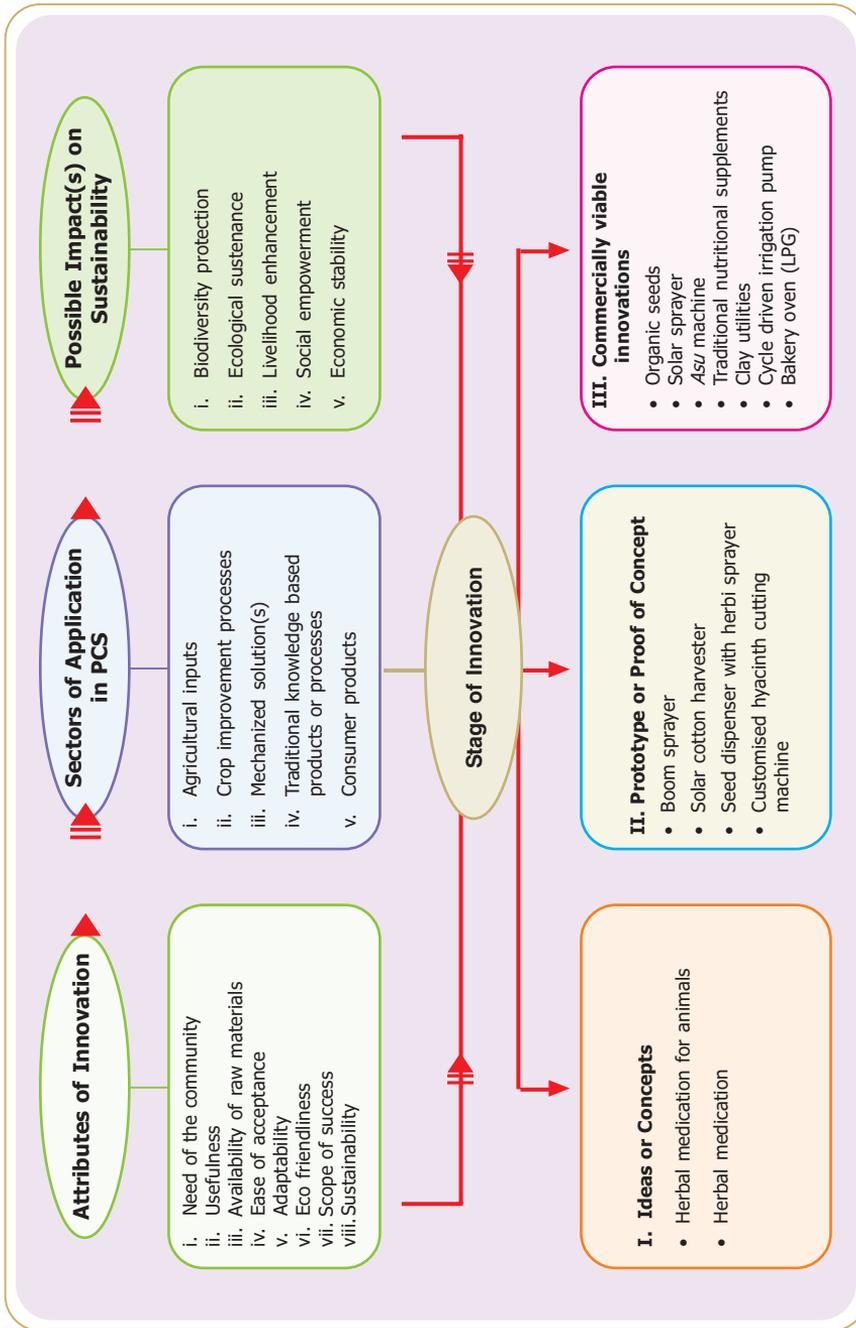


Figure 1. Conceptual framework for selection of the grassroots innovations \*

\*Thirteen grassroots innovations related to agricultural PCS were selected for this study from the agricultural and rural sectors.

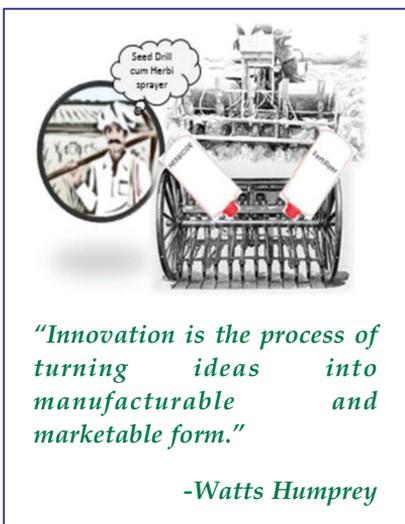
India. The preliminary sources of case studies were two organizations, namely, Palle Srujana and NIF. An iterative approach was adopted to identify and scouting innovations. Initially, an attempt was made to participate and gather information through series of workshops organized by several organizations including NAARM, NABARD, NIRD, participating in *Shodh Yatras*, Rural Food Festivals and innovation showcasing events of NIF and Palle Surjana. Participation in these events afforded the opportunity for identification and rapport building with innovators and understanding the existing systems. Standard tools like structured and unstructured questionnaire, personal interviews and other sources of data (photographs, certificates, recorded programmes, etc) were used to collect the information from the innovators. The secondary sources of information were Palle Srujana and Honeybee magazines, compilations on rural innovations from libraries, e-resources for information, websites of organizations and various online and print journals. Based on data and information collected, a flowchart was conceptualized as part of procedure to select relevant innovations (Figure 1). The framework consists of attributes of the grassroots innovations, stage of the innovation, prospective application in and across agricultural production–consumption system (PCS) and possible impacts on the ecosystem, society and rural economy. 30 innovations selected from various sources were rated against all the listed attributes and features using this framework. 18 innovations were first shortlisted and based on hierarchical listing, 13 case studies relevant to the agricultural value chain with impacts on the rural sector were selected for a more detailed study.

Based on the premise that “*Common people do uncommon things and are unique to grassroots vista*”, the genesis and the background context of each innovation in these 13 case studies was studied. Each case study has been presented to bring forth the principles and method adopted during the painstaking experimentation of the innovator. Attempt was also made to understand the innovation process, along with the successes and the setbacks experienced in each case. At the end of each case study, an effort was made to infer the major learning from that case along with a suggestive action for the future. Finally, the book seeks to create a provocative thought process among its readers so that the current initiatives for nurturing grassroots innovations are strengthened to foster agri-entrepreneurship in the country to enhance rural livelihoods.

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## The Journey of Farmer as an Innovator



*Innovation* : **Seed dispenser with herbi sprayer**

*Innovator* : **Tondapi Guravaiah**

With the changing needs of the farmers, agricultural practices and methods are also constantly evolving. Some of these changed practices have impacted the fragile ecosystems leading to depletion in natural resources, which are essential for the very existence of the production systems<sup>20</sup>. Dramatic changes in the climate across the world have influenced crop production, led to

hydrologic imbalances, impacted input supplies and other components. Consequently, these biophysical effects and utilization of natural resources intensify the pressure on agricultural production.

Researchers in agriculture continue to work towards maintaining and increasing the nation's agricultural productivity. They develop ways and means of improving crop yield and control of pests and weeds. They also look for ways to improve quality with less labor, greater safety and effectively conserve soil and water. These innovative methods make way forward for better and higher agricultural outputs. But, an abyss exists between such formal research sector and informal sector of farming community. A support or hand holding from organizations has often been of a great help to the rural and agricultural community in crossing this chasm. One such innovation that has seen light was from a small village of Rupenguntla in Guntur District of Andhra Pradesh. This was built on concept of “Zero tillage”<sup>21</sup>, an age old practice which was revived through the adoption of this unique innovative model.

Majority of agricultural lands in coastal regions of Andhra Pradesh are irrigated areas. Paddy is a major crop cultivated in such lands. It is sown in rainy season and the harvested after 120-130 days. It is a common practice of crop rotation<sup>22</sup> in these areas when pulses like black gram or green gram are sown as the second crop. This gives an advantage of using residual moisture with zero tillage after harvesting the *kharij*<sup>23</sup> paddy crops. Zero tillage minimizes efforts in land preparation and also the cost of cultivation. In recent years, farmers have found maize crop to be more remunerative under these zero tillage conditions. The practice saves one to two irrigations with this method of soil conservation. Adoption of this crop was seen to give more farm income with less cost of cultivation and easy maintenance.

### *Problem of non- availability of labour*

It all started in 2003 when the paddy crop of coastal regions of Andhra Pradesh was devastated by floods. In Guntur region of Andhra Pradesh about 3.72 lakh hectares<sup>24</sup> of land were sown with paddy during *kharij* season. This was the normal practice but the crop suffered huge losses due to the floods. The farmers were naturally disheartened, but wanted to offset their losses by sowing maize using traditionally known zero tillage practices. Their experiment of dispersing maize seeds in the fields to derive benefit from the residual moisture before it is evaporated gave a good yield. Thus, the method of using the residual moisture after rice crop for growing maize crop picked up in that region. However, during the next five years, the farmers started to face a deficit of labour during the post-harvest season for annual seeding operations in the non-ploughed fields. Large acreage had to be sown in a short span of 10-15 days without any tillage practices being adopted. More over during the harvest of the *kharij* paddy, majority of the labourers are engaged in the harvesting, threshing and bagging the yield of that crop. A scarcity of labour resulted in a demand for higher wages by the available manpower.

Normally, for sowing the second crop, ten members are required per acre of land. An acre of land also requires about four to five persons to spray the weedicide or herbicide<sup>25</sup>. Thus, availability of labour during this span of 10-20 days is important and any deviation becomes as a stumbling bottleneck. To overcome this problem, an illiterate grassroots innovator

with great conviction, designed a farm machine that was named as “Guravaiah seed dispenser with herbi sprayer”. This machine could provide a feasible solution to some of the major problems of sowing faced by the farmers for taking up the second crop.

### *Guravaiah – The grassroots innovator*

Hailing from small village Rupenaguntla of Narakallu mandal<sup>26</sup>, Guntur district in Andhra Pradesh, India, Mr. Tondapi Guravaiah, like other farmers of this region, also followed the practice of zero tillage with maize seeds. A humble person by nature, he devoted his time for the family and farming. As a patriarchal member of his village, he was involved in several decision making platforms in his village which also enthused him to work on issues related to the welfare of the farmers.

He was the eldest son in his family and had started working with his father at very early age. He continued with the tradition of being part of a joint family and did farming on a cultivable acreage of about 70 acres of wetland for several years. Later, as the family divided and he inherited a share of about 12 acres land, and continued cultivation on same lines down the time. At an age of 65 years, and after having settled his three children (two daughters and a son), he continues his work with a great zeal and serve the farming community.

He observed that majority of the farmers at his place were facing a severe dearth of labour during the season of harvesting. The sowing of the next and the succeeding steps of herbicide spraying, administration of fertilizer and other procedures for that crop sometimes proved difficult due to lack of labour. This resulted in higher costs for engaging labour from other neighboring villages (Box 1).

Guravaiah was personally affected by this situation. He started to look for an amicable solution which could benefit his colleague farmers and conceptualized a mechanized application of sowing. He focused on this and after a lot of hard work and effort, a unique contraption named “Tondapi Guravaiah Seed Dispenser with Herbi Sprayer” was made. This farm equipment has been designed at grassroots level to overcome the challenges faced by farmers especially for maize sowing under zero tillage conditions after paddy harvesting.

### *The story of innovation*

Looking at the need of the farmers for help in sowing operations, Mr. Guravaiah wanted to make a machine which could be used by the farmers themselves. He tried dispersing the seeds of the second crop superficially on the soil with seeds twice the amount necessary for traditional sowing. He intended to take the complete advantage of dampness in soil. He consulted some of the seed companies on his idea of dispersion. But the problem to tackle weeds was not met and sprouted seedlings were killed after few days because of weed plants which were growing faster. It reminded him of a Telugu saying “*molava valasindi molavadu-molichindi pothundi*”. Translated into English, the quote means “that a sapling which is essential does not sprout and that which sprouts dies”. With this major drawback, the method was a failure. But, Guravaiah never gave up and believed in himself to go forward.

#### **Box 1. Need for innovation**

- *Dearth for labor during harvest period*
- *Lack of uniformity in seed distribution resulting in clustering of plants and uneven growth in manual process*
- *Improper placement of depth of seeds impacts the final emergence of saplings in the manual process*
- *Uneven growth due to old practices*
- *Loss of time for maximizing the advantage of zero tillage due to dependence on labor*
- *Problem of administration of weedicides*
- *Missing the opportunity to exploit the moisture and fertility of the soil resulting in loss of income*

He was constantly thinking about this issue and one day he happened to observe closely a tractor moving in the neighbouring fields. A brilliant idea suddenly struck and the seeding for his innovation then took shape (Box 1).

Mr.Guravaiah had a vision of making a machine for dispersion of maize seeds under zero tillage conditions (Figure 2).

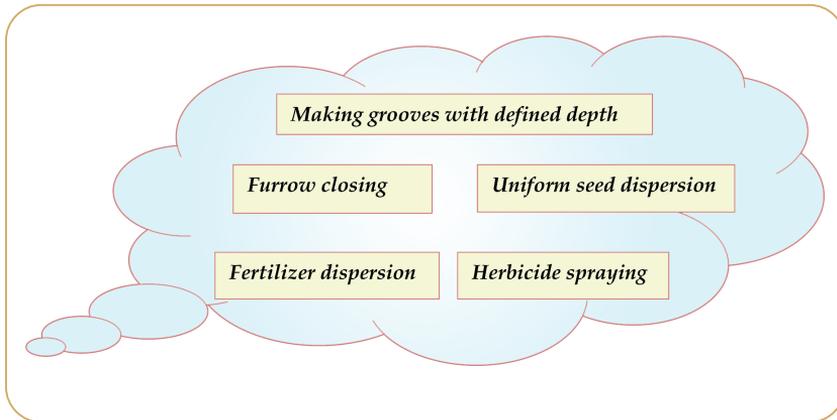


Figure 2. Concepts built into Guravaiah's innovation

His idea started off with a concept of linking some agricultural implements to the wheels of the tractor. Though, Guravaiah had the idea, he lacked the technical expertise in making it. He looked for a real time solution. He met various agricultural scientists and other literates of formal sector in Farmers' Meet at LAM Farm<sup>27</sup>. Mr.Guravaiah raised the problem being faced and discussed about the plight of farmers in his region. He enquired about availability of farm equipment that can solve the labour problem. Scientists informed about ongoing research and discussed the bottlenecks they were facing during the designing of similar machines. But this interaction with the scientists proved fruitful to him. It was decided by all to invite some farmers for understanding their problems at the site and explore for possible suggestions. The participative approach advocated by the College, motivated Mr.Guravaiah to firm up his resolve to make farm equipment and facilitate farmers of coastal Andhra region where the zero tillage opportunity after paddy harvest could be used for a profitable second crop. Since, he did not have technical knowledge; he approached Bapatla Engineering College<sup>28</sup> and with the technical guidance of scientist, Dr.T.Yellmanda Reddy<sup>29</sup> he started working on his concepts and ideas. The Principal of the Agricultural college<sup>30</sup>, Dr.T.V. Satyanarayana and other

faculty also supported to bring Guravaiah's ideas into a design for a machine. An old seed dispenser<sup>31</sup> was modified with detachable coulters<sup>32</sup> of a new machine called rotator and a new working prototype was built. In all this process, Guravaiah was assisted by the scientist and also technically trained mechanic working at the workshop of the college. Thus, this scientist-farmer-mechanic trio modified the existing seed drill successfully and brought out a new drill that made two rows of furrows for seeding in zero tillage. This built up confidence in Guravaiah to further modify the design for more furrows. The basic cost of the seed drill was approximately Rs.45,000/- and Rs.10,000/- more needed for the modification. With this technical and some monetary assistance, Mr.Guravaiah conducted field trials on this appliance using bullocks in Agricultural Engineering College fields. The demonstration brought few more technical issues for which some more funds were needed. But, the lack of appropriate sanctions at the college for this work stopped Mr.Guravaiah to continue at that point of time. He was disheartened and had to wait for a year when he could get some support.

### *Palle Srujana—A way forward*

The initial success and also support from the College at Bapatla instilled a passion in Guravaiah and he found that his idea was still a dream. However, his work started to get recognition in farmers of that region. It was through another grassroots innovator, Mr. Upputella Krishna<sup>33</sup> that Mr. Guravaiah got a chance introduction to 'Palle Srujana' team. After hearing about him and his work, the members of Palle Srujana team went to his place and met him. This was in October 2011. This meeting and conversation paved way for Guravaiah to take forward the innovation. The vacuum between formal segments with this grassroots innovator was filled through a suitable support in the form of financial, technical and also moral mentoring from time to time. With a financial grant of Rs. 95,000/- under aegis of Mr. Mohanaiah, Chief General Manager (CGM), NABARD and technical help from Palle Srujana, Guravaiah started re-designing his machine. Mr.Narendra<sup>34</sup> of Aler, a mechanic by profession, helped him in building the frame work and making the basic prototype of the equipment with three coulters. In five days' time, he made the first model of the farm machine by adding more coulters to the seed drill. This

was linked to the tractor and field trials were done. All this was done at the workshop at Aler and testing in nearby fields there. Aler was a dry land area and even though irrigation arranged for the test trials, the results from these fields did not satisfy Guravaiah. All along, his idea was for a machine to be used in wet lands of coastal regions. Brig.Ganesham and members of Palle Srujana helped Guravaiah in moving the contraption to his village, Rupenguntla village. The team also scouted for mechanics from their network of grassroots innovators who could understand and also have rapport with Mr Guravaiah so that his ideas could be suitably translated. Through its wide network, the voluntary organization could help cementing the gaps and also build self-confidence into Mr Guravaiah. This gesture was indeed a turning point for him in his journey to realize his dream.

### *Guravaiah's endeavour*

It was no easy task to make a device with multiple functions for an illiterate farmer without technical knowledge. Apart from this, Guravaiah had to face a lot of criticism. As the project demanded his complete dedication, he leased his lands and took one year off from active farming. The machine made with Mr Narendra help in Aler was brought to his village and customized for using it in wetlands there.

Courtesy: Innovator



A photograph of three row seed dispenser attached to tractor

It was observed that the dispenser in the machine was able to maintain the needed depth for seeding of three inches in soil. But while furrowing, soil was found to be stuck in the seed dispensing channels. There was also a need to build a mechanism to close the furrows after seeding to conserve the moisture. Three mechanics, Mr.Tirumalnath (Nani), Poornaiah and Koteswar Rao<sup>35</sup>, of Narsaraopet, Guntur District were contacted for technical help through Brig.Ganesham of Palle Surjana. They proved to be the 'engineers' for Guravaiah and helped him to further modify the device. Initially, they helped him to attach more coulters to his earlier version of 3-coultler machine. The 5 row coulters machine was then linked to the fertilizer dispersing system. Finally, a container for herbicide and nozzles for herbicide spraying were added in intercalating position with seed dispensing coulters. The entire system was developed as an attachment to a tractor. Every time a modification was done, a demonstration was arranged for suggestions from all attending, more particularly, solicit from the farmers themselves. He ensured that his rural engineer(s) were always present during these displays and discussions. Each and every suggestion was deliberated and then implemented. This process continued till no further suggestion came. This is an example of a '*crowd sourcing*' technique that was practiced by Guravaiah during the development of model. The modification and the progression came up stage wise in the equipment. It was revised nearly five times in a short



Courtesy:Innovator

A photograph of Guravaiah's "Seed dispenser with herbi sprayer"

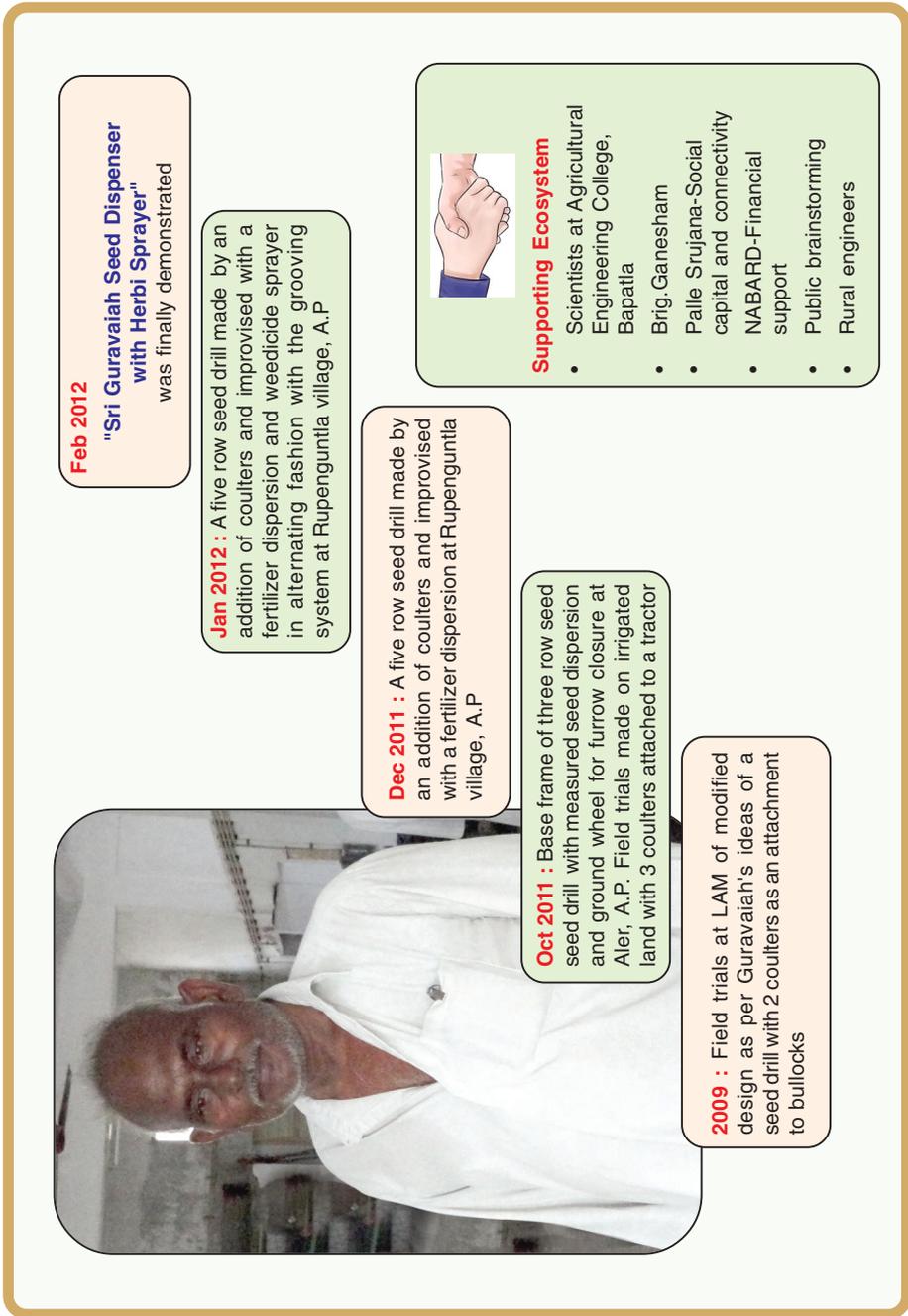


Figure 3. Guravaiah's journey to innovation

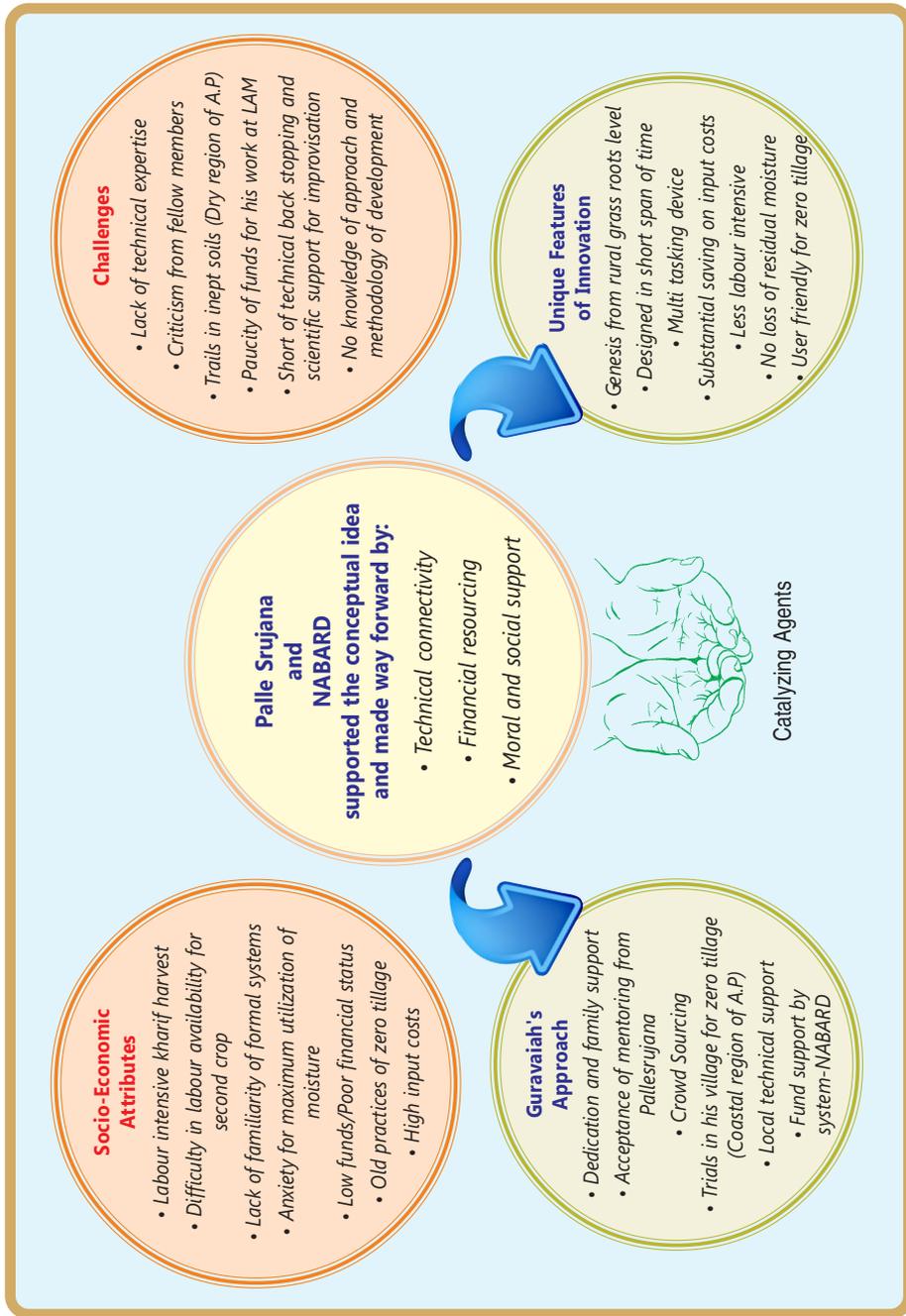


Figure 4. Progression of Guravaiah's ideas into an amazing device

span of three months. Finally a prototype was developed by him along with his team by December 2011. A demonstration of the final model was undertaken in February 2012 and the dream of Mr. Guravaiah was then actualized. Figures 3, 4 represent the milestones in the timelines of a rather long struggle of Guravaiah in his pursuance of a dream and providing solution to his farmer peers.

*The innovation- ‘Guravaiah seed dispenser with herbi sprayer’*

Participative mode of work, good team working and the zeal to achieve his goal were perhaps the key factors for success. In all it took about three months for Mr.Guravaiah to complete the basic model after he got the financial, moral and technical support. The first working prototype was demonstrated in February 2012 and met with appreciation and success. The innovation was named as “Seed dispenser with herbi sprayer” and has the following features:

- i. Coulters to make furrows for the seeding attached to an existing seed drill equipment
- ii. A seed metering disc attached to the system for dispensing seeds in equidistant pattern in the grooves in measured amounts.
- iii. A fertilizer dispersion system is attached that delivers the necessary fertilizers for growth of the seed in graduated quantity.
- iv. A ground wheel to close the furrows with soil after seeding and providing fertilizers.
- v. A sprayer system with nozzles attached to the device such that it is arranged in alternating fashion with the grooving system for rational spraying of the herbicides.

### **Box 2. Benefits of Guravaiah's innovation to farmers**

- *Performs many functions in single operation*
- *Can be handled by two individuals*
- *Requires no specialized training*
- *Effective mechanism for zero tillage cropping pattern*
- *Very useful for millets, cereals, etc*
- *Consumption of seeds, fertilizers and herbicides is minimized*
- *Equipment can cover large acreage in a short span of time*
- *Seeding is equidistant without clustering and fertilizers are dispensed in sufficient quantities.*
- *Furrows are simultaneously closed and herbicide sprayed immediately will not affect the seeds thus making way for healthy sprouting*
- *Substantial reduction in input costs for farmers unlike manual system*

#### ***A cost effective practice***

Guravaiah's innovation proves to be of great benefit (Box 2) to the farmers as it performs 'five' tasks at a time. The investment on four to five persons for one acre of land is nullified. It can make up to three days of manual work in a single day. The device can cover about ten acres of land in a day and gives the farmers the advantage of nearly two-three irrigation cover. Therefore, as the task of irrigation decreases, water and power consumption are reduced. There is no wastage or loss of seeds and an optimum dose of fertilizers is only need to be applied. Closure of furrows gives protection for the seeds from herbicides and the herbicide sprayed by the herbi sprayer impacts and destroys the weeds before seedlings sprout out. This multi-functional machine can also be used for other cropping systems with slight improvisation. This machine is an attachment to a tractor and only two persons are needed to be engaged for the entire operation. Perhaps it may

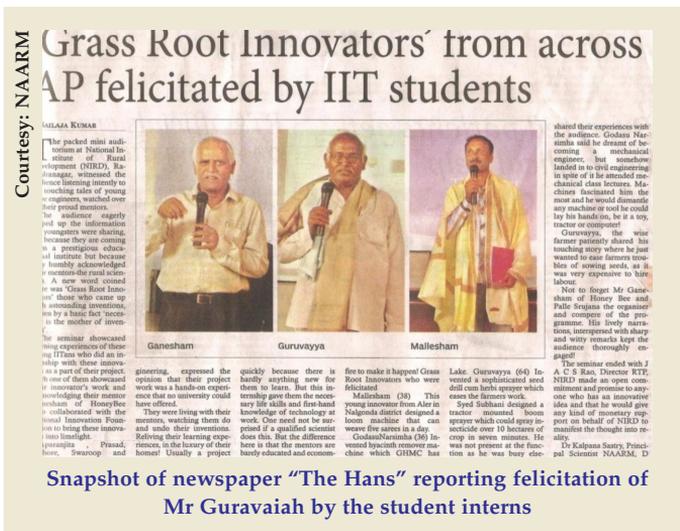
be one of its kind machine offering the multi-functional capacities under the specific conditions of sowing under zero tillage conditions in rice fallows.

An estimated 3.7 lakh cultivators in Guntur district alone stand to benefit through this innovation. Mr.Guravaiah's calculations indicate almost one lakh rupees of investment for the initial model. He plans to reduce the cost of making of the machine at a rate of Rs.40,000 - 50,000/- per device. The likely turn over for the estimated 200 such devices works to about Rs.1.2 crores. This machine when deployed in adequate numbers facilitates about five lakh acre of the land being sown in a period of 10 -15 days making it cost effective solution and an effective practice under zero tillage conditions. It is calculated that there is 30% reduction in input costs for the farmers. Thus, there is a saving of Rs.2000 - 3000/- per acre of land for sowing maize. If this technology is further transferred in the adjoining districts covering 4.5 lakh more acres, an estimated Rs. 90 crore can be saved by all the farmers of these areas. But any up scaling of his innovation at this juncture would require more technical support to Mr. Guravaiah from the manufacturing sector and also more opportunities for investments through financial agencies including the public sector organizations. Suitable models of transfer of such technologies from grassroots level for up scaling and manufacture need to be in place so that more users can be reached.

### *Honour and recognition to Mr.Guravaiah*

It is important to understand that Mr Guravaiah was contented person as his family was modestly provided for and his children are well settled. It is his own drive and passion based on his observation of the felt need of his peers that motivated him to pursue his idea. He was lucky to be supported by the faculty at Agricultural Engineering College, Bapatla in 2009. The turning point for him, perhaps, was handholding initiative of Palle Srujana, at a very crucial moment which his activities in this experiment had met a block. The release of sanction of Rs.95.000/- from NABARD in 2011 through the networking efforts of Palle Srujana provided the much needed finance. The association with this voluntary organization also proved to be morale booster for him with fostering of a platform for discussing his ideas and problems.

Other organizations like NAARM also recognized his efforts. Two young students from Indian Institute of Technology (IIT) Kharagpur<sup>36</sup> working for their summer internship at NAARM were closely associated with Mr Guravaiah for their project work. It was a unique case of engineering students learning from him in his own fields and at his ‘workshop’. The innovation system emerging at grassroots level was an important learning for the students who publically acknowledged Mr Guravaiah as their teacher. In a felicitation event after the completion of their project, they presented the work of Mr Guravaiah highlighting their learning during that time. To put it in their words, *“it was one of greatest experience in their lives which brought the practical side of engineering”*. Mr Guravaiah considers this association with them as recognition by scientific community and feels this is a very important milestone for him. He could relate his thinking to young students who, he feels, can become torchbearers of such innovation systems happening in the countryside.



In 2012, Mr.Guravaiah was awarded the 1<sup>st</sup> Runner –up position in Samsung Innovation Quotient-Season-2<sup>37</sup> contest. This nationwide hunt to recognize and reward innovative cutting edge technologies was organized by CNBC TV18 in partnership with Samsung and Mr. Guravaiah’s application facilitated through the efforts of Palle Srujana and NAARM to ‘SIQ-2’.



These initiatives further led to his participation at Centre for Innovation in National Institute of Technology (NIT)<sup>38</sup>, Warangal where an opportunity was facilitated to several innovators including grassroots innovators to exhibit their innovations and invite students to work with such innovative minds from informal section. This was yet another platform for connecting budding professionals with innovators through the Palle Srujana platform. Box 3 tabulates the recognitions attained by Mr. Guravaiah

### Box 3. Felicitations to Mr. Guravaiah

- *Mr. Guravaiah was felicitated by IITians of Kharagpur who were interns at NAARM, for his marvelous innovation and quoted him as their "Guru" for inspiring the young minds on a public dais organized at NIRD in July 2012.*
- *He was given a 'Certificate of Recognition' and a citation of Rs.3,00,000/- as the 1<sup>st</sup> Runner-Up in Samsung Innovation Quotient Season 2 contest held in September 2012.*
- *He was given a warm felicitation with a citation as token of appreciation for his innovation at 'Technozion 2012' organized by NIT, Warangal in Centre for Innovation during September 2012.*

#### **Box 4. A word from Innovator**

*“My aim to make this machine is to cater to the needs of my fellow farmers of my region. I was moved by the lack of labor faced by many farmers in the region. Especially during kharif harvest, sowing millets on zero tillage land to gain more yields and higher income has been tough task for the past few years. I knew that my machine could cater to their needs and farmers can save time as well as earn more. I wish that my innovation could be taken forward to all regions and I would be happy if the government could give these machines on subsidy like the tractors are subsidized so that it can suffice the necessity of farmers in every mandal. I am further planning to modify this device to suit for different crops and soil types. I am very thankful to Palle Srujana and Brig. Ganesham Garu for having supported me all through my endeavor.”*

#### ***Thought provoking***

Guravaiah’s “Seed dispenser with herbi sprayer” provides impetus to several researchers in engineering and other sectors. It is a motivating innovation and its journey proves the need for co-existence and co-partnering between formal and informal communities in agricultural sector. Systemized programmes like internship or field experience training for young school and college students can set in a process for reducing the gap between both the sections of the society. Such experiences of drudgery being faced can give practical experience and initiate new thinking in the young minds to cater their ideas for solving needs of farmer. Further they, can also bring to light several such ‘unknown’ innovations already in place in the villages. To build and improvise an innovation, technical back stopping is needed from the scientific researchers and technologists and for taking it further. The innovation of Mr. Guravaiah has its roots from the needs of the farming community. The analysis of his efforts highlights the development of low cost, multitasking, user-friendly solution to the problems being faced at ground level. It is even essential to practice and profess philosophy of Mr. Guravaiah (Box 4) who utilized crowd sourcing and social capital to achieve his goal. This story of his innovation is an

eye opener and can guide scientists and technology developers in their pursuit of technological solutions. Such attempts will further catalyse their efforts and also be acceptable to the end-users. It beckons for policy support from private and public, organizations including Krishi Vignana Kendras (KVK)<sup>39</sup> and NGOs with their participation. All agencies involved in extension work can be further linked through suitable public-private partnership (PPP) models for bridging the technological gaps and facilitate in building grassroots innovation systems.

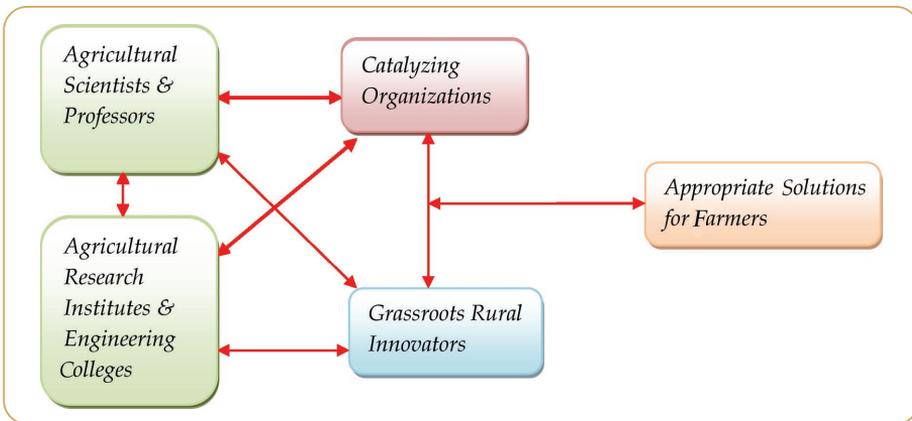


Figure 5. A micro model for uptake of beneficial GRI concepts for farm machinery

While the scientific community is mandated, armed and equipped with resources to access vast data or information, the domain knowledge of the creative farmers can further accelerate the process of development of agricultural processes and devices which are appropriate and affordable. Research laboratories located across various parts of the country directly or through catalyzing agencies could connect to innovative farmers to arrive at appropriate solutions (Figure 5). The local engineering colleges could also be engaged in the technology development activity on a continuous basis. Such a model helps in reduction of costs, time for development and shall be able to promote customized and affordable farm equipment to the needy farmers. A system like this in place would have helped Guravaiah to reach his goal much earlier. A person with high degree of technical aptitude is a rare icon among illiterate agriculturists and this

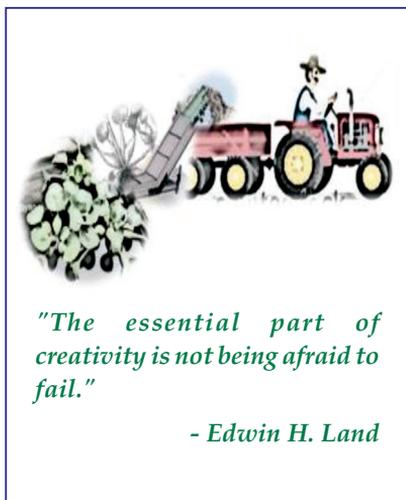
calls for not only applause but to learn lessons from him. It incites and ignites the scientists and young brethren to think on such innovative, creative lines. It is very true when the IIT'ians of Kharagpur called Mr.Guravaiah as their "Mentor or Guru". This story of Mr.Guravaiah brings the importance of solutions to problems at local level by the local people with local resources.



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## Hyacinth Removal Made Easy



*Innovation : Hyacinth cutting machine*

*Innovator : Godasu Narsimha*

Water hyacinth (*Eichhornia crassipes*), is an ornamental garden pond plant that originated in the Amazon Basin, a native to Brazil and was introduced into many parts of the world for its beauty. It has flourished in parts of Africa, Southern USA, South America, South East Asia and Australia. The intense proliferation of this plant is considered due to its adaptability to the tropical and subtropical climate.

Water hyacinth<sup>40</sup> is an aquatic floater with stems and leaves containing air filled tissue which gives the plant considerable buoyancy<sup>41</sup> that enables it to float and spread rapidly within and between connected water bodies. The propagation of the plant results in a rapid increase in biomass. Often, continuous mats of living and decaying water hyacinth up to two meters thickness covering the entire water surface are seen. A single water hyacinth plant can produce a few to 5000 thousand seeds contained in capsules. These seeds may sink to the bottom mud where they can remain viable for 5 to 20 years. Their growth takes place at a rapid rate under preferential conditions. As much as seven-fold increase or spread in just 50 days' time has been observed. In fact, it has been reported that two hyacinth plants can grow into 1,200 offspring in 120 days.

In India, it was introduced as an ornamental plant in West Bengal in early 20<sup>th</sup> century. However, presently, it is one of the most devastating weed of most aquatic bodies in India. It is estimated to cover over 0.4 million hectares of water surface.

### *The menace*

The rapid proliferation of water hyacinth allows the plant to build huge populations in the areas of introduction, developing dense mats on the surface of the water and becoming a major weed. Its infestation over large areas of water causes a variety of problems including reduction in light, oxygen and change of water chemistry. This is affecting flora and fauna of these water bodies apart from increase in water loss due to evapotranspiration. Its spread causes practical problems for marine transportation, fishing and in catchment areas of hydro power and irrigation projects. It is now considered a serious threat to biodiversity. This weed represents a serious environmental problem and also a public health problem. It creates a microhabitat suitable for the breeding of many vectors of human infectious diseases and also as host for poisonous snakes.

### *Water hyacinth problem for fishing in Muktapur*

Muktapur<sup>42</sup>, a place very close to Pochampally village of Nalgonda district of Telangana is predominantly, a fishing hamlet. The fishermen of this place earn their livelihood by fishing in the lakes and other water bodies in and around the village. These fishermen sell their catch to a contractor on a regular basis for their living. Since last few years, they have been facing a serious problem of water hyacinth growth in the water bodies in their village. This has led to the marooning of the boats in water bodies because of inability to move through the water covered by the floating weeds. The difficulty of its removal and rapid re-emergence of plant after removal is proving to be threatening their livelihoods. This led to mounting of huge debts by the fishermen. Nearly ten villages in and around Muktapur, continue to face this problem. Narsimha, a small fisherman who belonged to this village also faced this threat impacting his income from the family profession of fishing.

Godasu Narsimha was a boy of eight years when his parents, Mr Anjaiah and Mrs Seethamma passed away. His elder brother supported him till his schooling. When his brother could not support his education at college level, he discontinued his pursuit of the Diploma course in Civil Engineering. He married, Lavanya of the neighbouring village and the couple was soon blessed with three children. Owing to family

responsibilities, Narsimha also taught in a small school apart from undertaking the family profession of fishing in the water bodies of his village.

Over the time, the fishing community started to face the emerging threat of water hyacinth problem in the water bodies of their village. The members decided to clean the ponds manually to ensure the fishing activity continues. Realizing the quantum of work, the entire community planned this cleaning in a phased manner with each member undertaking the work on a rotation. All the fishermen shared the work of cleaning and fishing. The returns of the fishing trade were distributed equally among the members.

Narsimha also shared this responsibility of undertaking hyacinth weed cleaning in the water bodies and fishing activities as per the roster decided by the elders in the community. But, Narsimha had a problem as he also had the regular job in the school. He was a poor man and could not afford to lose his income from both the sources. He also could not keep away from his community responsibilities and invite their displeasure. He constantly thought of a solution for hyacinth problem to keep himself free for his other commitments and wished to get his turn of cleaning only once in ten days. Since, he also had interest in mechanical works, he started conceptualizing a design for a hyacinth cleaning machine. This started his journey of innovation and on the path of making of the “Narsimha hyacinth cutting machine”.

### *Narsimha's story*

Narsimha narrates the genesis of his innovation and the challenge she went through in achieving it. To quote him: *“I come from fisherman community of Muktapur village. I used to work as teacher in a school for a salary Rs.3000/- per month. Apart from this, I have the responsibility of fishing as per our community norms and we share the returns on the fish sale. Unfortunately, our lake in the village gets covered with water hyacinth and it hinders the growth of fish. This hampers our fishing activity and affects our livelihood. If we cannot have good yield then returns will be low and we get into debts. In order to clean up the lake, 50-60 members of our community ought to work for 90-100 days for which we take a loan of Rs. 3,00,000/- approx from the contractor to whom we sell*

*our produce. He in turn deducts this loan from our sales proceeds of our fish catch. It is a difficult task to clear the weed from water as it causes skin infections, sometimes snakes bite or at times it could prove fatal due to choking amidst the weeds. Since this is a very difficult job, the wage per day is Rs.500/- and 6 days of this work equates to my salary. It comes to about Rs.15,000/- per month of income. My community members wanted me to share the work and frequent absence in the school was not acceptable to the school management. For this reason, I thought if a machine could be used such that I get my turn once in 10 days then it would be easier for me to manage things as well as reduce the drudgery of hyacinth removal."*

He then suggested his idea to the community members, that a machine could be designed for which a sum of Rs.20,000/- was required. They accepted and provided him the amount for designing the hyacinth removal machine. He made the machine but it cut hyacinth only and the lifting of the cut hyacinth was still a problem. Thus, this design of the machine was not acceptable to his community as lifting was a treacherous job for them and mere cutting after pulling it out would not solve the actual problem of huge manpower.

Narsimha conceived a solution for this but he needed Rs.20,000/- more to design this part of the model. The village community could not support the amount but assured him that once the model was ready they would buy it. His lack of financial resources stopped his pursuits. He was always apprehensive to take loan from money lenders. Any failure with the machine could render him financially more insecure.

Yet, undeterred, with the support of his wife and children, he started to work late nights to make a machine with wooden planks, iron frame and blades. Once this was in some shape, he approached his friend in nearby village Revanapally and offered to clean up hyacinth from their lake, if they supported him with Rs. 20,000/- for a test run of the machine. Initially, they resisted considering the feedback they heard after the first testing of his machine in Muktapur village. Narsimha persuaded them and finally succeeded. He then made a hyacinth cutter with a lifter. He could clear the lake in that village of Revanapally in 15 days, saving the sixty member group of fishermen from the physical drudgery of weed removal. This

cleaning also saved a time of three months, the period they would have needed to clear the pond manually. All the fishermen of the village were amazed, lauded in appreciation and paid him Rs.10,000/- more as a token of appreciation. That was a great experience to Narasimha and gave him a sense of self-confidence that he could contribute to alleviate the pain and suffering of his fishermen community.

### *Palle Srujana and Creative Minds*

This success of Narsimha's innovation was reported in the local press. The members of Palle Srujana team, Brigadier Ganesham, Mr.J.Durga Prasad<sup>43</sup> and others heard about it and went to see the innovation. They appreciated his marvelous effort and high degree of technical acumen. The team decided to help him. Soon a mentoring partnership between Narasimha and the Palle Surjana team emerged. He voiced his needs and the organization readily supported him with financial, technical and moral assistance in taking forward this innovation.

Palle Srujana scouts, guides and supports the grassroots rural innovations presently spread in Andhra Pradesh and Telangana. They organize *Shodh Yatras*<sup>44</sup> with a number of volunteers and move along the villages gathering knowledge, knowing about innovations, mentoring and supporting the rural creative people. Narasimha's innovation of hyacinth cutting machine was one of such memorable experiences for Palle Srujana. His innovation proved to be one of the kindling factors in conceiving a new concept organization, 'Creative Minds' by the team. It is a concept that churned from the process of connecting innovator to an entrepreneur to take forward the grassroots rural innovations into commercially viable products and market them through effective dissemination at affordable prices and also to make them easily available. This hand holding was considered essential, as the grassroots innovators have no knowledge of commercialization of their innovations. The organization works in a unique style unlike other commercial and marketing organizations. The innovators themselves are the shareholders. The model eliminates the problem of connecting the innovators to entrepreneurs and persuasion time to take up the innovation is minimized. Instead, Creative Minds gives the innovator necessary seed capital to scale up their innovation to a

commercially feasible product. Sometimes, marketing of these products is undertaken by Creative Minds while the innovator manufactures the product. This organization provides the platform for cost evaluation, quality creation, market channels and market support for the innovations of grassroots, rural people. Creative Minds is a novel business model (Figure 6) which provides capital from the sales proceeds of the innovations to the innovators as well as provides fixed monthly income and profits to the innovators. It does much more than financial support by hand holding the innovators with added support for their livelihood. Narsimha became the first and an important person for this support system from Creative Minds.

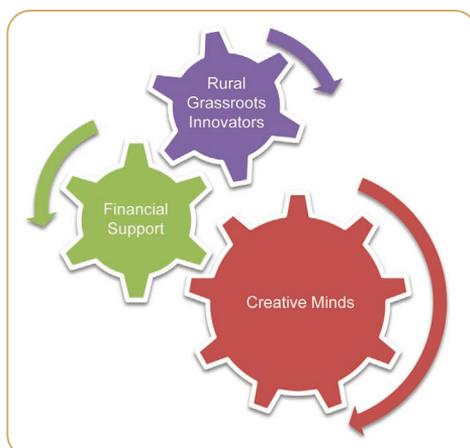


Figure 6. Business model of Creative Minds

Further, like in Guravaiah’s case, the linking with Palle Srujana platform brought the more financial support to Narsimha for modifying further and customizing the innovation. The basic machine requires about Rs.60,000/- for its manufacture. For each task of pond cleaning, the basic model of the machine has to be re-designed and technically customized to the needs as required at that site. For instance, an amphibian model was required so that bigger lakes could also be cleaned. A requisite financial support was requested by Narsimha through Palle Srujana to several agencies. Finally, his application was approved by NABARD and an amount of Rs. Four Lakhs sanctioned. The floater model cuts the hyacinth in the water, brings the debris to the shore in a net and dumps it.

*Evolution of Narsimha's innovation*

Narsimha has adept technical expertise to design mechanical devices from his childhood with an innovative thought process in all his endeavours. The idea of “Narsimha hyacinth cutting machine” is one such effort made to alleviate the water hyacinth removal problem of fishermen. His path of innovation has been in stages.



At each stage, there has some new conceptualization and the model customized for a particular need. He initially intended to cut the hyacinth



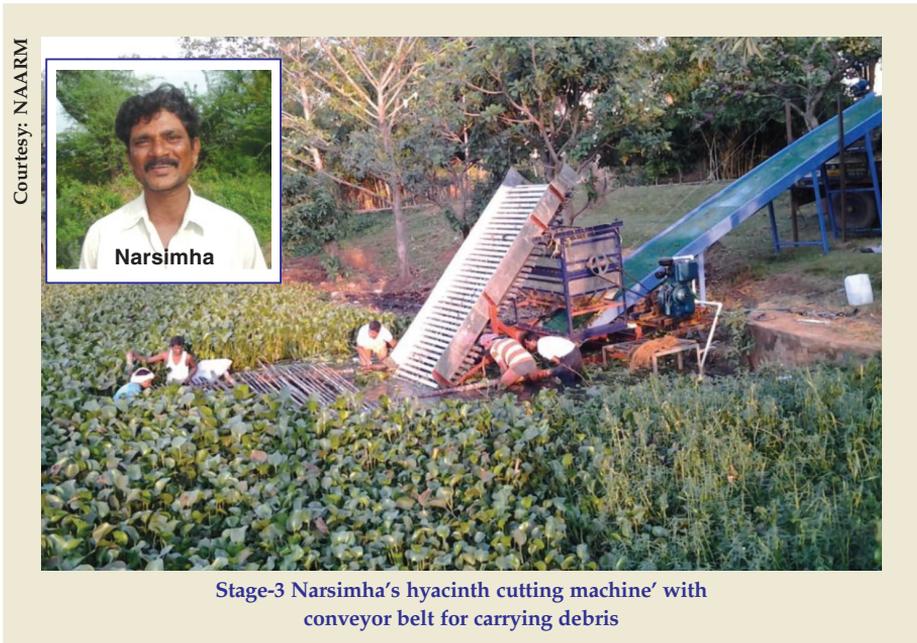
using a 5 HP motor to rotate a shaft with eight cutting blades positioned diametrically in a box with an outlet. But that did not suffice the problem as hyacinth plants were found to be heavy to lift and manual labour was still necessary.

To ease the work, he further extended it with a turning conveyer belt made of wooden planks. This was further modified for better durability with metallic conveyer and buckets for collection of hyacinth by the cutter.

To run the lifter, he connected it with another 5 HP motor. Hyacinth bunches were manually moved on to the conveyer, lifted to about 4-5 feet for feeding the cutter and cut to pieces of 3-4 inches length.

To enable easy mobility of the machine from one place to another he used an auto rickshaw engine of 8 HP. Four men for a period of five days performed the same job of hyacinth removal which otherwise needed 50 people over 100 days to work manually. The cost incurred for the clearing was only Rs.2000/- for labour and Rs.1500/- for diesel.

The recent one of Narsimha's hyacinth cutting machine is the stage-3 version, an improvised model made with quality materials that do not get broken due to wetting in water. The blades are sturdier and set with a vernier scale for the accuracy in cutting. The machine was designed in a better way than the previous stages to function continuously without damaging the blades when any unwarranted materials like sticks, wires, etc., are stuck. The conveyor is also modified with synthetic sheet for disposal of the cut pieces. Moreover, each part is automated and regulated with a remote such that it removes a load for every 12-15 minutes. About 4-5 labourers are engaged for the complete operation. The method followed is simple and done with great ease. Hyacinth being a floater moves with wind. It is a difficult task to contain it at a place for lifting to the cutter. In order to pull the weed a unique but simple technique is used. The hyacinth is rounded off with a rope and bamboos to certain extent and tied to the shore such that it can be pulled towards the lifter. An individual goes on a floating raft to do this job as it is very cumbersome to wade through bunches. They do it once in 2-3 days to gather sufficient hyacinth to feed the lifter.



### *Up scaling of the innovation*

Since, Narsimha's hyacinth cutting machine is unique and could be customized according to the location of the water body, it has greater industrial application. Up scaling of such innovations solve numerous problems and also bring in new industrial avenues for value additions with hyacinth.

Narsimha's innovation was given financial support by the members of Palle Srujana in investing for better materials and spares. Their backing proved useful and connective in enterprise development of the innovation. A businessman of Vijayawada in Andhra Pradesh approached Narsimha for the machine, as hyacinth was the raw material for his manure industry. The machine was designed and developed accordingly in 12 days period and was effectively used. In a short span of five days the entrepreneur got raw material sufficient for one year. He was pleased with the efficiency of the machine, for he saved on the labour expenditure. He paid Narsimha Rs.40,000/- for the machine.

The machine owing to the potential value addition was taken forward by 'Creative Minds' for the mutual benefit of the innovator and society. This contraption was acknowledged by Greater Hyderabad Municipal Corporation (GHMC)<sup>45</sup> which gave a contract work for cleaning up of water hyacinth in lakes and water bodies in Hyderabad. GHMC spends few crores of its budget for the cleaning of such weeds, as they are breeding centers for mosquitoes, insects, filth, obnoxious odour and unwarranted diseases. But, Narsimha's innovation came as boon for rescue from the menace of hyacinth and the GHMC Commissioner, Mr. Sameer Sharma identified a great potential in it.

Narsimha started working with his machine in different places of Hyderabad but the locale, depth, placement, size, type of weeds, and overall topology of the water bodies varied at large. His lateral thinking and his iterative thought process helped him to customize the machine accordingly. Since June 2011, Narsimha has taken up the contractual work and has successfully removed the weeds from the water bodies under GHMC jurisdiction under the aegis of Creative Minds. He has worked in different places with variants of hyacinth cutting machine suitable to the location. Below is the brief description of his work in those lakes:

- Kummarikunta lake: It is situated in Hayatnagar of Hyderabad. The first trial was made here with the modified version. The work was efficiently done though, the process was slow due to lowering of water flow and manual disposal of hyacinth debris from the surroundings.

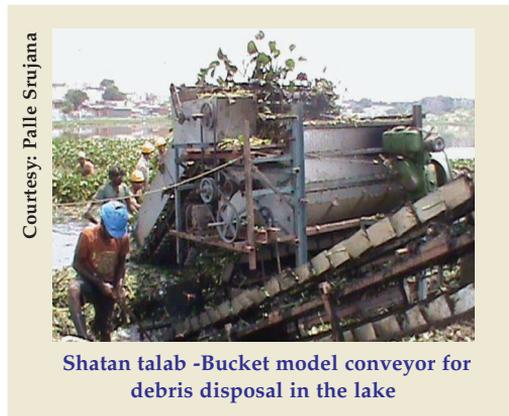


- Hakimshakunta lake: This place is located in the south western part of Hyderabad. This lake was filled with a different kind of weed. It almost came to a climax stage of hydrarch in ecological succession<sup>46</sup>. The weed



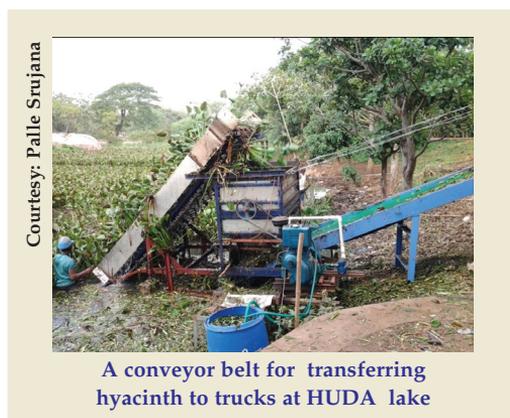
was lifted from the lake and dumped on to the bund or shore which was further removed with the help of a JCB machine as the weed was heavy to lift manually since it carried mud.

- Shatan talab lake: This lake is situated near Golkonda fort in Hyderabad. The hyacinth cutting machine was further modified with



a conveyor belt and buckets to transfer the waste from the base. The cleaning work of this lake was done in about 70 days time with seven labourers.

- HUDA lake : This is one of the large water bodies in Langar House area adjacent to Golkonda fort in Hyderabad surrounded by dense residential localities. The place is full of hyacinth and is a serious mosquito breeding point. Nobody can even stand near the lake around 4'o clock in the evening as mosquitoes just flock around, with no possibility to open their mouth. Such is the adverse situation as each plant of hyacinth harbours few hundreds of mosquitoes.



Narsimha did a neat job of cleaning the place with his machine which he further up graded with the automatised control of all motors attached to different parts with a remote control. This increased the efficiency and reduced the tension of multi tasking at a time. Today, this lake stands clean with efforts of this innovation and is a pride to local as well as municipal authorities. It is infact providing a clean environment to local area.

A tabulation of various jobs undertaken by Narsimha at different places along with customised modification at each location is presented in Figure 7.

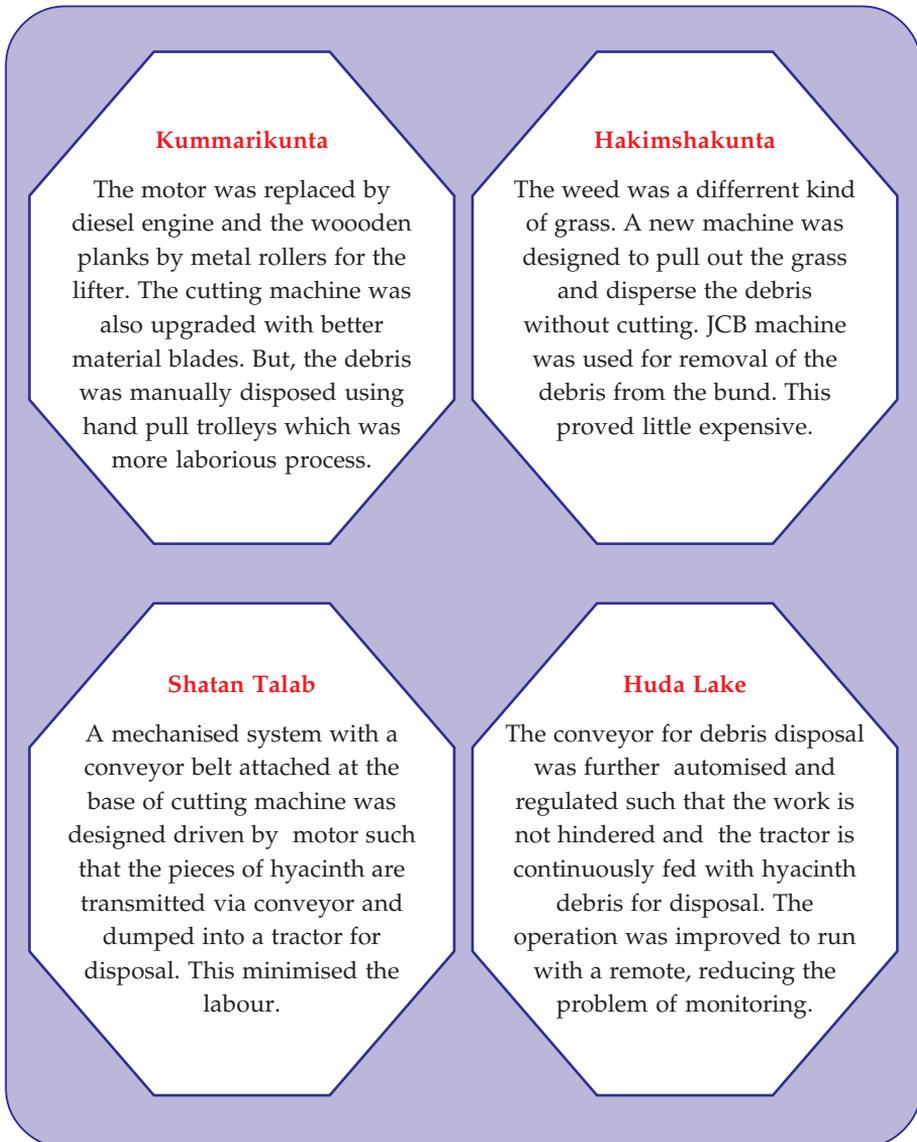


Figure 7. Experiences of Narsimha in four locations as part of GHMC work

### *Socio-economic values of the innovation*

Narsimha's hyacinth cutting machine is a remarkable device that can cater to numerous problems caused by hyacinth and such other weeds. Every version is unique in its function and has enormous economic and social benefits. The machine reduced the pain of lifting and removing the heavy hyacinth plants from murky water bodies. The fishermen's drudgery was also reduced from the attack of skin infections, snake and other insect bites. Mosquito breeding was reduced largely saving people from serious vector borne infections. It also helped in improving the aesthetic beauty of the ponds and offers promise to develop as tourist spots.

A look at the economic perspective of the first device shows a great advantage in cost cutting with saving and improved earnings for the fishermen community. The machine reduces the labour cost with just four-five persons working instead of 50 members. The cost incurred by Narsimha was Rs. 60,000/- for the designing of the machine, Rs.10,000/- for labour for five days of work and Rs1,500/- for the diesel that made up to Rs.71,500/- initially. This reduced the burden of loan by 60% for the fishermen. It also saved their time and energy which can be channelized for other works. Moreover, the clean water bodies have led to harvesting of higher yields of fish ensuring better profits for the local people.

The machine on an average cleared lakes at a rate of 2.5 tonnes of hyacinth every 10 minutes approximating to about 50 trailer loads per day which displays the efficiency of the machine in cleaning an acre in less than five days depending on the convenience at the location.

A significant highlight of this innovation is that it provides spin offs in form of inputs for various industries using hyacinth. The cut pieces are sources of high nutritional value and are used as value additives.

### *A make over*

This innovation is slowly getting national and global recognition. Earlier number of techniques such as use of biological agents like weevils or chemical agents like phosphosan have been successful but the advantage through Narsimha's innovation has far reaching implications. Sustained

use of a biological or chemical agent is a difficult task owing to the rampant growth of hyacinth and the bulkiness of the plant. This weed has affected large water bodies like Lake Victoria in Africa, the Amazon river in South America and the lakes of Florida in USA. It has also affected the lakes in

Courtesy: Palle Srujana



Stage-4 The 'amphibian' model for hyacinth cutting machine

Maharashtra, especially Mumbai, fishing operations in Assam and Bengal and also inland water transport in Kerala. Small dams, anicuts infested with hyacinth make the reservoirs unattractive as tourist spots and increase work for maintenance personnel. Narsimha's innovation could address all such problems. Removal of water based weed was never tough task as such for him. This innovation can be customized according to the water body and the place with ease. Narsimha has a solution for every situation and recently a unique amphibian model of the hyacinth cutter which can float on water and also move on land with the wheels was designed. This

could be considered as stage-4 model that represents his high technical skills. The machine is firmly placed on a floater made of inexpensive materials like hollow drums and series of thermacol sheets that could easily float on water. The lifter is placed in such a way that hyacinth is carried to the cutter. This machine has the ability to bade through the bulky bunches and cut them into pieces that fall into a net and pulled ashore. The contraption reaches hyacinth rather than hyacinth being pulled towards the machine. For large lakes, employing floating hyacinth cutter is a better proposition.

### *Awards and felicitations*

It is great effort from a grassroots innovator to take forward an innovation intended to serve fishermen being of immense use to the present day cities. In 2012, a student from IIT Kharagpur interning at NAARM undertook her project work with his guidance. According to her, '*no words are enough to describe his technical iteration and mechanical skills*'. As a gesture of appreciation for his tutelage, the students felicitated him in a formal event of felicitation of grassroots innovators at NIRD and acknowledged him as their guru. Recently, Narsimha's innovation was selected for first position in The "Agri business Idol"<sup>47</sup>-2014 South Zone competition conducted by NAIP, for making entrepreneurial opportunity to budding entrepreneurs.

### *Learning from grassroots innovators*

A small innovation from a grassroots innovator in India could serve the cause globally. The design of the amphibian version proves that a grassroots 'technocrat' is no less to the urban technocrats. It is not out of place to predict that Narsimha's creativity and service to the society will get its due recognition at regional, national and even international levels. A number of people like Narsimha have worth and talent in them but cannot move forward in this journey of innovation due to lack of connectivity and enterprising skills. In this a supportive hand from voluntary organization proved to be of value case in bringing out such innovation and the creator to limelight. Another way of support is the through horizontal linkages with other GRIs. In this case, the remote designed by a grassroots innovator, B.Mallesh was useful to Narsimha in

automating his machinery. Thus, this horizontal connectivity gives innovators the advantage of peer experiences and leads to mutual learning.

*Potential of the innovation*

Narsimha’s innovation has enormous potential and its up scaling could prove worthwhile in generating value additions, revenue and attaining salubrious environment. A more proactive role play by the engineers, officials, technocrats and technologists could catalyze its use further. It may be simple solution but acceptance by all is a slow process. Hence, more efforts from literate elite to encourage and take it forward are needed. Leveraging simple solutions swiftly can create a win-win scenario for benefit of society and ecology. GHMC in Hyderabad has taken a pioneering initiative of supporting the innovator and this led to the advantage of its citizens and ecosystem at large.

A simple machine designed by Narsimha for NAARM pond



Courtesy: NAARM



NAARM pond under cleaning process

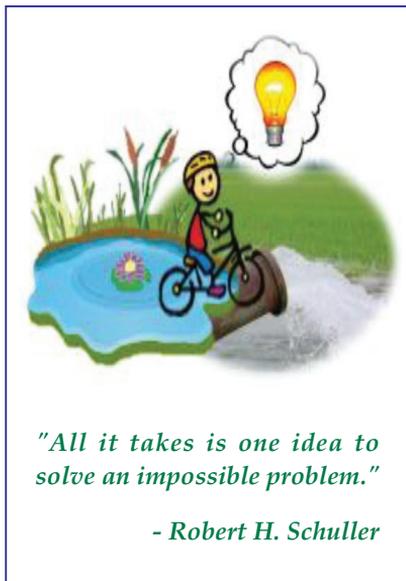
Similarly, as a part of its effort to support and showcase the rural technology and mainstream some of this knowledge, NAARM has invited Narsimha to clean up the pond in its campus recently. Such initiative from the public system like GHMC and now NAARM energizes the confidence of rural innovators like Narsimha and paves way for more opportunities. Truly, such innovations teach simple solutions that can be explored for a more sustainable ecosystem. They can incite the budding minds that, with commitment and conviction, nothing is impossible.



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## Innovative Approach of Tribal Youth for Sustainable Livelihood



*"All it takes is one idea to solve an impossible problem."*

*- Robert H. Schuller*

*Innovation : Cycle driven irrigation pump*

*Innovator : Vikram Rathore*

In India, a large part of its population continues to depend on agriculture for its livelihood and stay in remote parts of the country practicing farming. However, most regions have poor connectivity to basic needs like electricity and life is sustained with limited available resources. Yet, people from such areas continue their pursuits using their creativity and innovativeness. Combining these qualities, most of them learn to

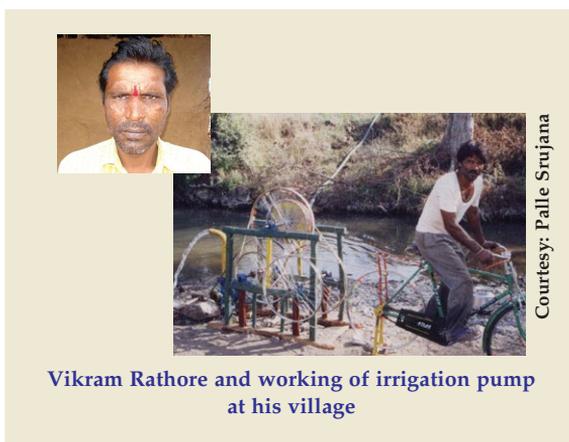
overcome some of the challenges faced in day-to-day activities. This is the story of a humble farmer from a tribal region in northern Telangana whose innovation helped him to be successful and a role model for several young men in his village.

### *Creativity of Vikram*

Vikram Rathore hails from a tribal village Jaitram Thanda, Narsapur of Indravati Mandal, Adilabad district, Telangana. His ancestors are from Rajasthan and settled in this region few decades ago. He left schooling in fifth standard owing to family demands and a lack of support from his parents. He opened a cycle repairing kiosk for his livelihood. But, Rathore's creative mind never stopped to think and he continued his efforts to create novel solutions to the problems around him. This urge soon became a passion and he continues to innovate and reach his community members through his set of innovative solutions.

Rathore has a large family of five children and wife. He and his wife also work at a local flour grinding mill. As a result of this experience, he designed an 'automatic pounding chakki' by attaching it to a motor that worked on electricity. He was successful in making it work and started earning good returns.

This small experiment prompted Rathore to analyze and understand the problems of cultivation he was facing and looked up for simple solutions like this. He cultivated dry crops like red chilli and wet crops like paddy and wheat in his two acres of land. Unfortunately, the wet crops yielded less and started becoming unsustainable owing to insufficient irrigation for the crop. Poor power connectivity and also high costs of electricity drove Rathore in search of alternatives. His 'tool kit' from the cycle repairing experience gave him an idea to design a cycle-driven-water pumping assembly. This sparked off a unique, yet simple model of cycle driven irrigation pump.



### *The design*

Vikram Rathore with his basic knowledge on cycle repairing services charted out a concept to run an irrigating pump without electricity. For this, his simple understanding that a continuous propelling fan could serve his purpose was promptly put to designing. He made a device using two free wheels interlinked; one being attached to the rear wheel of the cycle

Courtesy: Palle Srujana



Vikram Rathore's -Cycle driven irrigation pump at a display

and the other through a chain of pulleys that was linked to the pump. The cycle pedaling rotates the wheel chain and this in turn rotates the pump with sufficient rotations per minute (rpm). He understood that sustained propulsion by pedaling made the irrigating pump to lift water. This machine sufficed his need to lift water from the nearby water pit for irrigating his fields. About one acre of his land was irrigated in two-three hours with two persons-one for pedaling the cycle and other to divert the water for equal distribution. He used to give water once in a week for his fields. Continuing his experimentation, he worked out the machine to lift water from a depth of 25 feet.

### *Livelihood*

The machine was effective in providing adequate irrigation that proved fruitful with good yields from their land. About 25 quintals of rice and another 20 quintals of wheat could be harvested due to sufficient and timely water supply to the crop. This was a remarkable achievement from a person living in a remote village that was challenged by lack of basic amenities of electricity and water. His success with the pumping machine also attracted

the villagers and Rathore started leasing his cycle driven irrigating pump for hire @ Rs.300/-per day. He could earn about Rs.3,500/- to Rs.4,500/- per month as rent for use of his innovation. He also got more orders and sold four to five machines to neighbouring villages. These innovations of Rathore have given a fillip to his earnings and this extra income was used towards expenses of education to his children.

### *Support of NIF*

Vikram Rathore's innovation was published in newspapers in 2002. The National Innovation foundation (NIF) recognized this simple, yet sustainable grassroots rural innovation and wished to take it forward. Prof. K. Anil Gupta, the Executive Vice Chair of NIF, himself visited Vikram Rathore and was impressed with his ingenuity. He instantly offered monetary support to improve on his methodology and extended all the backing from NIF for the innovation. With the support of NIF and later Honeybee AP, Vikram Rathore got various opportunities to showcase his innovations at several platforms. He was honoured by the President of India in 2003 for the outstanding innovation that had helped the tribal community. He was given financial support of about Rs.30,000/- to scale up the innovation. Through the technical and financial support of NIF-Honeybee combine, Vikram applied for a patent. This innovation was granted a patent in India in 2006.

### *Honour and recognitions*

Vikram Rathore's innovations have attracted few organizations and he has been awarded for his efforts. Some of these include:

- Honour as outstanding innovation for tribal community by President of India in 2003
- Felicitation for his contribution to use surface water innovatively on Foundation day of Central Research Institute for Dry Land Agriculture (CRIDA)<sup>48</sup>, Hyderabad in April, 2012
- Felicitation by students of National Institute of Technology (NIT), Warangal at Centre for Rural Innovation at Annual National Technical Festival '*Technozion*' in September 2012.

- Sale of ten machines to Reliance Foundation for use in Andhra Pradesh, Madhya Pradesh, Odisha and Telangana states.



### *An innovation from need*

This device was intended to work for irrigating fields, lifting water for domestic use or other purposes from ponds, lakes or shallow water pits where there is no option for channelizing. It comes to be of value in remote villages where basic civic requirements are meager and such sustainable innovations can be apt solutions. The process can easily be disseminated to peers for immediate cause and a respite from the problems that are local in nature. It is well known that a number of innovations and branded devices are available for similar work. However, many of these are not of use to the poor farmers at their site. Low affordability to buy these expensive devices, among poor and marginal farmers of remote areas with small agricultural holdings is the major reason. The unique selling point (USP) in Vikram's innovation is that it is "low-end" technology in contrast to the general trend of making high-end technologies to solve a problem. This innovation sets a trend for selecting technologies for devices which

have higher sustainability and affordability. The primary goal to serve the people is to innovate and transfer the technology on a need-based perspective. Preference should be for such simple and affordable technologies that can be handled with ease by the farmers. The effort of social voluntary organizations in bringing such technologies to focus is also appreciative. At the same time, it is important that more attempts be made by researchers in the country to work towards the alleviation of problems by supporting such need-based innovations.

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## The Magic from Potter's Wheel



*Innovation* : **"Mitti Cool" and other earthen utilities**

*Innovator* : **Mansukh Lal Raghavjibhai Prajapati**

The use of clay utensils has been in vogue from times immemorial. Even today, several people prefer the unique food cooked in earthen clay ware. Everyone enjoys drinking water from clay pitchers especially in summer. With the changing needs of people, different utilities are being developed by employing new technologies. Many utensils and utility items for domestic use have flooded the market. But, these are not affordable by the rural people

and majority of them are not sustainable too. For instance most of the rural households look for better cooling devices, especially in summer. The innovation of Mansukh Lal Raghavjibhai Prajapati's<sup>49</sup> "Mitti Cool"<sup>50</sup> Refrigerator is one such effort. This product needs no power, yet provides cool water and keeps vegetables and fruits as fresh as placed in a conventional refrigerator.

### *The struggle for livelihood*

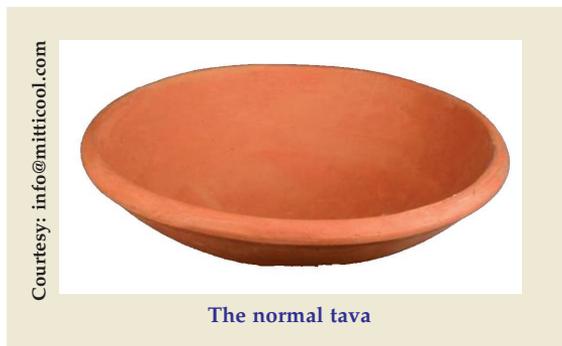
Mansukh Lal Raghavjibhai Prajapati, a pottery artisan, was born in the Prajapati family of Nichimandal village of Morbi, Rajkot, located in the Saurashtra region of Gujarat state. This place contributes 70% to the ceramic industry of India. Since childhood, Mansukhbhai, being the only son of their family helped his father in their traditional profession of clay pottery. Collection of clay from different sources and providing it to his father was his daily chore. Other than this, his contribution to pottery was limited.

While his father made their livelihood through this profession, the calamity of breakdown of Machhu dam of Morbi in 1979, displaced their family. They were forced to migrate to Wankaner, Gujarat and his father had to take up masonry work to support their family. In spite of their struggle for livelihood, Mansukhbhai's parents encouraged him to pursue his school education up to tenth class. He then left his plans for further studies to lend a helping hand to his father in supporting the family. He started his journey as a worker in a small rooftop tile manufacturing unit. But, he injured his left eye in the very beginning of his job, while working inside a chimney. As a result, he had to quit work for more than eight months. After recuperating and with improvement of his vision, he put up a tea kiosk on a highway for about six months.

Mansukhbhai again got an opportunity to work in a rooftop tile industry in 1985. He joined as trainee in Jagdamba Potteries for Rs.300/-. He worked hard and saved for the expenses of marriage of his younger sisters. His experience and the expertise gained at this unit gave him ideas to plan for an independent clay accessories manufacturing unit.

### *A labourer turned entrepreneur*

As a child Mansukhbhai observed the earthen pots, plates and vessels being manufactured on a potter's wheel. With a continuous hard work at the wheel, a potter could at the most make 100 pieces per day. His experiences in the manufacturing unit gave an idea to work upon the concept of hand press for these earthen pans. In 1988 with this idea, he



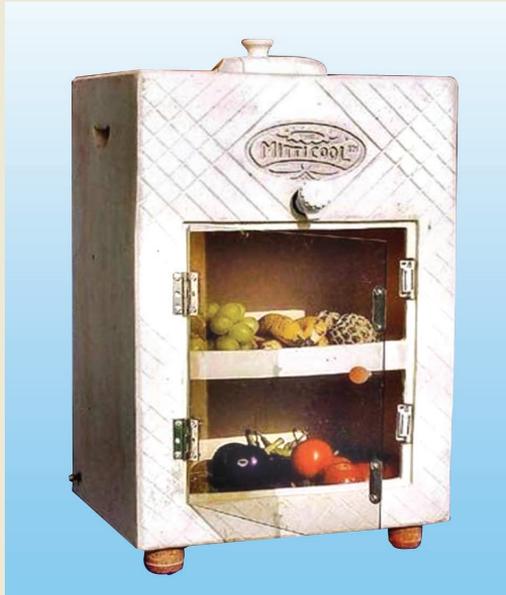
quit his job and started an earthen pans manufacturing unit with a loan<sup>51</sup> of Rs.30,000/-. He purchased a small piece of land for putting up the factory. He gathered the dyes and presses, soil mixing machine, electric potter's wheel and other scrap objects necessary for making the articles. Mansukhbhai gathered all the necessary elements for the manufacturing unit in a short span of a week. Initially, he made 50 pieces of the earthen pans or plates (locally termed as Tava) and sold them in the nearby villages at a price of Rs.0.65 per piece.

This was the first earning of rural innovator turned entrepreneur. He continued his efforts for more few months. But his sales came down as the products were not able to withstand continuous heating. He tried to make new proportions of raw materials to overcome this problem. He also realized that the potter's wheel needed to be modified to have a better quality of the product. With his previous experience in the roof tile making, he modified the hand press and developed a hand press machine having capacity to produce 700 earthen pans per day<sup>52</sup>. Mansukhbhai gradually improved his sales and by 1989, he started his sales on a motor rickshaw instead of cycle. In 1990, he got his unit registered in the name of Mansukhbhai Raghavbhai Prajapati at District Industries Center (DIC), Rajkot. A trader from Bhuj in Gujarat was impressed with the improvisation of the tile press and gave a bulk order of 3000 tavas in 1992. This was, in fact, a big encouragement for the innovator after a struggle of so many years. His earnings improved for the next two years which helped him to clear his debt and he was able to manage his business comfortably. The hard work, expertise and goodwill gained by Mansukhbhai with his previous employer, helped him to explore for new business model. In 1995, an entrepreneur from Rajkot, came to find a suitable potter for his bulk export order to Nairobi, Kenya. He approached Mansukhbhai with a design of a water filter and gave him a month's time for the first sample piece. Mansukhbhai made a marvelous terra cotta filter with a ceramic candle for filtration and completed his task in just eight days. The entrepreneur liked the sample and Mansukhbhai got his "first business order". This accomplishment boosted his confidence and changed his business.

### *Genesis of "Mitti Cool"*

The emergent market for the water filters was a turning point for Mansukhbhai. He started to work for more user-friendly items with the earthen clay. But, the tragic earthquake in Kutch region in February 2001 shattered his dream. He suffered a huge loss due to breakage of the earthen products. Despite the adversity he was facing, on humanitarian grounds, he donated his remaining stock to the quake affected people. He was disheartened with the loss but he started off on a positive note after he read a photo feature on earthquake in 'Sandesh' a Gujarati Daily. Under a caption of "the broken fridge of poor" in this feature, the report commented on Mansukhbhai's ruined water filter. This provoked him to work on a new model with earthen clay. It was at this point, that his intention to provide a non-electric refrigerator for the rural masses took shape in his mind. It took him a year to materialize his ideas and started working in 2002. After a great struggle in testing various combinations of soils and raw materials for the designing of the fridge, he finally designed his "Mitti

Courtesy: Palle Srujana



The second version of 'Mitti Cool'

Cool”, the poor man’s refrigerator in 2005. It was a three year painstaking journey for Mansukhbhai having gone through all the experimentation for the feasible model. This version has the ability to preserve the freshness and taste of vegetables or fruits for about four-five days. The principle of working is same as that of clay pots and does not need any external source of energy like electricity as in conventional refrigerators. The first version of “Mitti Cool” had two water chambers, one at the top and the other at the bottom. Water filtered from the top chamber gets collected in the bottom chamber which was fitted with a dispenser. Each chamber had a twenty litres water holding capacity. In between the two water chambers was a storing compartment of three kilograms capacity for storing fruits, vegetables, milk, etc. He sold this version for Rs.1500/- per piece till he improvised it into another version. Mansukhbhai came up with a second version by increasing the storage space to a capacity of seven-eight kilograms by removing the bottom chamber. The top chamber with ten litres water storing facility was fitted with a dispenser. The two bottom compartments together can store about five kilograms vegetables or fruits for about four-five days. This is one of the unique grassroots rural innovations that has natural cooling phenomenon that saves energy and reduces the burden of high electricity charges. The added advantage is its portability due to smaller size and its zero maintenance<sup>53</sup>. This version was priced at Rs.2000/-.

Around the same time, Mansukhbhai was inspired to look at a new model of tavas. One day his wife had asked for a non-stick tava from the market.

Courtesy: Purvi Sanghvi and  
Mitticool website



Clay tavas being treated in fire

Since, the market price of this tava was about Rs.200/- per piece, he thought if he could make such kind of non-stick tava for rural masses. In 2003, he did the market research for the product and the materials used in its manufacture. He realized that the Teflon coated non-stick tava is expensive and the coating being worn out after sometime. Moreover, it does not retain the natural flavour of the food. His interest to learn about new methods and experiment in his firm to come out with innovative models with earthen clay is perhaps his winning streak. So, he learnt the process of non-stick coating from a Mehsana based non-stick manufacturer. He looked out for appropriate materials to be used in clay tavas. Having done sufficient research while experimenting with more than a lakh tavas, Mansukhbhai finally succeeded in achieving a stable earthen clay non-stick tava.



He used a food grade non-stick material like Teflon known as 'Azo Noble' that retained the natural taste. This was comparable to the non-stick coated metallic tavas available in the market. The cost of this tava designed by Mansukhbhai is about Rs.50- Rs.100/- depending on the diameter. It gives the advantage of saving on the fuel as the coating gets absorbed in the pores of the earthen material and it does not wear off easily. Till date he has sold about 50,000 non-stick tavas.

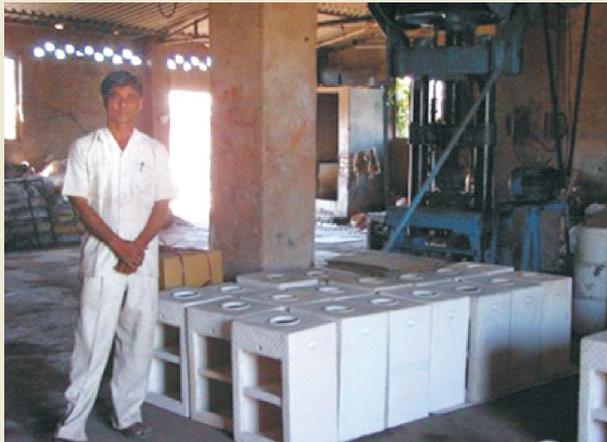
His innovations did not end here. Some of other innovations include earthen clay handi (cooking vessel), rice cooker, thermos and many utensils. The innovator sold about 500 pieces of one litre and two litre capacity thermos flasks.

### *Socio-economic drivers*

As seen from his story, the turning point was the designing of water filter. The entrepreneur impressed with the quality of output placed an immediate order of 500 pieces at a price of Rs. 200/- per piece which was twice the earlier agreed price. The product was marketed in the name of "Aquatech". He received an amount of Rs.1,00,000/- for his bulk order. More so, with the support of his well-wishers and encouragement from a Patent Official in Ahmedabad, he filed his first design patent for the product and also a trade mark application in the name of "Mitti Cool" in the year 2001. From here, he never looked back and forged ahead with his earthen clay innovations.

It was in 2002, when he started his work on "Mitti Cool" fridge, he came in contact with members of Grassroots Innovation Augmentation Network (GIAN), Ahmedabad. This connectivity was useful and helped Mansukhbhai to fulfill his dreams. It was the time when he needed the support for testing and certification of his products. The network gave him the required mentoring, physical and financial support by linking him with various organizations. Testing of the fridge was facilitated at

Courtesy: Purvi Sanghvi and Mitticool website



Mansukhbhai with his 'Mitti Cools' in his manufacturing unit

Krishi Vigyan Kendra (KVK), Chaswad, Bharuch. It was found that the temperature inside the fridge was 4-5°C lower than the room temperature. The shelf life studies were also performed and compared with normal electric driven refrigerator. It was drawn that the fruits and vegetables remained fresh for four-five days and retained the natural taste. This was considered better than those stored in normal refrigerator.

His innovation saw light in newspapers and got good market promotion. A civil engineer looking at its applications gave him the order of 100 pieces for which he got Rs. 2 lakh as a token of advance.

GIAN facilitated design improvements in the fridge through National Institute of Design (NID), Ahmedabad which helped him for the packaging with thermocol casing that is necessary for long distance transportation. Further, "Mitti Cool" was featured at platforms of Centre for India and Global Business, Judge Business School, University of Cambridge, UK in May 2009. This gave a gateway for more business openings both at national and international platforms. Bosch and Siemens Hausgeräte (BSH), Germany, one of the world's largest home appliance companies has evinced interest in his products<sup>54</sup>. GIAN supported financially for the non-stick tava and it was tested in Institute of Chemical Technology, University of Mumbai. GIAN also assisted him in setting up a company "Clay Creations" in 2008 and in development of an online retail portal ([www.mitticool.in](http://www.mitticool.in)). An investment of Rs.1,80,000/- under the Micro Venture Innovation Fund (MVIF) of National Innovation Foundation (NIF)-India, helped him further. GIAN mentored him for the design of metallic frame for the non-stick tavas. The idea of thermos was also mediated by GIAN by linking him with a student of Bihar. In turn, Mansukhbhai shared his profits from the sale of thermos flasks with the student.

Throughout his efforts, it is his family who has been supportive. His wife Hiraben and his two sons always give a helping hand. With interest in family profession, Mansukhbhai's elder son pursued his Diploma in Ceramic Technology and is working with him for marketing and sales of his products. Both of them manage the sales of the products at exhibitions. Mansukhbhai also attributes his success to constant guidance given by his father.

### *Zest to innovate*

Mansukhbhai has always been open to suggestions and is eager for trying new concepts to improvise his innovations. For instance his participation at "Saatvik"- a traditional food festival held in 2008 at Indian Institute of Management (IIM), Ahmedabad, he got lot of suggestions and feedback from the customers on his "Handi" model. He persued these responses and worked to improve on the model. This led to the creation of "Rice cooker"<sup>55</sup> which he presented in the next Annual festival in 2009.



He continues experimenting and comes up with new innovations with earthen clay. Mansukhbhai is presently working on the reverse osmosis feature as an improvisation for "Mitti Cool" that gives better taste and quality water. He has plans to improvise on non-stick tava with a flat model for *Dosas*, (a South Indian dish). He has plans to make the complete cooking range of earthen clay utensils. He has conceptualized an idea of non-electric house with sufficient ventilation and with natural cooling phenomenon. He is ambitious to get into Guinness Book of Records with his innovations. He was felicitated by the President of India with the National Award in Seventh Biennial National Award Function of "Grassroots Innovators and Outstanding Traditional Knowledge Holders", organized by NIF-India in 2013. Former President A. P. J. Abdul Kalam

lauded him as the “true scientist”. Recently, he was also given the title of “International Eco Hero” (2010) by National Geographic<sup>56</sup>.

His success story has been telecasted in the regional and national media like ‘The Discovery Channel, AajTak, NDTV, IBN 7, DD News, BBC, etc. This brought in the recognition of his work and also helped in promotion of his products.

### *A retrospect*

Now, Mansukhbhai is an innovator and also a startup entrepreneur. He has been exhibiting and selling his products across the country. Today, Mansukhbhai sells about minimum of 50 fridges, 500 filters, 500 pressure cookers and 1,000 griddles in a month. It is indeed worth looking at the struggle of Mansukhbhai, a small potter from a rural pocket who came up with great hardship to the stature of an entrepreneur. His story is a journey of the zeal to innovate and inspirational for younger generations to innovate and grow. The support and encouragement given by his clients, officials, students, GIAN, NIF and few public organizations including KVKs are the key drivers for his progress. The linkages provided by GIAN, the flow of funds and in turn providing the profits to recognized idea generating links is a unique conduit. This model synergizes the flow of knowledge through horizontal and vertical linkages. Research and development (R&D) in public sector can also be used for promotion of this value chain and enable the main streaming of them.

Societal progress gets accelerated by capturing such out-of-box creativity emanating at grassroots. Nurturing it further will go in a long way to reap the sustainable benefits to the larger sections of people. Mansukhbhai’s “Mitti Cool” provides an alternative to the available refrigerator which have been known to generate excessive heat in the environment. Such innovations which are built in bottom to top approach open opportunities of innovation systems and create new business models which can make several more Mansukhbhai like innovators.

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## A Chronicle of a Weaver's Struggle to Reduce Mother's Pain



*"Creativity is thinking up new things. Innovation is doing new things."*

*- Theodore Levitt*

*Innovation : **Asu machine***

*Innovator : **Chinthakinda Mallesham***

Pochampally<sup>57</sup> is a renowned place in Telangana for *ikat*<sup>58</sup> tie-and-dye sarees. It is the first traditional handicraft to receive the status of Geographical Indication<sup>59</sup> under textile category. An estimated one hundred thousand weavers in Telangana benefit from the grant of Intellectual Property Right (GI) to the traditional tie and dye practice on fabric from unfair competition and counterfeit. It is believed that 'Ikat' technique was brought to Pochampally around sixty five years back. Each member of the weaver

families is closely associated with the tie and dye process of 'Ikat'. Today, *Ikat* weaving is spread over several villages in Nalgonda and Warangal districts of Telangana.

Aler is a small town surrounded by number of small villages with families of artisans weaving Pochampally silk sarees for the past few generations. The weaving of a Pochampally saree takes a good amount of pain and is a difficult task. The process involves the washing of silk thread which is then put on a spindle and *Asu* process is undertaken. Designs are marked on the triangular frame of thread formed during the *Asu* process. Tying is done and then dyeing with requisite colours and shades is performed. The dyed thread is wound on the spindles and used on the loom (Figure 8) as weft thread for weaving a saree. The 'Asu' process is perhaps most difficult and highly skill based task in the entire process of weaving the Pochampally saree.

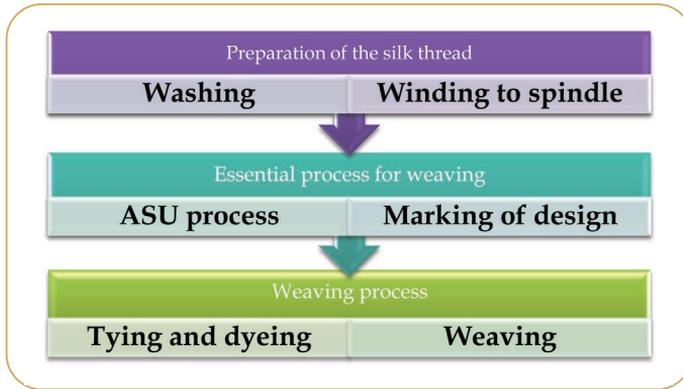
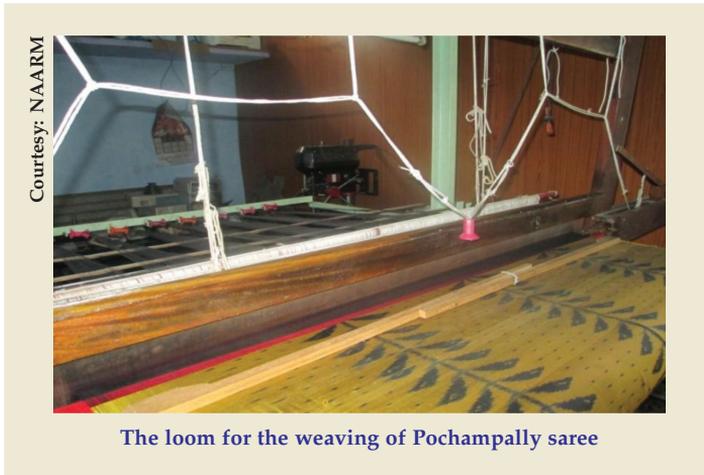


Figure 8. Flow chart depicting the technical steps in weaving process of the Pochampally saree



The loom for the weaving of Pochampally saree

### *The weaver's plight*

Chintakinda Malleshham hails from Padmashali community<sup>60</sup> of Sharajipeta village in Nalgonda district. He pursued his basic education up to eighth standard and thereafter picked up their family tradition of saree weaving at that young age. The adage “Necessity is mother of all inventions” sounds very true in case of Chintakinda Malleshham. When he started the work, his mother was performing manual ‘Asu’ process involving a long drawn process of moving her right hand over a distance of four feet for as many

as 9000 times. This was done for as many as five hours during one day. He was moved by the sight of mother and her pain while doing this 'Asu' process for weaving. Understanding that this is the situation for most women of his community while undertaking the *Asu* process, he was determined to find a mechanical solution to this drudgery in this step during the entire process of weaving.

Courtesy: Palle Srujana



Mallesham's mother performing manual *Asu* process

The *Asu* process is basically making a template of the weft thread for facilitating marking the designs as required on the saree. This process is done by women of the weaver families that requires about five to six hours of manual work by hand movement to and fro for 9000 times to spread the thread on designated nodes in varying numbers with great concentration. It is in fact, both a physical and a mental strain for the person doing this work. More so, if a woman has to cater to two looms in a family, then she needs to spend 10-12 hours of time apart from other family responsibilities. Mallesham grew up watching and feeling for the pain of his mother in performing the 'Asu' process. When he decided to join the family tradition, his mother always lamented that he should pick up another job instead of this traditional weaving as she was unable to cater with the 'Asu' process. She was agonized with the work and suggested Mallesham not to do this work anymore and "*put other daughters of the*

family” to such trouble. Mallesham did not know as to what to do. While his qualification could not get him a good job, at the same time he did not want to compromise and work under some one for meager salary.

### *The genesis of “Asu Machine”*

The trauma of his mother’s suffering with shoulder pains and her concern for other woman pinched Mallesham. He always thought of some mechanism to lessen the anguish of his mother. Mallesham resolved to automate the ‘Asu’ process. He worked on this concept day and night. Despite lack of technical training and exposure on machine manufacturing, he used his basic knowledge of traditional practices of weaving and a thorough understanding of the intricacies of the ‘Asu’ process to put his thoughts into practice. He started conceptualizing his thoughts from 1992. He made a wooden frame first to make holes. Using all the available resources around him like cycle wheels, spokes, gears and chains, he tried to assemble them for the requisite processes. But all such attempts proved futile. He ended up wasting precious time and money for his trials on making a machine for ‘Asu’ process. But, somewhere deep in heart, he had confidence that it can be worked out. He invested money in trying out some other spares and materials using the savings of his parents. It was like building a plane while flying. He knew nothing of materials, synergizing processes or about available technologies. He was young and could only speak, read and write Telugu language. When his parents admonished him for his unfruitful approach, he was pushed to take hand loans from known friends for working out the machine. His parents got him married at an age of 24 years to put an end to his obsession for experimentation. For a year, Mallesham did not work on his dream project, but soon he convinced his wife and invested all their money into it. He kept weaving aside and worked on designing the machine. He was successful to a large extent and went ahead with renewed confidence trying to reach his long cherished goal. But, the family ran into penury and was unable to withstand the financial pressure. This situation forced him to work as daily wage worker in an electrical shop in Hyderabad. This gave him respite from his debts and he could support his family. However, he never left his passion to complete the machine. After some months, he started to invest again in his experimental ventures.

In 1999, while attending a job work at his work place, he came across an interesting technical step during the working of those machines. He keenly observed the kind of movements required and noted down the mechanism to be worked out. Further, he sorted his doubts with a colleague mechanic and then bought some spares to fit the concept into the working plan of his equipment. The mechanism worked and the "Asu Machine" was made. His happiness had no boundaries that day as he realized that he had met with success in his dream project. It was the end of a wait for almost two years for that last link. He was successful nearly after seven years of dedicated work and immediately packed up to demonstrate to his friends in Aler. The machine worked well and the thread made from this process was further taken for weaving. Thus, 'Laxmi Asu machine' – an outstanding innovation was born.



### *'Laxmi Asu machine'*

The Laxmi Asu machine is an automatic device to carry out the 'Asu' process without any attendant. It involves winding of silk thread 5-10 kilometers long around 41 steel pins separated on a four feet frame to knot the thread around each pin, in a specified pattern for designing the cloth for weaving. The machine can perform the 'Asu' process for one saree in one and half hour as compared to five hours taken with manual procedure. It was found that a worker could prepare yarn for about six to eight sarees per day using 'Asu' process on this machine as against the time taken earlier for



Chintakinda Mallesham



Courtesy: Pallesrujana

The winding of silk thread around steel pins for Asu process

making yarn by traditional method which could cater to only two sarees per day. Another feature was that the machine automatically stopped when the thread is broken or cut. This saved the thread and did not hinder the process altogether. The machine can be restarted after joining the thread manually. It operates on single phase electric system and electricity @ Rs.2.00/- per 'Asu' process for one saree is consumed. The cost of the machine per piece, at present is Rs.20,000/-.

### *Socio-economic impact of 'Asu machine'*

Asu machine was a grassroots rural innovation achieved from the need of societal requirement by a school dropout from a low economic background. It carries the understanding of the problems of the weaving community and an irreversible solution for the age old drudgery and pain of the women

of the weaving community. The innovation removed the major constraint of the Pochampally weaving industry where even an unskilled workers could be employed to operate the machine. The *Asu* machine is an affordable machine that can be shared among family members and used at their convenience. With this, women had more time to do their domestic chores and also share the work of their spouses in other pre-loom activities. The men of the family had more time to work on the looms for longer hours. This resulted in 25% higher production of sarees per month. The girls of these families started pursuing higher education. Some of them are undergoing training in computer aided textile designing for improving the designs on the sarees. There has been a cultural shift among the Pochampally weavers with self-pride in them as *Asu* members. Today, *Asu* members are regarded as accomplished and successful members of that community and owning an *Asu* machine is a status symbol.

### *Recognition for Malle Sham's efforts*

The innovator, Malle Sham, has received several recognitions and awards for this high impact innovation in weaving process of Pochampally textiles. Through his machine, the woven cloth was of better quality than the cloth obtained from manual '*Asu*' process. The community members of village lauded his efforts and coaxed him to provide *Asu* machines to other families for the benefit all women of their community. With this, his focus moved towards the benefit of the community especially in removing the pain of '*Asu*' process among women in weavers' family. He made 200 pieces of *Asu* machine, each costing about Rs.16,000/- during 2001-2003. But, with the increase in price of steel, the cost of machine doubled. Knowing the fiscal challenges faced by his community, Malle Sham started to look at alternate cheaper materials to be used for *Asu* machine. He worked on electric and electronic assemblies replacing the mechanical ones used in the first version. Learning about various materials and sub-assemblies was an uphill task for him, but determined as he was, the second version was ready in 2005. He could lower the cost of *Asu* machine to the original price of Rs.16,000/-. He manufactured and sold another 200 *Asu* machines of this second version. In this machine, Malle Sham found a major drawback that each time the weaver had to change the design, there was lot of work to be done. To make switching of the designs easier for the weaver, he

thought of incorporating embedded technology into the electronic control. He knew nothing about this and when he approached an engineer, he was asked to pay one lakh rupees for the embedded technology. Mallesham decided to do it himself as the money was not available. He spent two years in learning and understanding assembly language. He made a protocol for design and integration modalities in *Asu* machine. He was successful in integrating a microcontroller programmed in lower assembly language that could knot the thread to different stems in varying modules to achieve multiple designs. This next generation design of *Asu* machine was made in 2011. It was affordable and easy to handle. With this, Mallesham started to get more orders.

Apart from this, Mallesham's efforts were widely recognized by several others. A young student of B.Tech from Indian Institute of Technology (IIT)-Kharagpur did her project work under his guidance while she was doing her summer internship at the National Academy of Agricultural Research Management (NAARM). Perhaps this was one of unique association of student working on her project work with a person like Mallesham who was never part of mainstream education earlier. This also initiated Mallesham into academic circles. Soon after, he got an invitation to showcase his innovation at NIT –Warangal. The students at NIT felicitated him at a public platform. Such gestures are indeed appreciable as they go a long way to instill a sense of confidence in this young man who did not get any opportunity for formal education and struggled against several odds to build his innovation. Such recognitions also seek to create awareness on GRIs and inspire young students to interact closely with grassroots innovators to help the processes of innovation using their skills as engineers.

### *Support from various organizations*

In 2008, Mallesham was introduced to NIF through Brig. Ganesham of Palle Srujana. The team from NIF visited him at his place, spent few days with him and tried to understand the innovation. Later, based on recommendations of the team, Mallesham was awarded President's Award at the Fifth Biennial National Grassroots Innovation Awards in 2009.

Courtesy : Innovator



Malleasham receiving the National Award from the President of India

This was followed by several more awards including one at Samsung Innovation Contest where he was judged as second runner up and received a cash award of Rs. 1 lakh along with a citation. As part of up scaling at

Courtesy : Innovator



Malleasham receiving the "Samsung Innovation Quotient" Award

initial instance, Mallesham's process and machine were facilitated for patent application through support of NIF. Palle Srujana's efforts to connect Mallesham's innovation to the formal society helped Mallesham to reach out to the society through various platforms (Box 5).

The existing Pochampally weavers of Nalgonda district were brought under a single platform of "Asu family" when they all started using *Asu* machine designed by Mallesham.

### **Box 5. Recognition and Felicitations to Mallesham**

- 2008- *Felicitated at a programme in Osmania University Engineering College*
- 2009- *President of India Award for being First in the country to innovate a high impact Asu machine*
- 2010- *Samsung Quotient Award*
- 2011- *Forbes listed only innovator from erstwhile Andhra Pradesh*
- 2011- *INK Fellow and TED.com talk*
- 2011- *Recognition in Civil Society Hall of Fame*
- 2012- *NABARD Award*
- 2012- *Felicitations by students of IIT- Kharagpur (Interns of NAARM)*
- 2012- *Felicitations by students of NIT-Warangal*
- 2013- *His case study is now a part of a corporate leadership course*
- *His story is included in the book "Awakening Leader" published by the Atlantic Foundation*
- *A biopic is being written on Mallesham*
- *Internship for Japanese, Korean and American scientists is frequently undertaken for a day or two on Asu machine*

Courtesy : Innovator



Malleham receiving the “Civil Society Hall of Fame” reward - 2011 from Dr. M.S. Swaminathan

### *Genesis of “Asu Family”*

The story of Malleham’s innovation brought a new dimension. A major social change has been observed in this community. It brought a sense of pride and ownership of the weaving art. In these days of urbanization, recognition of the value of traditional art and ability to integrate modern mechanization tools and the fact that the stakeholders are inspired to continue with pride is indeed great achievement. The innovation also brought in the concept of “Asu Family”. The mentoring of Palle Srujana has led to a much needed social change in the community of that region. “Asu Family” is a platform of the weavers of Aler region under one roof. In 2011, all weavers who owned or wished to own an *Asu* machine joined together and formed an “Asu Family”. They learnt to share their pain, drudgery, professional problems and also discuss family issues. This platform gave them an opportunity to help each other in building capital funding for *Asu* machine.

### *Impact of being united*

There are about 30,000 weaver families in and around this place and it is estimated that a demand of 2500 *Asu* machines is there in that region. Till date, about 500 machines have been distributed or sold. Initially, a subsidy for the machines from the state and central governments were applied. With the support of mentors Mallesham also put an appeal on the internet following an interview with rediff.com. The appeal carried the request for donations for *Asu* machines across the virtual communities. There was a good response with donations from all over the world and about 20 *Asu*



machines could be financed with this contribution. In order to extend this further, the "Asu Family" decided to share the 20 machines on a loan basis. Three persons shared one *Asu* machine and each person had to repay Rs.250/- at the end of the month. With this collection, a new *Asu* machine was manufactured and given to three more persons or families. Thus, through voluntary contribution of weavers of "Asu Family", 20 machines could be made to 30 machines within 18 months. Palle Srujana also

networked with Central Silk Board (CSB)<sup>61</sup> for possible grant. The recognition for Mallesham's *Asu* machine across the world through 'Samsung Innovation Quotient' and similar platforms brought in momentum and the CSB recommended Rs.10,000/- subsidy per machine during 2013 to the Ministry of Textiles, Government of India.

*Asu* family also had a problem of sourcing good thread. The members felt that high quality thread is best sourced from Bengaluru. An '*Asu* Silk Nidhi' for interest free loan for its members was created for procurement of silk thread. This is working effectively. Thus, "*Asu* Family" has now become a successful model where the members themselves jointly discussed and developed their own business model (Figure 9).

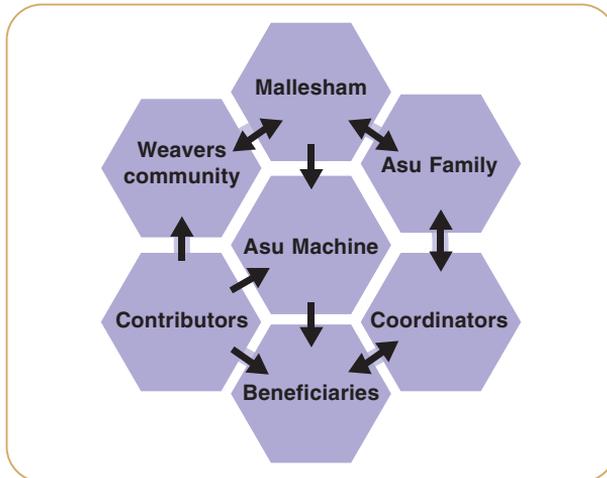


Figure 9. A web depicting impact of *Asu* innovation—  
"Unity is strength"

### Retrospection

Mrs. Laxmi, mother of Mallesham is a happy mother in Sharjipet, a village of handloom weavers in Telangana. She and many women weavers, are now free from pain and stress that consumed hours of labour by the manual process.

The effort of Mallesham has brought in the social connectivity, economic affordability, sustainable livelihood and recognition for grassroots rural innovators. It has enormously helped in reviving the dying tradition of Pochampally saree weaving. The innovation enhanced the creative approach for new designs and brought a makeover in catalyzing the manufacturing of the traditional Pochampally sarees. It improved marketing prospects, learning process and economic development of weaver community. This machine essentially brought in spin-offs such as computer aided designing, an automated design marking machine and new fusion varieties of sarees with Pochampally *Ikat*.

Above all this is an underlying factor that voluntary organization like Palle Srujana has been pivotal in handholding, mentoring, mediating and supporting the cause and recognition of the rural innovation.

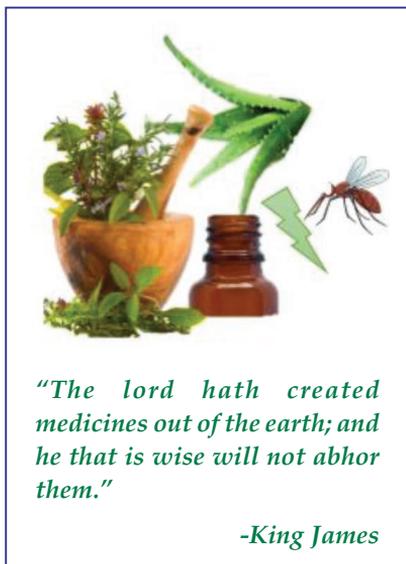
There is a need for the formal system to scout and support such high impact innovations. A model could be evolved to accelerate the pace of introduction of such devices into the society to bring benefits of the innovation sooner. When there is an available solution for the existing problem known, the delay in ending the problem needs deliberation and necessitates handholding approach from the formal system.



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## The Healing Touch from a Rural Innovator



*Innovation* : **Herbal medicines**

*Innovator* : **G.Chandrashekar**

The Indian subcontinent is a vast repository of medicinal plants that are used in traditional medical treatments. Use of plants as a source of medicine has been an ancient practice and is an important component of the health care system in India. Rural population in India predominantly depends on the traditional system of medicine. The alternative medicines in the traditional systems are generally derived from herbs, minerals, and organic matter. Medicinal plants have been widely

used in the preparation of herbal drugs. Around 20,000 medicinal plants have been recorded and 25,000 effective plant-based formulations are being used in traditional and folk medicine<sup>62</sup>. In India, most healers or practitioners of the traditional systems of medicine prepare formulations by their own methodologies and dispense them to the patients.

### *The herbal medication*

Mr. G. Chandrashekar from a small village, Karakollu of Andhra Pradesh is one such healer living close to the Nallamala forest, a precious abode for biodiversity. He has been a serial innovator ever since his childhood. He pursued his primary schooling in the village. He had to go long distance of 15 kilometers every day to finish his high school education. Later, he went to Srikalahasti town to pursue biological sciences at higher secondary level and commerce at graduation level. His parents spent their savings from farming activities for his education. Being a keen observer with innovative aptitude, he started to work for finding solutions for the problems impending around him. His first reading experience of Thomas

Alva Edison's autobiography at his college library impressed him to look at science as a solution for all problems. He drew his inspiration from eminent scientist like Sir J.C.Bose. He decided to solve problems and sufferings of rural people by adopting a scientific approach. His first innovation was the groundnut sowing machine. In spite of the family members being against to his activities, he pursued his mission and started to work on his principles.

Chandrashekar is a good orator and his speeches have influenced many people in his community as well as drew the attention of like-minded people towards him. They all formed a group to discuss, analyze and solve the problems around them. They analyzed the problems, prioritized the issues and all of them looked out for solutions for alleviating sufferings of their villagers. Initially Chandrashekar started to work on the health issues. They created a basic village laboratory in a small hut to work on their propositions. For instance, mosquito bite was a major menace in their area which was most painful to humans and animals. Chandrashekar and his team spent three years to locate a plant from the nearby Nallamalla forest which could affect the mosquitoes. The exudates of the leaves of the plant were mixed with coconut oil and applied on the body of humans and animals. This natural product kept the mosquitoes away from the living beings and was validated by the local communities. Today, people in and around his village carry the oil to protect themselves and their cattle from mosquito bites which help them to avert threat of several diseases. The team also found another herb that has mosquito larvicidal affect.

Chandrashekar and his team went ahead picking up on many other ills faced by the rural community. In the process they brought out many herbal compounds for the numerous ailments of humans and animals. The solutions worked for healing or treating a number of health complaints such as body pains, inflammations, ulcers, burns, wounds and similar problems. A cascade of products was identified by them, which have anti-fungal and anti-bacterial properties. The healing compositions got recognition when a destitute women suffering from an open wound was healed. Hair blackening suspension from plant extracts was also obtained and indepth studies are being pursued for a product formulation. Chandrashekar also developed a formulation for controlling pests in crops.

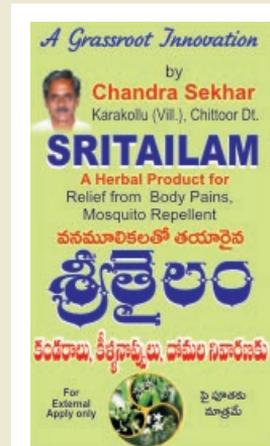
Courtesy : Palle Srujana



Mr. Chandrasekhar demonstrating the medicinal plants

The villages were initially apprehensive to test but now they trust him and his products.

The first product to have public acceptance was the one for control of mosquitoes. Voluntary organizations like Palle Srujana read about the efforts of Mr.Chandrashekar and recognized his work. Through NIF they got his product validated by SRISTI laboratory, Ahmedabad. The product was named as “Sritailam” on suggestion of the team of Palle Srujana. While working with this oil, it was realized that it has numerous therapeutic values. The validation by people in the villages itself speaks about the natural product. Today, it is carried not only in villages of that region but to other parts of the state and country through the support given by organizations like NIF and Palle Srujana. Yet, it was necessary to have a validation by a testing agency and a license to be in place. ‘Ayush’<sup>63</sup> was approached and applied license for three products namely, Prithvi pain



Sritailam- a mosquito repellent

oil; Prithvi diaheal oil for humans and Prithvi mast oil for animal mastitis. The products have been certified for Good Manufacturing Practices (GMP) from Ayush and new marketing strategy of the products under 'Prithvi Herbals' company has been initiated. Through Palle Srujana, Mr.Chandrashekar has signed a Memorandum of Understanding (MoU) with Centre for Cellular and Molecular Biology (CCMB)<sup>64</sup> for defining the therapeutic composition and activity of the components in the extracts. Validation of 'Sritailam' for wound healing has been successfully done in a certified laboratory through NIF.

Recently, Chandrashekar has worked out a remedy for destruction of nematodes from plant extract perhaps the only herbal and eco-friendly product for nematodes from his desk. The herbal formulation was found to be effective pesticide against number of pests. It was found to be highly effective on nematodes, mosquitoes and their larvae, gram caterpillar and mealy bugs. This was further validated by Indian Agricultural Research Institute (IARI)<sup>65</sup>, Delhi; Directorate of Oilseeds Research (DOR)<sup>66</sup>, Hyderabad; University of Udaipur and other laboratories at Coimbatore as a preliminary proof of concept. Further research is being done as the early findings at laboratory and fields were encouraging. The journey for



the cause of healthy living got him several recognitions from communities across the country. His work on nematodes was rewarded through the President Award in 2012 at Seventh Grassroots Innovation & Traditional Knowledge Awards platform at New Delhi. Some of his innovations were demonstrated at National Academy for Agricultural Research Management (NAARM), Hyderabad and National Innovation Foundation (NIF), Ahmedabad. The products are at incubation level and efforts are on for connecting with entrepreneurs.

### *Reflections*

India being a biodiversity rich nation can achieve a reasonably high level of food and health security. Encouragement to make the best use of the local biodiversity resources with appropriate science and technological interventions is needed to cope with global race for new herbal medicines and products. It forms the collective responsibility of individuals, families and governments to ensure the health security of members of the community. For instance, Tropical Botanic Garden and Research Institute (TBGRI)<sup>67</sup>, Thiruvananthapuram having recognized the importance of biodiversity are supporting and are teaching the traditional Indian medicine to ensure the health and wellbeing of their local communities. This in turn ensures maintenance of biodiversity. *'The Herbs for All and Health for All'* project with them provides an excellent model for botanic gardens so that they can play an important role in educating people about the sustainable utilization of the local biodiversity for health care and income generation<sup>68</sup>. Such sustainable initiatives can also be taken up by other public organizations or governmental arms that could preserve biodiversity. Educating rural communities on these lines can prevail longer with healthy communities. Chandrashekar's story is a best example to understand the worth of our country's rich natural flora and fauna that could provide remedies for all problems. It yearns for proper support from the formal society to work for solutions for numerous impending problems globally. Such enthusiasts working for the benefit of the society need to be encouraged. People with such bent of mind to look for natural solutions should be given support by hand holding for validation and taking such products ahead. Awareness creation on traditional herbal remedies in

modern society with scientific approach should be addressed for a healthy and sustainable livelihood.

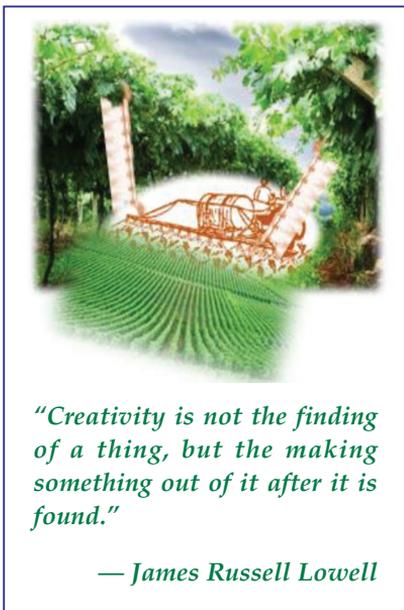
This story of Chandrashekar reveals that there are number of knowledgeable people at grassroots working on natural resources. Society and organizations in the formal system need to reach them and leverage this wealth of knowledge and use for societal benefit.



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## Subhani's Boom Sprayer



*Innovation* : **Boom sprayer**

*Innovator* : **Syed Subhani**

Mechanization of crop production practices is gaining impetus in the farming community in recent times. It is known that timely and effective application of chemicals or fertilizers results in higher yields and enhances productivity. The increasing incidence of pests in the agricultural fields has also paved way for technologically sophisticated sprayers for speedy and timely application of pesticides. These improvised spraying systems are slowly replacing the traditional kind of hand sprayers, dust sprayers, diesel or petrol sprayers.

Thus, use of agricultural spraying equipment is now an essential part of farm activity. With these developments of use of sprays and sprayers in crop management practices, issues of frequent servicing and maintenance, lack of trained manpower and increasing dependence on labour for these activities are surfacing. Quite often, delays in timely execution of spraying activities due to the limitations of the existing sprayers adversely affect the timelines in crop production cycles and impacts the crop yields. An innovation made by Mr Syed Subhani of Nagabairavapalem<sup>69</sup> of Guntur District, seeks to address some of these issues and is now widely used by farmers of this district. The innovation named as “Tractor mounted boom sprayer” was designed by this grassroots innovator in tune with the felt needs of the end-users.

Mr. Syed Subhani, a science graduate hails from a carpenter family. His parents, Mr.Qudhawan and Mrs.Hussaindi had been a constant source of

encouragement for him to pursue his formal education. Unfortunately, circumstances after the untimely death of his father forced him to drop his study for B.Ed degree and take up the family responsibilities. He then started to look for various business opportunities to sustain the family with sufficient income.

During this transitional phase, his kith and kin convinced him of business opportunities in servicing sector of agricultural sprayers. Subhani started to work with mechanics based in his village and slowly built his business around this sector. His technical capability and hard work soon paved way for manufacturing of sprayers and sprayer parts. He started a company 'KMS Agro Products' in 2003 which gained good business across the states of Andhra Pradesh and Karnataka. While working and providing these services, Subhani realized the dearth of trained manpower for the spraying activity. He also noted the hazardous impact of these works on the health of the personnel engaged and started to explore for simple remedies to reduce these impacts. The keenness to find some solution to these problems, led to the innovation of the "Tractor mounted boom sprayer".

### *How the innovation took shape?*

Guntur district in Andhra Pradesh, from where Subhani hails, is a fertile soil belt with adequate rainfall and sufficient irrigation for growing three crops a year. In recent years, many farmers are opting for cash crops like chilli, cotton, tobacco etc., as an additional crop. This measure is proving to be remunerative to them giving good returns. However, as most of these crops are input-intensive and also fetch good returns, the farmers are cautious and take care in protecting them from pests and other insects which damage the crops. They resort to frequent pesticide spraying services from time to time to cover large acres. It was observed that labour shortage particularly during the peak times and some of the inherent limitations of the available sprayers resulted in delay in field operations and often led to severe damages causing economic losses. Engaging untrained manpower also had a problem as this required constant monitoring by the farmer which was sometimes, difficult. Mr. Subhani started to explore for practical solutions to these problems. His assiduousness to achieve the concept was remarkable but, the evolution of equipment took eight long years to make

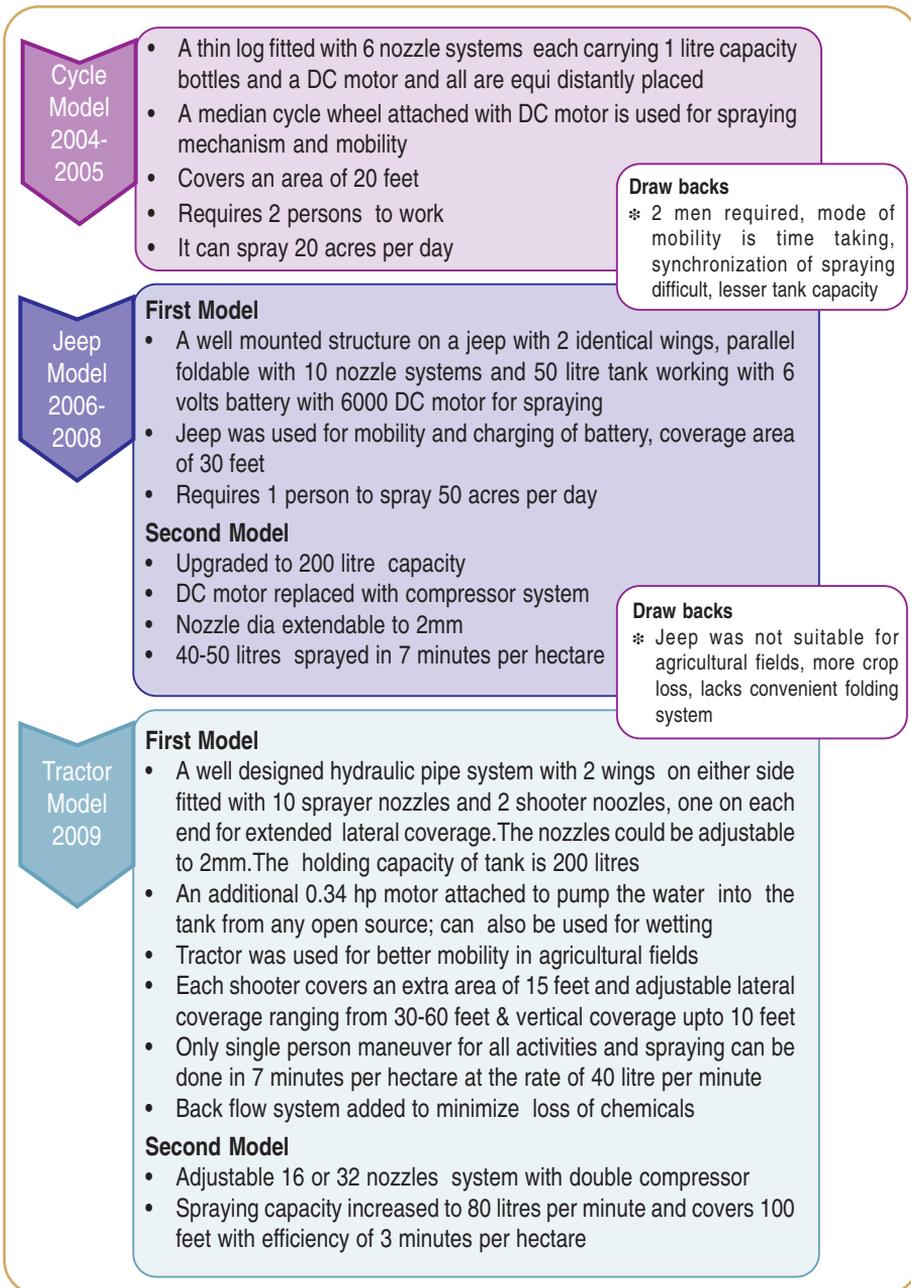


Figure 10. Evolution of Subhani's boom sprayer model

it to the present model of boom sprayer. The innovation came into form after a series of iterations and modifications over the years. Subhani's innovation can be categorized into sets of three unique and significant models based on the system of delivery of the pesticides or fertilizers. The stages of the innovation are represented in Figure 10.

These models of Subhani helped in removing the drudgery of farmers by reducing the burden of sprayer tanks on their shoulders; affording longer duration for spraying and reducing the exposure to hazardous chemicals, insect and snake bites to the manpower engaged in spraying.



The innovation also presents other advantages. The cycle model intended for mechanized spraying version was designed with a thin log as an extension support for the 6 nozzle sprayer systems each connected with a DC motor and one litre capacity bottles. But this model could only cater 20 acres of land. It was further modified owing to the draw backs (Figure 10). The next model was designed using hydraulic pipe systems with 12 nozzles mounted on a jeep for better mobility, synchronized spraying from a single 50 litres tank run by a single 6000 rpm DC motor. This model was further enhanced with compressor system run by 5 HP diesel engine, 200 litre capacity tank and adjustable nozzles up to 2 mm in the second model. But, jeep was not affordable by the farmers and unsuitable for agricultural fields. It was further modified to a tractor based design with same hydraulic

system and the solid pesticides were solubilized with the compressor for easy liquid spraying. This machine was first tractor model that could stretch up to 50 feet with 40 litres per minute spraying capacity thus, covering 60-80 acres a day.

Courtesy: Innovator



Syed Subhani's 50 feet "Tractor mounted boom sprayer"

An augmented model of tractor was made recently in 2012 with 100 feet extension, double compressor with a spraying efficiency of 80 litres per minute. This model covers 100-125 acres at 3 minute per hectare of efficacy

Courtesy: Innovator



100 feet "Tractor mounted boom sprayer"

and this is presently on field trials. The equipment though, taking a long trail of modifications, proved a success in achieving the goal of single maneuver model covering large areas in a short span of time. Moreover, the crop loss is reduced from 10% to 2.5% which gives a substantial saving on the crop.

Since, regions of Guntur, Ongole, Anantapur, Kurnool and other districts around Subhani's home town have a dry spell season; this machine could be used for sowing too. This saves the farmer from flood irrigation of the land before sowing as done with traditional methods. Box 6 lists the multiple advantages of "Subhani's boom sprayer".

#### **Box 6. Advantages of Subhani's boom sprayer**

- *Only single person maneuver*
- *Timely spraying to the fields*
- *Useful as vertical or horizontal models for spraying of pesticides and fertilizers*
- *Can be used for irrigating the agricultural fields.*
- *Variable nozzles can be used with improved sprayer efficacy*
- *Farmer's need to monitoring of labour is reduced*
- *It takes just five minutes to cover one hectare*
- *Extension of farm coverage is easier*
- *Mechanized water filling system*
- *Minimizing the loss of pesticide or fertilizer by a back flow system*

#### ***The monetary perspective***

Since 2004, Subhani has spent a huge amount from his personal savings for developing the sprayer models. He invested Rs.50,000 for cycle model, Rs.1 lakh for the first jeep model and Rs.1.5 lakhs for the second jeep model. For the "Tractor mounted boom sprayer" model, he spent about Rs.1 lakh. While the cost of the boom sprayer was Rs. 45,000/- for the 50 feet sprayer, the cost of tractor mounted boom sprayer was restricted to Rs.70,000 - 80,000/- for a 100 feet equipment. His hard work has fetched him some

positive signals. Till now, he has sold nearly 32 pieces of his machines to the buyers from districts of Krishna, Nellore, Anantapur, Guntur, Nalgonda and Ongole of Andhra Pradesh and adjoining districts in Karnataka. These have been successfully used by the farmers for crops like chilli, tobacco, pulses, millets, cotton, grams, and sugar cane. The sprayer could be used for crops up to 8 feet height. The vertical sprayer has been used very effectively in grape vine yards.

Currently, Subhani also has a business model of leasing his machine at minimum rate of Rs.100-125/-per acre. A single operator functions as the driver and independently completes the work covering a minimum of 10 acres in one hour. He earns about Rs.1000-1250/-per hour. With an estimated expense of Rs. 2200/- for 10 acres, the expense for the farmer is reduced as using the machine reduces the expenses on three persons. Subhani's machine saves almost 50% of the farmer's expenditure and also the mechanization ensures quality service in spraying operations. The hazardous exposure of spray chemicals to operating manpower is also reduced. These make the operations more economical and environment friendly activity for his clients. Additionally, an adherence to timelines also results in better crop yields with lower pest incidence and enhanced quality of the produce.

### *The support of voluntary organizations*

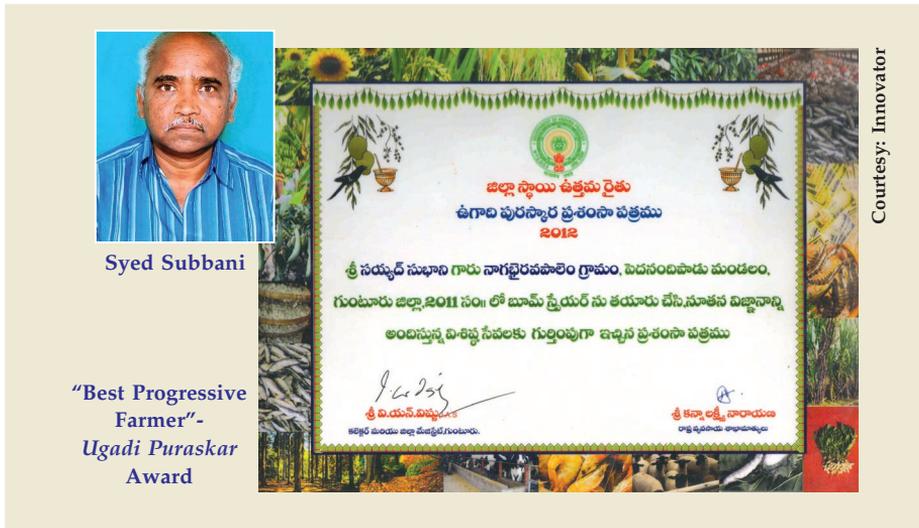
Since 2007-08, Subhani has been supported by a voluntary organization, Palle Srujana. Brigadier Ganesham and other members of this network lent their supporting hand in bringing out this innovation of boom sprayer to lime light. In fact, this innovator was connected to this organization by another grassroots innovator, Sri Patan Saida<sup>70</sup> in 2007. The benefit of building a strong connectivity and network across the country by the innovators themselves in realizing their efforts of creativity is again emphasized with this innovation. They lay down roots of strong innovative ecosystem which helps in resolving problems at the local level by local people and extends to other areas across the country. For this, a supporting connecting system or platform is needed to give innovators, a backing to catalyse the journey from idea to proof-of-concept and later during the product development stage. In this story of Subbani's "Tractor mounted boom sprayer" the support of Palle Srujana<sup>71</sup> helped the innovator in

seeking fund for developing the final model. A financial assistance of Rs.2,34,000/-granted from NABARD under Rural Innovation Fund (RIF) in 2011 was timely for the progression of the innovation. Syed Subhani was also presented a certificate of participation in “Grassroots Rural Innovators Interaction Meet” in May 2011 by Mr. Mohanaiah, Chief General Manager (CGM) of NABARD, Andhra Pradesh in recognition of his efforts till then.

It will not be out of place to mention that Subhani returned an unused amount of Rs.20,000/- from the grant he received. This emphasizes his strong value system and needs to be appreciated.

*Appreciations and awards*

The handholding and mentoring efforts of support platforms like Palle Surjana have catalyzed the recognitions of the innovation and brought laurels to him. The first experience of showcasing the ‘Jeep model’ of the innovation at ‘Grameena Jateeya Pragati Pradarsana’ in 2007 was perhaps the beginning. This led to several others including the felicitation by State Government in ‘Palle Bata’ Programme of State department of Agriculture and “Best Progressive Farmer” Ugadi Puraskar Award in April 2012 with a cash award of Rs 5000/- and a citation.



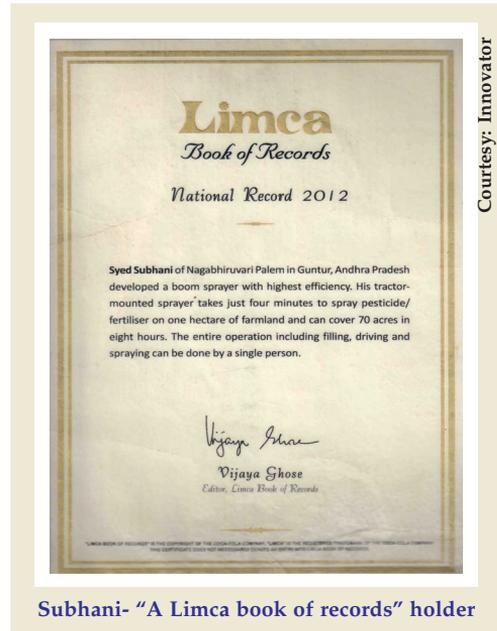
Perhaps, the greatest moment for Subhani was the recognition by 'Limca Book of Records' in 2012 for creation of a National record of the first ever award granted in sector of agricultural machinery by the organizers. Again, connection of Subhani to this platform of Limca Book of Records was through Palle Srujana .

Following these achievements, Subhani also got opportunities in media channels with coverage of his 'Boom sprayer' innovation. National Channels like TV9, iNews, TV5, Sakshi, Saptagiri, Ntv have captured his

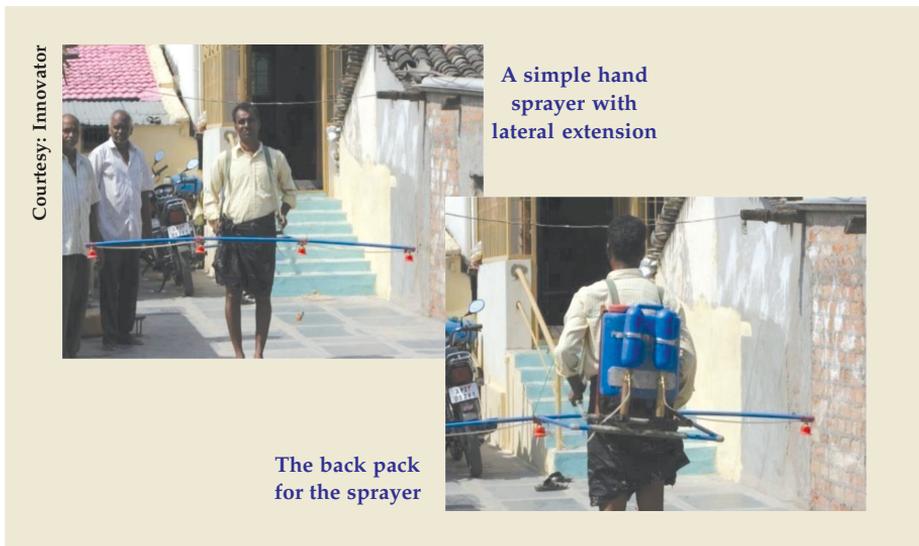
innovation. A recent opportunity with BBC is yet another hallmark of recognition for him. Subhani's story has been source of motivation to young students too. Two students from IIT-Khargapur were facilitated through NAARM-Palle Surjana combine for their summer internship programme with him. The young students have put on record that the learning they received from Subhani was a '*treasure of knowledge*' and motivated them to explore for more such innovations in their professional life. Engineering students of NIT, Warangal also felicitated him with a token of appreciation at the student-led 'Technozion-2012' programme organized in September 2012, when his innovation was demonstrated to thousands of engineering students from across the country who had participated at the fest.

### *Subhani's aspirations and institutional support*

It is indeed, a pride to the nation when a grassroots innovator like Subhani achieves laurels in various platforms. The recent demonstration of the tractor version of 100 feet was a remarkable achievement. It showed three minute per hectare efficacy during the field trials. It is an amazing design



from an innovator with only local-based knowledge and his inherent technical skill set. Mr. Subhani now aspires to move a step ahead in his concepts and visualize making a “balloon sprayer” that could spray the requisite liquid from a height that covers the whole crop which could be similar to an artificial rainfall. The ideas and creative thinking of Subhani brings to focus the innovative thought process emerging out of needs and drudgery of rural people and their resolve to find solutions to their problems.



The awards and recognition for such grassroots innovators gives impetus to several other similar innovators to come forward and explore for solutions to their problems. These ideas and concepts of the grassroots rural innovators certainly need more encouragement for further improvement, up scaling and commercialization. The support and mentoring of voluntary organizations in taking forward these innovations lays the emphasis for scouting, validating and sustaining such innovations.



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## A Woman Crusader for Organic Farming



*“Empowerment of individuals is a key part of what makes open source work, since in the end, innovations tend to come from small groups, not from large, structured efforts.”*

*-Tim O’Reilly*

*Innovation* : **Organic seeds**

*Innovator* : **Mrs. Santosh Pachar**

It is well known that farmers are the custodians of treasure of traditional knowledge and practices. Most of traditional agricultural practices continue to be used by many growers and over years become part of the culture and social life in the villages. For instance, the common practice of saving the seeds for next crop has traditionally been part of farming practices in several parts of Asia and Africa. This work is usually undertaken by women and there are several instances where these practices have led to building valuable resources of

bio-resources like seed. Conservation of seed, novel methods of preservation, selection and growing of good material are also associated elements of the journey towards developing new varieties. Over years, several women farmers have developed their skills and acumen in these functional areas of the crop production activities. Practicing such methods has made them more knowledgeable. There are several women farmers who have blended these skills with modern technology successfully and are slowly emerging as leaders engaged in such agro-businesses. Most of these women continue to be located in their own eco-system and villages and operate their business from there itself. The story of Mrs.Santosh Pachar, an innovative farmer from a small village of Sikar district of Rajasthan is about her successful efforts in this direction. With a natural passion for farming and great interest in learning new developments in farm practice, she has developed an improved variety of carrot with desired features of vermilion colour, long length, low percent of forked roots and sweetness<sup>72</sup>.

### *A hobby turned to livelihood*

Santosh Pachar hails from a simple farming community. Since childhood, she helped her family in farming. Initially, it started as a hobby and she worked in these activities after school hours or during holidays. The interest created due to this engagement in farming activities at home became her occupation after marriage. Both Santosh Pachar and her husband, Mr. Jabarmal Pachar are school dropouts but very enthusiastic in trying new and innovative farming activities. They are well known in the village for their knowledge in this subject and their enthusiasm to share that knowledge. They have been practicing organic farming in their five acre land for a very long time; cultivating different varieties of crops including vegetables and fruits such as wheat, fenugreek, onion, carrot, garlic, coriander, pomegranate, and papaya. Santosh likes to experiment and tries to implement her own way of conducting field trials in her land. With no formal training in any new cultivation methodologies, her techniques in experimentation and her own intuition helped her in developing an improved variety of carrot.

### *The journey to organic farming practice*

The major turn in the lives of Pachars was during 2002, when Mr. Jabarmal Pachar got five acres of land to his share after the joint family property was divided among the brothers. Since, their village is under one of the water deficit regions of Rajasthan state, the cultivation of any crop was not very profitable. The lands were also resource-deficient and unfertile with low productivity. This situation was slowly becoming economically unsustainable for the Pachars and their livelihood was threatened. It was during this period that they heard about M.R. Morarka-GDC Rural Research Foundation<sup>73</sup>, an NGO in Rajasthan that advocates organic farming. Santosh happened to accompany her husband in one of the meetings for farmers held by this organization in that district. In fact, she was the first woman farmer to have attended such a meeting. Being a traditional woman, she did not speak and could not express her doubts in presence of other men. Though she did not take active part in the discussions, she has understood the significance of improvement of soil fertility through practices based on organic farming for higher production. Since their land was low in fertility, Santosh decided to try these practices.

The initial financial support provided by Morarko Foundation for the seed capital also proved to be an additional incentive for Santosh and her husband to adopt the practices about organic farming, which they learnt from the Foundation. Santosh started the first step of vermi-compost preparation in their nursery with preparation of a bed or pit with soil, organic waste, sand, green leaves, etc., layered in a sequential pattern. Then she introduced earthworms into the bed. In about 40-45 days, she observed the change in the bed with loosening of soil and the vermi-compost was ready for use in their lands. She experimented with onions and cauliflower at a small scale in their nursery using both the techniques of organic farming and the regular practice with chemical fertilizers and pesticides. To her surprise she found that the quality of vegetables grown with organic practices was better than the other produce from the other plot. This result boosted the self-confidence of Pachars to experiment in larger plots of their land. So, Santosh with encouragement from her husband tried the same experiment with the same vegetables in one acre with organic farming practices and in rest of the four acres with recommended chemical fertilizers and pesticides.



Soon it was observed that there was increase in profits from the produce from one acre of land. This was primarily due to better quality, taste and quantity as compared to the produce from rest of four acres. This gave a boost to go ahead with her experimentation techniques with other vegetables. Her success was recognized by the District Collector and she was awarded with cash award of Rs.11,000/- as token of appreciation at *Panchayat* level (the local body) for her efforts and also as an encouragement from the local administration to a woman farmer. Later, she was also rewarded with Rs.25,000/- by the Chief Minister of Rajasthan for her efforts in advocating organic farming.

Santosh continued her organic farming practice by extending and building more vermi-compost beds. But, for doing this she needed large quantities of 'cow dung'. For this, she started investing in more cows. However, this had adverse impact on their farming activities. Most of the time of Santosh and also her husband was diverted in maintaining the animals and they were unable to focus on farming activities. So, they invested on an automatized arrangement for the feed for the animals, thus reducing their time on feeding animals. Now, Santosh could focus on her experiments with more techniques of organic farming on different varieties of vegetables<sup>74</sup>.

### *The carrot story*

About few years back, Santosh Pachar had collected some carrots for domestic use from Akwa village in the Laxmangadh *tehsil* from a farmer. As the carrots looked very good in appearance and had very few numbers of forked roots, she thought of using some for propagation for her own use in next season and she started growing the carrots for seed produce. Santosh did a 'root to seed method' of planting with a focus on certain attributes that she wished to propagate. Her main focus was to lower the number of forked roots based on her observation that higher the number of forked roots, lesser would be the yield. She adopted selection criteria for attributes like long length, sweetness, vermilion colour, less number of forked roots and softness. Mrs.Pachar gathered few seeds from the first generation of planting and sowed them in a small field. She continued with the same process of selection for 4 to 5 years to attain the stability in the seeds. She used neem oil as a pest controlling agent.

Apart from adopting this selection process, Santosh has also experimented with the seed sowing method. Prior to sowing, the seeds were scarified by rubbing them with palm. After scarification, seeds were treated with sesame oil and then sown in pre-prepared plots (size 15 x 20 ft) in rows. To retain high soil moisture content, the sown fields were irrigated with sprinklers. Thereafter, only light irrigation was provided with sprinklers for a period of one month. It was then followed by normal flood irrigation process. Weeding was done intermittently in about 15-20 days after sowing.

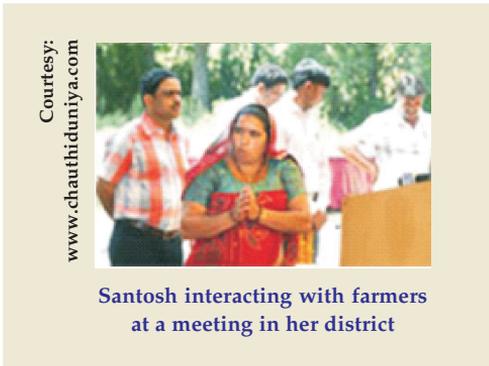


The thinning process of removing clustered or entangled seeds was done for maintaining space between the seeds and to have straight carrots.

Adopting a well formulated plan into practice, Santosh finally produced carrot seeds with the features she had identified. This seed lot was found to be well adapted to higher temperature regimes, often prevalent in her state. The carrot seed had a length of about 1.5 feet with very low percent of forked roots. It was also found to be resistant to several diseases with crop duration of about 2.5-3 months. The final produce is also less hairy and a record yield of 63 tons per hectare as against an average yield of about 40-50 tons per hectare was produced. The seeds obtained were stored in cotton bags of two kilograms each. The quality of this improved variety of carrot by a continuous natural selection process has good market value. Santosh makes about Rs.5-7 lakhs per year with these organically produced vegetable seed.

### *The effort of a woman innovator*

The efforts of a rural woman like Santosh to develop improved variety of carrot need to be appreciated. Without much of formal training or any support from any organization, she has used her knowledge and experience. This together with proactive nature of peer interaction has



Santosh interacting with farmers at a meeting in her district

proved to be her gift to continue her pursuits. She continues to share her own learning from the cultivation practices and distributed her seeds along with teaching the practices followed by her. Santosh, being an enterprising person keeps interacting with other farmers to be in touch with newer techniques. She invites them to

visit her fields to see her approach. She attends meetings at *Krishi Vigyan Kendras* (KVKs), *Gram Panchayat* and regional farmers' meet regularly. Her innovation and organic practices often form part of the discussions during these interactions. Her work especially the experiment with spinach and carrot has been greatly acknowledged by the farmers around her village.

### The family support

Santosh's husband continues to be the supporting pillar and her children encouraging all through her experimentation and achievements. From her



Santosh felicitated by the President of India with National Award

side, she has ensured that her children were given proper education. Her daughter has completed her Master's in Education, is now employed with Rajasthan Police department as Sub-Inspector and her son is pursuing Law. The children take pride in their parents being farmers and their mother as a progressive farming woman. Along with her family responsibilities of ensuring good education to her children, Santosh feels the responsibility towards her village. She campaigns for awareness of organic farming among the villagers and works for the promotion of organic cultivation practices. Till now she has trained about 800 women in their region on organic farming practices. She has been the inspiration and role model for the women in their region. In this direction, she always encouraged the farmers of the village to move ahead with her unstinted support. She plans to apply her practices to other crops too. She has identified the demand from the market as the driver for continuous improvement programme of plant varieties. She has also realized the significance of organic cultivation and continues to encourage the use of such sustainable practices in the village.

### *The support to Santosh from external sources*

Santosh was always supported by *panchayat*, and district level officials. This connectivity helped her to be recognized for her work at the state level. She wishes to work for improvement of more varieties of vegetables and plan with better methods of organic cultivation. But for carrying out the experimentation, she needs more technical support from Agricultural Extension department and other agencies near her village. There is a need for more financial funding to conduct the trials in organic cultivation for different crops. In case of carrot seed production, Morarka Foundation and Honeybee Network proved to be the initial catalysts for building the needed linkages and encouraging her in her experimentation. It was due to efforts of NIF that her work gained recognition at the National level. Santosh was felicitated by the President of India during the Seventh National Awards for Grassroots Innovators and Outstanding Traditional Knowledge Holders, organized by National Innovation Foundation-India in 2013<sup>75</sup>. Her case also indicates the role of good linkages for a grassroots innovator. The learning from each other and sharing of knowledge is critical for these innovations to be successful. Such connectivity can also facilitate

and provide technology backstopping wherever, necessary. Her story also proves that empowering women can bring change in the thinking of families and also communities. Truly *'innovations tend to come from small groups, not from large, structured efforts'*. The observation, commitment and diligence of Santosh helped in her innovation journey. Her willingness to learn and share with others helped her to succeed in her village. Santosh's efforts have impacted the nearby villages and set forth a sustainable pathway for organic seed production and farming as a agri enterprise. Her story is indeed of a successful agri-entrepreneur.



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## Rajanna - “Dhanvantri” of Animals



*Innovation* : **Herbal medicines for animals**

*Innovator* : **Boya Pedda Rajanna**

Livestock is an important entity of our food chain. Increasing incidence of diseases in livestock and domestic animals are becoming major deterrents in livestock and dairy production. Increasing costs of modern health care techniques and the presence of strong cultural beliefs in traditional herbal healing methods and procedures are perhaps major reasons for depending on traditional health care practices in

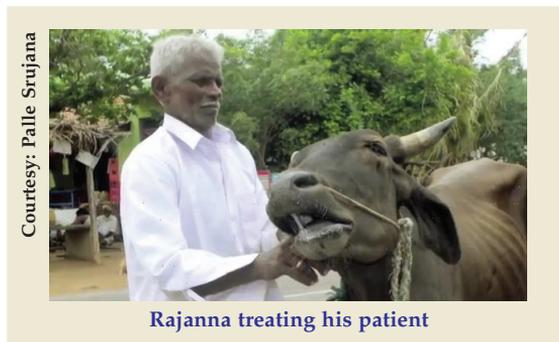
rural India. This is also strengthened by the fact that the country is blessed with rich and diverse heritage of cultural traditions. These traditions are associated with use of wild plants as medicinal herbs and form part of livelihood for several ethnic communities living in ecosystems around dense forests.

The use of herbal medicines has been practiced across the world from time memorial. The mode of knowledge dissemination has always been through informal learning and practice. The iterative process of watching and learning has been the base of most traditional health practitioners. In India, it is often centered in families or communities with knowledge being handed over to their children.

This story of Boya Pedda Rajanna of Andhra Pradesh is his journey of intuitiveness, keen observation of eco-system, the process of experimentation using traditional and cultural beliefs for practicing the products and processes as real time solutions in animal health.

### *A real animal physician*

Rajanna, a 60 year old man belongs to farming community of Golla village in Anantapur district of Andhra Pradesh. From a very long time his family was practicing treating animals in and around their village. Pedda Rajanna acquired the traditional knowledge from his grandfather for curing the



diseases of animals with the herbs and other plants. From his younger days, he gained knowledge and information on animal behavior, animal health and on diagnosing the symptoms of a disease. All the villagers approached him for advice before and

after buying farm animals for his suggestions on maintaining good health of the animals. Over the years, he attained a reputation as a 'Healer of Animal Diseases' - *Dhanvantri*<sup>76a</sup> of animals. When farmers approach him for the treatment of their animals, Rajanna leaves his own work of farming activities and gets engaged in treatment of their animals. This has been a routine for him for the past 30 years. Every time he needs to attend an animal, he goes personally to check out the condition of the sick and goes to the forest if the remedy is immediately not available with him. He searches for the right plant or herb which is effective on the ailing animal. Based on the symptoms, Rajanna prepares the medicine and administers himself. In almost all cases the animal recovers within 2-3 days. He has an effective method for successful management of fractures in animals. He can treat the animals for various diseases like *kunti kundu* (Ephemeral fever), *chali kundu* (Anorexia), *rakta kundu* (Hemorrhagic enteritis), *udu kundu* (Bloat), *katta rogam* (Repeat Breeder), *podugu vapulu* (Mastitis), *parukonudaniki* (Diarrohea), *kaallu kuntlu* (Foot rot), blindness, back pain, stomach ache, *kartam ganchu* (Babesiosis), blood in milk and milkless in animals<sup>76b</sup> (Figure 11).

Till date, his medicines and treatment processes have worked very well on his patients. There have been instances when diseases not found cured

through treatment by veterinary doctors were cured by Rajanna’s set of methods and some qualified veterinarians do take advice from him. All through, his passion to treat the voiceless animals imbibed from his childhood, has been the motivating factor for his pursuits. He does not accept any remuneration for treating animals and the service he has rendered for

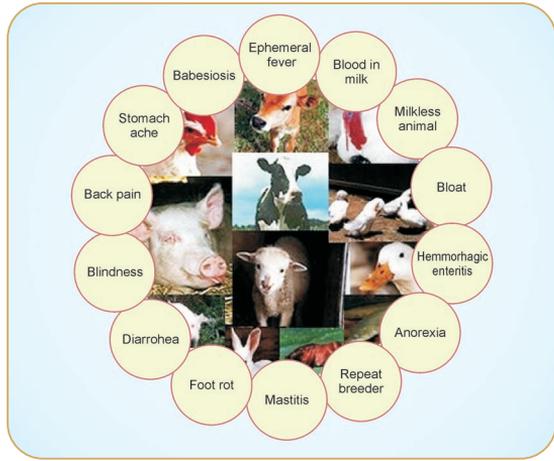


Figure 11. Range of diseases treated by Rajanna’s therapeutic methods

farmers. The intensity of cases and the animal treatment required to prepare medicines, takes away most of his time. Pedda Rajanna does not find much time to practice farming on his own lands properly. Though his livelihood depends on farming, he does not get enough time to work on the fields and provide in some for his family that comprises of wife and three daughters. He remains poor but continues to serve the animals generously with the skills and knowledge he has developed over a period of time.

*The connecting link*

These efforts and knowledge of Rajanna have been recognized by the NIF-Palle Srujana combine.



Courtesy, Palle Srujana

Rajanna receiving the President Award at the Seventh National Grassroots Innovation Awards

In March 2013 Boya Pedda Rajanna received the President Award at the Seventh Biennial Awards for Grassroots Innovation and Outstanding Traditional Knowledge, organized by National Innovation Foundation (NIF) - India and Department of Science and Technology, Government of India. He received the award for his *“selfless contribution in the field of herbal medication for animals”*. He was also nominated by the grand jury led by Mrs. Aruna Roy, for *“Hall of Fame”*<sup>76c</sup> instituted by the Civil Society during 2012, in recognition of his dedicated service to the animals.

### *An intriguing experience*

A day at Delhi for award ceremony with this illiterate poor man has been a wonderful experience to Brig. Ganesham, the President of Palle Srujana Organization. Rajanna said *“Sir, I prefer staying outdoors under the sky and fresh air instead of a luxurious hotel room. I feel suffocated indoors. I would speak at the award function what comes naturally to me at that moment.”* Then, when he delivered his acceptance speech in front of the large audience witnessing the award ceremony, there was a standing ovation and great applause for him. This small experience highlights the humbleness and simplicity of a person close to nature with a practical approach to life.

The efforts of Rajanna also demonstrate his essence of pure selfless service. The poor man’s family has been suffering in poverty all these years; yet he continues to offer his services free of cost. Recently, there have been attempts to put forth proposals for financial grants by several voluntary organizations which are still to fructify. However, these attempts signal recognition of Rajanna’s efforts by few who have come to know of him.

### *The need to ponder*

The discrete efforts of several such knowledge holders need encouragement and institutional systems are to be put in place. If such knowledge and the selfless services are not recognized adequately, there is danger of losing this huge traditional knowledge base existing in the country. The evolving global and national changes necessitate the use of traditional knowledge, authenticating its use and support rural based knowledge holders like Boya Pedda Rajanna.



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## Bakery Foods at Door Step



*Innovation : Gas operated oven*

*Innovator : Chidipi Nagabhushanam*

Baking is an art that has genesis from ancient Greeks period around 600 BC with bread baking, this in turn led to the invention of enclosed ovens. It is a food cooking method that uses prolonged dry heat by convection, rather than by thermal radiation. From bygone days itself baking was a luxury and only few could afford it. Integral to this was the technological developments of various models of

ovens and baking processes leading to the recognition of baking as a profitable profession. Therefore, developing a food baking oven may not be a novel invention, but definitely Chidipi Nagabhushanam's oven is a remarkable innovation. Serving tasty and hot bakery food items is the specialty of this rural innovator from a small village Munikodali of Seethanagaram Mandal in East Godavari District of Andhra Pradesh.

### *Unique baking art*

An innovator with passion for baking designed a Liquefied Petroleum Gas (LPG) operated oven which is user friendly like a cooking stove that could meet to the needs of rural people. Nagabhushanam comes from a poor family. His parents, Mr.Chindipal and Mrs. Gellamma worked as daily wage labourers to make their means of livelihood. In spite of penury, Chidipi Nagbhushanam's parents managed to give him basic education. Though he lost his parents at very young age, he continued his education till Intermediate with the support of his grandmother Aasamma. He completed his course in Andhra Kesari Junior College, Rajahmundry. Further, with her encouragement, he joined a course on bakery training at District Rural Development Agency (DRDA) in Kakinada District, Andhra



Pradesh. This became his passion and also the livelihood for his family. He started his profession as Food Processing Instructor in 1980 at a women campus in Bommaram, a small village. He trained the women folk of that region on baking biscuits, making jams and jellies as well as fruit juice concentrates on a regular basis.

But, this did not give him complete satisfaction. He intended to do some kind of work that could provide a means of livelihood for the trained women from the institute. These thoughts churned into innovative ideas in the baking process. He noticed that the traditional brick oven, electric operated ovens and even big Liquefied Petroleum Gas (LPG) ovens were being used by most bakeries. With the changing times and increased cost of fuels and electricity, the training institutes had to look for alternatives. This was the time when Nagabhusham put his innovative ideas to work. He got an idea to work out an LPG operated oven which could save the fuel and give more efficiency with fewer burners in the bakery oven. The journey of an innovator took shape from this point and worked it out for better livelihood.

### *The innovation from a bakery master*

The idea of making an oven occurred to Nagabhushanam when he was engaged in training rural women in baking procedures. He found a need for more useful device, keeping the local needs and demands in mind. This led to the idea of making an oven with LPG unlike the traditional

way of using wood or the conventional ovens run on electricity. He had put forward his ideas to a scientist of Central Tobacco Research Institute (CTRI)<sup>77</sup>, Rajamundry. With the encouragement and technical support of the scientist, he could design a 'Gas run oven' for making bakery items. He made a simple construct of the oven with available and inexpensive material. The galvanized steel sheet was used for the outer box and the inner trays were made of thin iron rods. Heating was provided with burners run on LPG. The unique feature of the oven is the design construct and selection of raw materials.

His innovation gathered great laurels and applause from various corners. This gave him enough encouragement to go ahead with his ideas. Instead of four burners being used for the two large trays (decks) in a bakery oven, only three burners were placed to achieve the required heating. The improvised version of the oven was soon brought out with an added the advantage of saving on the fuel. This innovation boosted his self-confidence to start and own a business.

In the year 1981, Nagabhusham started a bakery with his tasty savories such as biscuits, breads, curry puffs, cakes, and baked products. His specialty lies in process of baking in his oven giving a unique taste to the final products. Slowly, he started becoming successful in his business of making and selling baked products and also in training more youth and women to set up this business. In all this, his innovation of customized oven also took off. Needless to say, the support of his grandmother, his wife Padma and his son proved to be important factors for stabilizing his model of business.

Within a short span, Nagabhushanam ventured to start making customized ovens as per needs of his clients. His focus was to decrease the overhead expenses and gain better financial margins through the device. The demands and challenges of erratic power supply in peri-urban and rural areas of his clients were the focal points; he addressed these by providing improvements in the oven and suggesting the innovations in baking procedures. Recently, Nagabhushanam designed an oven with alternative fuel like LPG for baking process which gives better economic advantage over the firewood and electrical devices. The device named as "Gas

Operated Oven” for the bakeries is meant mainly for small scale entrepreneurs and for domestic use.

### *His journey to gas-operated oven*

Ch. Nagabhushanam, by nature, is a person with profound enthusiasm, and evinces great interest in any activities related to learning and analyzing of the concepts. He tried to grasp intricacies in working of oven and related the problem of bringing down a huge innovation at enterprise level to a common man’s kitchen. For this, Nagabhushanam had to identify the affordable alternatives for baking and also to blend the taste of cooking on a normal cooking stove. He designed a simple double layered chamber of galvanic sheet with insulating material being stuffed between the two layers. At the base, a unique heating unit with the gas burner attached to three iron plates with central opening for the heat to pass through them was designed. A provision for closure of the openings on the iron plates was made to regulate the heat. Above this heating unit, the perforated base of the inner chamber of the oven was placed such that the heat is conducted into the chamber. Another iron plate was placed inside the internal surface of the roof of the oven. This plate enhances the heating of



the chamber from the top when the vents in the bottom heating unit are closed. Thus, a uniform heating is accomplished with a gas burner system that saves fuel due to reduction in heat loss. It also ensures complete cooking in a comparatively short span of time which is much suited for conventional Indian cooking and baking.

A mobile gas oven is one such version designed in 2007 and used for door to door delivery of freshly baked products. He fastened a small oven that could run with small gas cylinder on the back seat of an old motorcycle and has set up an assembly with space for other materials. This was perhaps the first of its kind mobile bakery with an innovative oven, a lamp post and audio system for entertainment. His distinctive manner of advertisement and marketing strategy has helped to set a successful business with hot and delicious bakery foods being served at the doorstep of his clients.

### *The effective alternate approach*

Nagabhusham's simple innovation impacted not only his life but has changed the lives of many rural women. His ovens have a good demand



Courtesy: Innovator

Nagabhusham with his team at workshop

for the reasons of affordability and opportunity to clients to ask for custom-made ovens. A possible earning of about Rs.1000-1500/- per day using a two kilograms gas cylinder is an attractive proposition for several young home makers who can embark on a self-enterprise with little capital. The heat produced in the oven is completely utilized for cooking or baking of food stuff unlike the conventional cooking on stoves. Thus, the innovation gave a promise for a better livelihood especially for young home makers who can combine with their work and a small business of bakery products. With the increasing demand for his ovens, Nagabhushanam started a small workshop with the help of few assistants. He priced his ovens at very nominal amounts of about Rs.8000-10,000/- for the small ovens and Rs.15,000-40,000/- for the big sized ovens along with a servicing and repairing facility. Since 2012, Nagabhushanam has sold over 50 pieces of his oven models.

### *An innovation for livelihood*

All this was just possible for Nagabhushanam as he had the passion, worked hard with commitment and a conviction to take his skills forward for an innovation. His enterprising attitude showed new areas for expanding his skills and invention reaching several rural women with opportunity for self-reliance. Initially, he gave demonstrations on baking food stuffs to several women associations and explaining the advantages of using a gas operated oven to gain more earnings. The first demonstration at CTRI –Krishi Vigyan Kendras (KVK) -Kalvacherla was for one month, training a number of rural youth on baking. The success of this training spread to various institutions through word of mouth and many people from different organizations started to invite him for training the people with his simple innovation. He trained about 300 unemployed people in more than 14 KVKs, associated colleges of agricultural institutions and NGOs in various districts of Andhra Pradesh and Telangana. He enjoyed the phase of being a food instructor as he felt that he was passing his knowledge with his innovation to rural people for their livelihood. During these occasions, he also got several opportunities to demonstrate his prowess and share the products with several dignitaries. These gave him encouragement and the recognitions including felicitation by the Government in 2011 which helped him to go further. For instance, recently,

Nagabhushanam formulated a new recipe of biscuits and cakes using millets such as ragi, jowar, foxtail millets, etc. His participation in “Millets Mela” at Hyderabad in 2013 got good response and provided another platform for dissemination at College of Home Science<sup>78</sup>, Acharya N G Ranga Agricultural University (ANGRAU) for the budding entrepreneurs in the presence of leading academicians of nutrition and food science. Indeed, it is a feather in the cap of enterprising self-learnt individual with no formal training and education!

### *The supporting ecosystem*

It is important to understand that it has been a struggle for Nagabhushanam to reach into the society with his innovation. The support of the scientists of KVK of ICAR system helped him to get the initial monetary funding and put forth his ideas into an innovative and user friendly gas operated oven for the big bakeries. The sanction of Rs.50,000/- from the Schedule Caste Development Corporation (SCDC)<sup>79</sup> proved to be boost for him and helped to start his journey. The recognition by voluntary organization like Palle Srujana after a demonstration helped him, through their positive mentoring efforts, build networking opportunities with formal organizations. It was through one such effort, he got to participate in “An Awareness programme on Intellectual Property Systems” organized at NAARM exclusively for grassroots rural innovators. It helped him to

Courtesy: NAARM



**Nagabhushanam participating in  
“An Awareness Programme on  
Intellectual Property Systems” meet  
during November, 2013.**

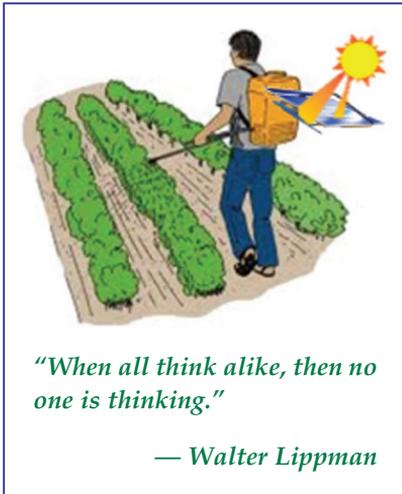
understand need for building IP enablement for his newer inventions and through this association with NAARM, Nagabhushanam has been successful in filing his patent in 2014.

The impact created by Nagabhusham's innovation on the rural youth and especially women has far reaching impact on lives of several rural people. It is in fact a business model of feasible rural livelihood. Perhaps this is one of the unique cases of the formal system nurturing and supporting a grassroots innovator. The support and mentoring given from the scientists of the public sector and voluntary organization in his case was valuable to motivate him. It is important to develop synergistic systems so that rural communities can contribute in efforts for sustainable innovations for the welfare of rural people.

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## A Serial Innovator from a Grassroots Landscape



*“When all think alike, then no one is thinking.”*

*— Walter Lippman*

*Innovation* : **Solar sprayer**

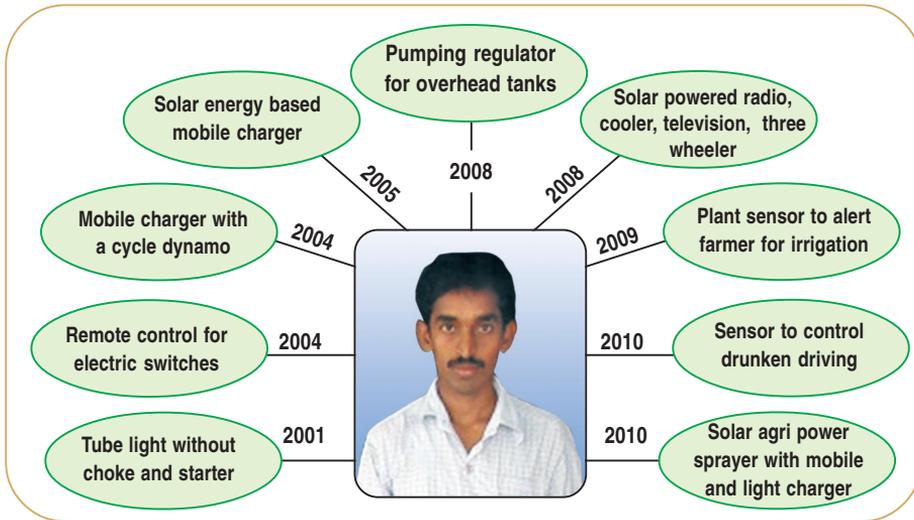
*Innovator* : **Bommagani Mallesh**

A grassroots rural landscape is a cascade of innovative ideas, innovations and innovators. Serial innovations are not uncommon from this pocket. Bommagani Mallesh is one such brilliant person from this sector, who has made several innovations. He hails from a small village Arjimpet of Nalgonda district, Telangana. His father, Mr.Venkaiah and his mother Mrs.Lakshmi were agricultural

labourers. They struggled hard to give primary education to their son Mallesh, a third child after two daughters. Mallesh had his basic schooling in his village and pursued till tenth standard in another village that was 7-8 kilometers away. After completion of his high school in 1999, he started working in a bakery in Warangal town for about six months. Later, he moved to Mumbai owing to financial crisis in the family. He worked hard to save some money for the marriages of his sisters. After one more year, he returned back to his village with sufficient savings which he also wanted to invest in his activities for experimentation. He started working in electronic repairing workshop in Mothkur of Nalgonda district. Using his experience he started venturing into designing. Slowly, Mallesh designed a number of electric and electronic gadgets. His innovations being simple in practice were oriented to answer some of problems faced by local youth. One such device is a remote control system for switching on lights and fans. His tinkering with electric systems inspired him to design a remote control for his bed ridden mother to switch on lights and fan at dusk when she was alone at home. This automatic gadget in his mother’s hand was the most priceless object she has ever had in her life.

*The journey towards innovations*

Mallesh’s intuitive mind brought in number of simple devices and machinery in his basket of innovations. Figure 12 indicates some of the electronic devices developed by Mallesh during the last ten years .



**Figure 12. Innovator Mallesh and his set of innovations**

Starting at an age of 16, Mallesh built his own work station in a small hut in 2001. He made more than 1000 pieces of his first tube light kit without starter and choke know how for the benefit of his community. After this, he never looked back in his journey of serial innovations. Since all his innovations are uncomplicated, user friendly and affordable appliances, they were always on demand from the local people. This helped Mallesh to eke his livelihood, as all his innovations were ‘market pull’ devices. He never made a high end business of his appliances as he believed that he has to serve people in his village. However, he never compromised on quality and gathered the raw materials for his devices from the city of Hyderabad which was as far as 100 kilometres from his place.

*Green technologies from a rural innovator*

In 2005, Mallesh underwent training on solar technology for three months from Swami Ramananda Thirtha Rural Institute<sup>80</sup>, Pochampally, Telangana.

Courtesy: Palle Srujana



Mallesh demonstrating his solar sprayer in the fields

This training changed the orientation of Mallesh's innovations. He designed many devices based on the solar technology. One of such innovative ideas was a solar three wheeler for the benefit of a handicapped person in his village. The experience of harnessing solar energy gave the opportunity to add green dimensions for existing technologies. Since, Mallesh was repairing the Taiwan sprayers used by farmers; he had an opportunity to work on modifying the machines. A solar agricultural power sprayer was designed which was cheaper and an affordable green solution that reduces use of conventional fuel created. Box 7 gives the unique features of the solar sprayer designed by Mallesh. But, he could not get enough finance to further his innovation.

### **Box 7. Solar agricultural power sprayer**

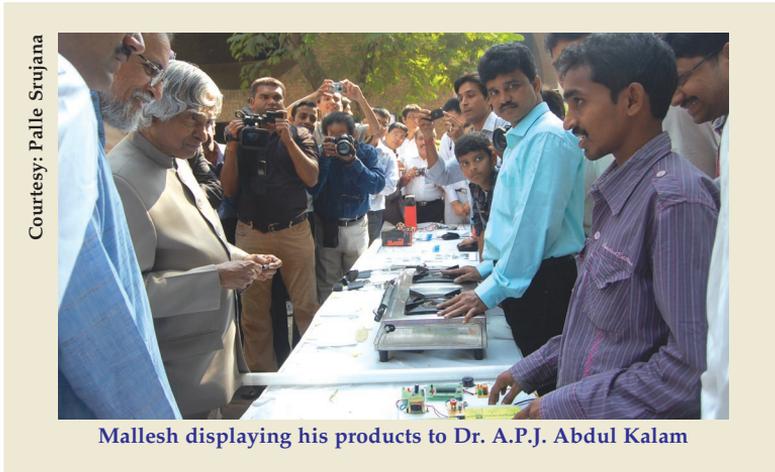
- *Works for 8 hours*
- *Additional accessories like solar light, mobile charging kit*
- *Used for any type of crops*
- *Sprays an acre per hour*
- *No fuel is required*
- *Runs with solar energy*
- *Noise and pollution free*

In 2009 he got connected to Palle Srujana through another eminent innovator Ch.Mallesham from the same district. He got a loan of Rs.8 lakhs from NABARD through the support of Palle Srujana. Till this point, Mallesh never had any support or mentoring and was always self-dependent. With this financial back up, Mallesh made better marketable versions of the sprayer. He initiated the assembly of the sprayers with five workers and made few pieces which had a good demand in the neighboring places. This encouraged him to go ahead with his innovation in different places as well as in other states like Maharashtra and Karnataka. Presently, he has made about 2000 pieces at a price of Rs. 5500/- which is much cheaper than some of the available sprayers in the market. Through his innovation. Mallesh got an opportunity to enter into next level of business and earn his livelihood with sale of this product beyond his village.

Apart from this ready- to- use product, Mallesh has also developed several other technologies like solar street lights and others (Figure 12) which were designed as improvements over the basic versions. The primary aim was to get an enhanced functional advantage of product to suit the local ecosystem and make it affordable.

### *Recognition to Mallesh*

Mallesh has relentlessly worked for his livelihood using his technical skills in mechanical and electrical works. He realized that his innovations provided ease to his members of his community in and around his neighborhood villages. His innovations came to better focus after he came in contact with the voluntary organization, Palle Srujana. A small company, Creative Minds, gave the opportunity to Mallesh for marketing his products with an opportunity for a stable income for his livelihood. Through the encouragement and support from this platform, he has participated in display shows for his innovations at *Rythu Sadassu* (Farmers Meet), NIF stalls, “Technozion” conference-2012 at NIT, Warangal and many more exhibitions.



His products were displayed at “Exhibition of Innovations” held at Rashtrapati Bhavan during March 2012 and in Indian International Trade Fair (IITF)<sup>81</sup>, New Delhi during 2012 and 2013.

Recently in 2013, he received the National Award for his electric remote innovation at Rashtrapathi Bhavan, New Delhi in March 2013. He also received “*Raitu Nestam*” Award for most creative innovator in Andhra Pradesh in September 2013.



### *The next steps*

Mallesh has been working for more than a decade now with various electric, electronic and mechanical devices that are affordable and user friendly for any common man. His perception to serve his fellows in nearby communities has brought his intellectual competence to a centre stage and built the innovator in him. His simple appliances do not need big efforts for up scaling and mostly are ready to use products in his vicinity. But, the fact remains is the recognition of such innovations and innovators who have the incredible skills in rural India, still lie at the bottom of the pyramid. Intervention of Palle Srujana and Creative Minds has brought this recognition for him, but the lack of suitable institutionalized channels for up scaling or for manufacturing of such products is a major challenge for such rural innovators. Their poor financial state and lack of knowledge for exploring funding options leave little space for their iterative thought process to go forward. In this case also, the innovator has still not been able to reach any public sector organizations or any major private company to take his innovations further. Though mentors are available, an invisible gap still exists between a formal system and the informal system for support. In case of Mallesh, his 'ready for sale' innovative products have a big challenge and need more up scaling to reach the cities through technical interventions and a lending hand. Entrepreneurs and inventors have to come forward to take up such simple and useful eco-friendly devices meant for the middle and lower segments of the society in our country. This can promote grassroots innovators as well as provide affordable solutions to the society at large.



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## Cotton Quick Picker



*Innovation* : **Solar cotton harvester**

*Innovator* : **Mullapudi Satyanarayana**

India has traditionally been involved in cotton production from centuries. This crop has been an important commodity in Indian Agriculture system and has been part of many events throughout India's history. Often called as 'White Gold', it is major cash crop in the country and meets nearly 65 per cent of the raw material requirements of the textile industry in the country. The recent advances in technology like the advent of Bt cotton with higher yields and global developments in trade liberalization

policies have made this crop an attractive economic proposition for most growers and farmers. Cotton production over the last ten years has recorded a more than 100 percent increase in the country, from about 158 bales in 1997-98 to 322 bales in 2008-09. Interestingly, the land under cotton production has registered only a 4 per cent increase in yields<sup>82</sup>.

The enhanced yields also necessitate better techniques for harvesting. As of now, mechanization of harvesting practices in India is still at infancy in technological advancements and their adoption. If the increase in yields have to be of better value, it is imperative that country must keep in pace with better methods and devices for harvesting operations. Recent scientific studies have clearly indicated net income of the cotton farmers will increase considerably with the mechanization of cotton harvesting<sup>83</sup>.

Courtesy: Wikipedia



Manual plucking of cotton in India

Mechanization can also provide solution to the lack of precision encountered during manual plucking operations. The chances that pieces of stem and petiole remains are present in the harvested cotton boll and fiber are quite high. The presence of such contaminants often cause difficulties in separation processes and fetch lower price for that type of contaminated produce. Studies indicate that nearly 5-10% cotton is estimated to be left out on the plant during manual operations. Added to this problem of incomplete picking, is the shortage of trained workers at the appropriate times of harvesting schedules. These are inherent problems faced by most farmers even after being able to produce a good crop and the need for simple devices has been voiced by several engaged in this work.

This is the story of a farmer from Telangana who tried to design a mechanical machine for cotton harvest operators. His efforts were primarily directed to overcome some of the problems experienced by him during harvesting of his crop.

### *The story of a cotton harvester*

Mullapudi Satyanarayana, a farmer by profession is a school dropout residing in Janampeta village of Khammam district of Telangana. He owns about 10 acres of land and has been growing tobacco, banana, cotton, chillies and paddy for past ten years. Since few years, he has been finding

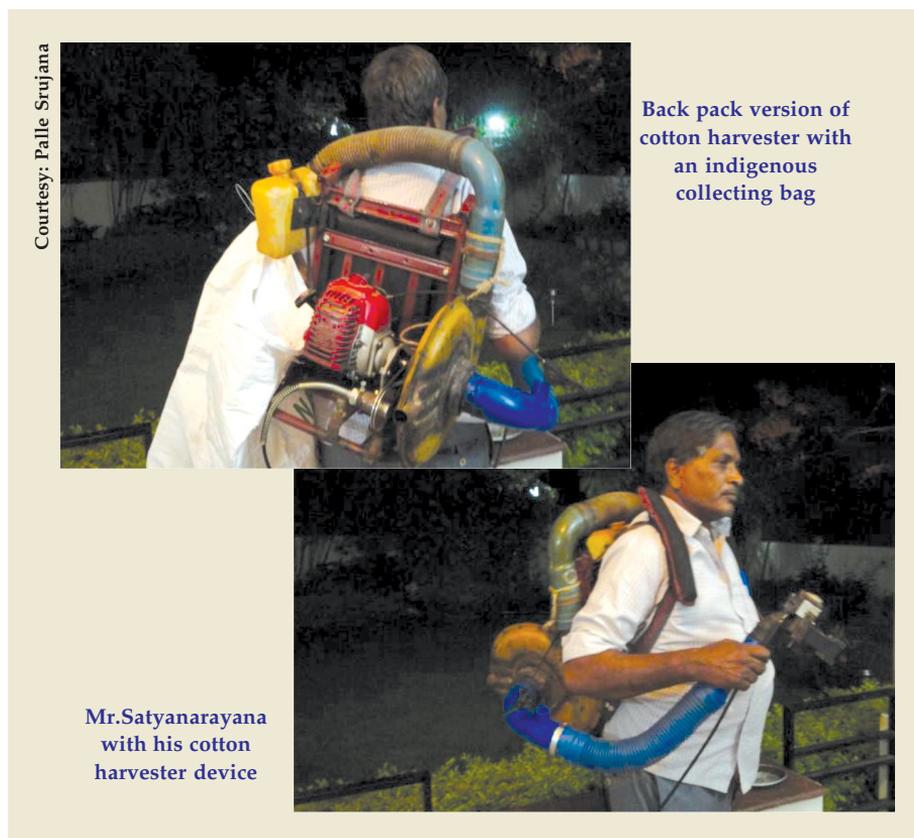
cotton cultivation to be less lucrative. This is despite the fact that his fields form a part of an important area of cotton growing of his state and a demand for the produce by buyers. He opines that the increasing high input costs especially on skilled manpower and an exclusive demand for quality cotton by the export sector and the large textile groups in the country makes cotton growing and harvesting economically challenging for small farmers like him. While he acknowledges the availability of number of superior varieties and hybrid seed in the market and the availability of high technology based crop production practices, he finds that getting skilled manpower for efficient picking(s) during the crop growth stages is very difficult in his village. He felt that developing efficient and low cost methods of mechanized devices could be one of the solutions for farmers in these circumstances.

In fact, it is this felt gap that instigated him to try few methods using devices he had tried to develop in his spare time. Mullapudi Satyanarayana was always interested in experimenting with mechanical and electrical gadgets. Being an eighth class school drop out, with not much of formal education did not deter him from trying to make simple constructs of different implements which may be useful to him during farming activities in his field. During these trials, he started to try his method of cotton picker device. He has been working since 2000 on improvising cotton pesticide spraying machine with an option to be used as a harvester. The improvement was mainly designed to deal the shortage of skilled manpower for cotton pickings and also for bringing in speedy efficacy in harvesting operations of quality, uncontaminated cotton.

### *Supporting entities*

After reading an article in local newspaper on another innovation supported by National Innovation Foundation (NIF), he was inspired and contacted them. He requested for their support to his efforts on the cotton harvester device that he was making and needed advice to overcome the blocks he was encountering. The National Innovation Foundation located in Ahmedabad, Gujarat introduced him to one of its associated voluntary agency, Palle Srujana and its members in Andhra Pradesh. This was in 2008. With the support and guidance from this team, he then developed

nearly eight versions to fine tune the model he had started few years back. The emphasis was to make it more user friendly, lighter in weight, ensure lesser fuel consumption and enhance higher rate of clean collection. After four years of focused work, it was in 2012, that he could develop a prototype of an efficient Cotton harvester. This was devised in a manner that the farmers could operate themselves. It operated with a diesel engine. But the rising costs of diesel and other fuels made him to look for alternatives and is currently engaged in developing an ecofriendly cotton harvester operated with a battery powered by a solar panel. The NIF has provided financial support for developing the solar powered battery operated version. The advantages of the mechanized cotton harvester of Satyanarayana over the traditional manual process are enumerated in Figure 13.



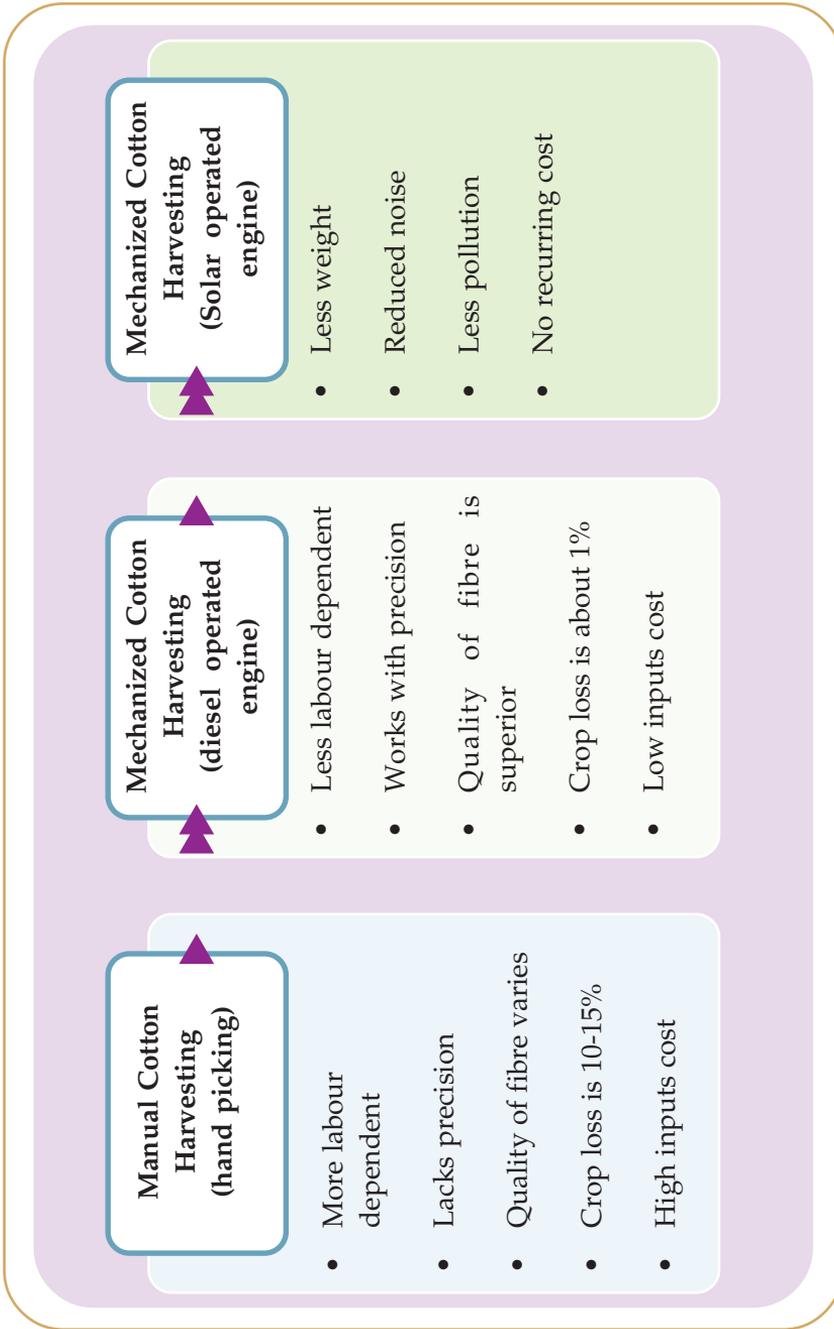


Figure 13. Advantages of Mr. Satyanarayana's cotton harvester model over manual picking practices in his village

### *The cotton harvester model of Mr. Satyanarayana*

Presently, this model is a backpack type of cotton harvester and weighs about 15 kilograms. The machine comprises of a vacuum sucker attached to a pipe for sucking in the cotton fibre and transferring it into bag carried on the shoulder of the operator. The machine runs on a motor with one litre of diesel and a single person can operate the device for 3 hours. The average rate of collection is 100 kilograms per day. The operator using this device works to be able to clutch the targeted boll with a operating pipe and allow the fibre to be sucked into the pipe in the presence of high velocity of compressed air coming from the machine. The harvested cotton fibre from the bolls is drawn into the bag. It is estimated that less than 1% cotton remains on the crop and thus using this machine, an operator can efficiently harvest most of his produce. The harvested cotton fiber is also less contaminated as there is little scope for pieces of stem or fruit to be picked by this operation. This ensures a better grade of harvested cotton fetching a better price from buyers. Concurrently, the whole operation is user friendly with more efficacy ensuring greater amounts of harvest by a single operator.

### *Greening of the cotton harvester machine*

Mr. Satyanarayana has now started to modify his innovation by making it a more ecofriendly device through the addition of a solar panel on it. A solar panel on the back of the operator will reduce the cost of engine and also reduces overall weight of the machine in contrast to diesel driven model where the tank for diesel does increase overall machine weight. His thinking is that with no requirement of fuel, there would be less or no pollution and this could be a perfect green technology in the segment of mechanized cotton harvesting devices. He aims to enhance the efficiency of operation with a better rate of collection to about one quintal per day. The prototype is under validation and is likely to be available in the market by the end of 2014. Through the suggestions of his mentors, Mr. Satyanarayana has also applied for a patent on his novel invention.

### *The drive to do something for fellow beings*

However, through this journey of innovation, Mr. Satyanarayana had to spend large amount of his hard earned savings on his trials. While the

final model is likely to be priced at about Rs. 25,000/-, the difficulties including the mental stress, he went through in developing this model cannot be valued. He calculates that he has lost a financial revenue of Rs.4-5 lakhs from his mainwork of farming and leasing his lands to workers. He has been leasing his farm since last four years to have time and focus on the development of the machine. Being not trained or formally educated, his singular efforts in the entire experimentation process are perhaps greater and challenging than confronted by a team of trained high class engineers. It is again mentioned that at one point of time, Mr. Satyanarayana opted not to grow cotton because of the very difficulties he faced especially during the multiple harvesting events. The different versions he developed as part of iterative process were presented at various exhibitions whenever he could get opportunity to participate, through his contacts or through the mentors. These participations were important opportunities to get feedback from the farmers and users that helped him to improvise his model. The struggle led to nearly eight versions which would be discouraging for anyone. But, he believes that it is his fervor and passion to work out a mechanized device for other cotton-growing farmers in his village which helped him to go on. Such tenacity in an individual can essentially be because of his *“samvedana which means the feeling for others’ pain when standing in their shoes’*. At the end of so many years of hard work, it has led to development of a simple but worthy innovation which can help in removal of the drudgery of poor cotton farmers and to have more income.

### *A need for understanding*

This is just not the first instance of rural innovator working on such devices. There are reports of several more innovators from other regions of rural India who have tried to build similar mechanized tools and devices for this crop<sup>84</sup>. In all these cases, it is this spark of ideas that needs to be ignited further. Making of such devices and machines needs timely financial support and technical backstopping. This would save the time and also hard earned money coming from the livelihoods of illiterate or semi-literate farmers. Handholding of such novel ideas coming from their felt needs to improve their own systems seeks recognition and a sensitised approach to encourage them to continue is essentially to be in place.

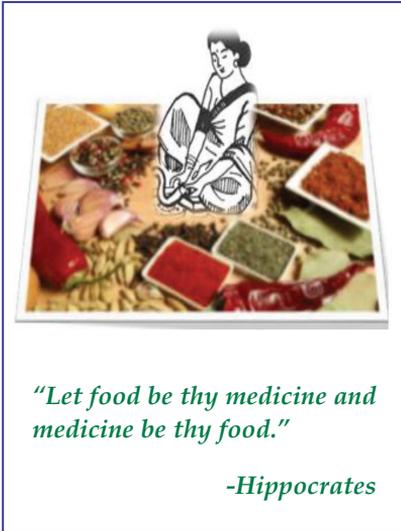
The contribution of Mr. M. Satyanarayana is highly significant to many farmers in his region. At this juncture, he needs a push so that the device reaches more people and a system based approach to help him in making more models which can also bring some income to him and his family. The innovation and the concerted efforts of “*a common man to do uncommon things*” needs to be recognized and addressed with proper mentoring or handholding at an individual and also at organizational level for the benefit of the entire farming community.



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## Reviving Traditional Food



*Innovation* : **Homemade nutrition supplements**

*Innovator* : **Tokala Sridevi**

Right after independence of the country, the policy makers have given priority to improve food security and nutritional status of the population. The Five-Year Plans enunciated suitable policies, laid down multi-pronged strategies, outlined multi-sectoral programmes, laid the goals to be achieved in a specified time frame, and built institutional mechanisms to implement the interventions.

It is true that due to these interventions, famines and severe food insecurity are all past occurrences. However, technological advances and mechanization of most activities have impacted the society at large. Increasing prevalence of obesity and associated non-communicable diseases often catalyzed by reduced physical activity and unaltered dietary intake have led to the new challenges of malnutrition and over nutrition and associated health problems. These have led to more emphasis of enhancing nutritive quality of food. Today, the food-health sector is emerging as new sunshine sector in agribusiness activities.

This anecdote is about a rural home maker whose experiences have now helped her to embark on new role for herself in educating her clients about traditional and nutritious food for healthy living. Mrs. T.Sridevi, wife of Chandramouli Sarma, an astrologer from orthodox brahmin family of Siddipet of Medak district, Telangana state started her venture with a mission to create more awareness about age old practices on creating nutritive food mixes. She came up with the idea of providing nutritional supplement powders based on traditional knowledge she had acquired from her mother.

Sridevi is only tenth class school pass out but her zeal and hard work along with accurate observation skills have helped her to be a successful entrepreneur catering to nutritional food products. She started her quest by trying to understand the needs and the existing gaps in knowledge on nutritional deficiencies in various sectors of people in her vicinity. Then she focused on disabled and challenged sections in her village and made tasty food powders with simple ingredients along with an enhanced level in nutritive values. Till date, she has made about eighteen nutritive supplements for different age groups.

### *Traditional nutrition for different categories of people*

Several nutritional and wholesome diet supplements for the nourishment of children, pregnant women, aged, patients, disabled people and sportsmen have been designed by Mrs.Sridevi. Though a home maker, and hailing from a conservative family, she has been successful to break some of the traditional barriers and come out to venture as an entrepreneur. The support of her family has been encouraging for her venture “Samruddhi Foods” under the banner of “Sri Dutta Nutritions”.

It all started in May 2004, when Sridevi’s husband was away for a month and her idle mind suddenly got a flash of thought for making some nutritious food. She recollected her childhood when her mother made ‘*Sattipindi*’ which is a mixture of powdered pearl millets and bengal gram that was a protein rich snack. She decided to use her traditional knowledge for designing products with natural, affordable and locally available cereals, pulses, oilseeds and such other edibles. Based on the age old practices, Sridevi began to make powders from finger millets, sorghum, black gram, green gram, jaggery and five different kinds of dry fruits. Initially, she had put up these products at a local super market for sale. With the good response from the buyers, she was encouraged. This gave her motivation to expand her innovative products in small sachets of the powders labeled with the ingredients and marked it for feedback from her clients. She started to put these products with fruit vendors and petty shops in Nizamabad district as samples and at times paid the vendors for delivering the products to their customers.

Courtesy: Innovator



A display kiosk of 'Sri Dutta Nutritions'

Sridevi was enthused with the responses she got after the distribution of her samples. She improved her products with the suggestions received through the feedback. She used her ideas in conjunction with the concepts of balanced diet and nutritional supplements. She gathered information out of her curiosity to learn more about the compositions, nutritional values, combinations of foods and supplements necessary for various categories of people from publications of National Institute of Nutrition (NIN)<sup>85</sup>. The urge to learn and extend her knowledge to rural society made way for conceptualizing training programmes about health and nutrition. Her zeal to work for the rural and disabled people led to taking up training programs in National Institute of Nutrition. She also acquired hands on training for product designing of the food supplements made with traditional knowledge. She planned the products by categorizing people on basis of age, stages of pregnancy, lactating mothers, patients, people with disabilities and sports professionals. She distributed her products freely to the physically and mentally challenged people whenever she could afford during the awareness campaigns and training programmes.

### Establishment of enterprise

Sridevi put up her best efforts to communicate her philosophy of need for variant nutritional increments to different categories of people. She found it tough to take her mission forward at an individual level. She realized the need of an organizational approach when she was advised about licensing and validity of her products at a meeting. This prompted her to launch the campaign with licensed food products. Under the auspices of a registered firm “Sri Datta Nutritions” in 2005, she started a small scale industry at her house with various initiatives for promoting rural health. She acquired certification of quality standards for ‘Sri Datta Nutritions’ in April 2007. A number of new initiatives have been taken up by this organization since then.

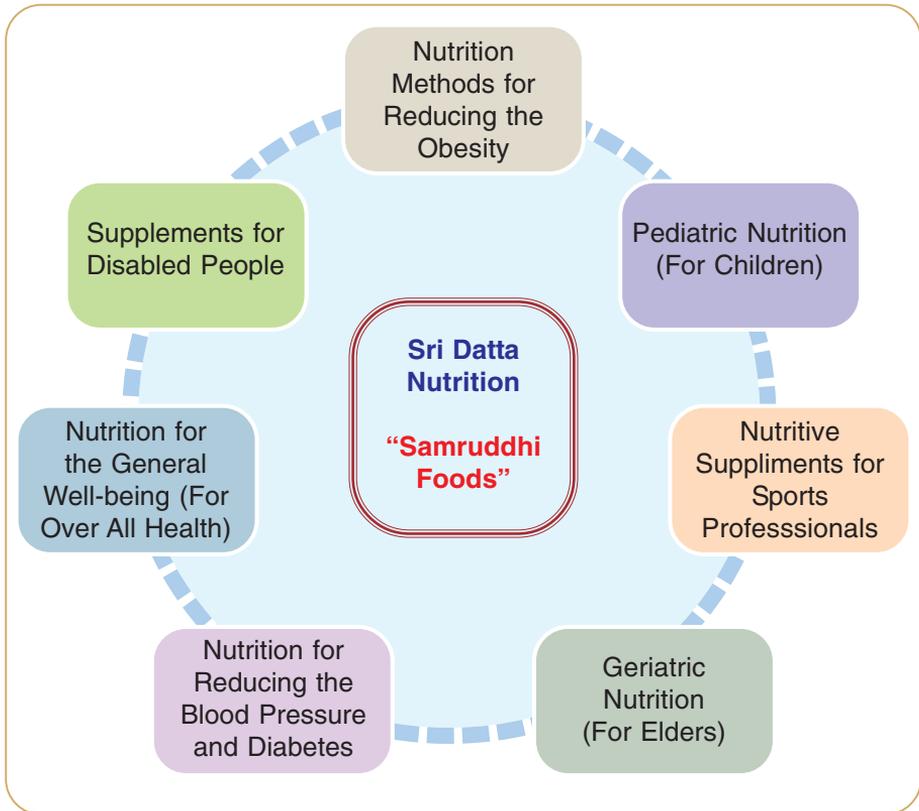


Figure 14. Innovative product list from “Sri Datta Nutrition”

Sridevi got good response for her innovative products as energy boosters and therapeutic supplements. They were strategically presented for dissemination of traditional foods with the pamphlets for feedback. The enterprise grew from a small entity to a large unit wherein the machines were taken on lease for catering to the orders from various educational institutions, associations for disabled and people from other organizations. The demand for products extended employability option for few people. About eight members were engaged for the work including two challenged persons. For the past eight years, she along with her team has prepared about eighteen such products useful for wide range of people that include infant foods, special supplements for disabled persons, energy giving foods for youth involved in serious work outs, nutritional products for age wise categorized groups, sugar free items exclusively for diabetic individuals and products for hypertension patients. They were nutritional supplements prepared in the form of *laddus*, or as ready to use food grade mixtures and water based instant powders. The nutritional packages for malnourished children, people with diabetes and blood pressure were found to be very effective and acknowledging in supplementing their vital requirements. In order to communicate effectively with the elite of the society, she educated herself by undergoing a number of training programs and acquired knowledge with requisite skills on designing the products. The

Courtesy: Innovator



Sridevi at one of her training sessions

innovative ideology and the assimilated knowledge through various programs made her nutritional food supplements unique with a blend of traditional knowledge and validated with a scientific approach. Her efforts since last ten years have made her as a recognized nutritional specialist and a successful entrepreneur. Sridevi got appreciation from various public, private and non-governmental organizations in Andhra Pradesh, Telangana and neighbouring states for her services and products that possess high nutritional values.

### *The quest*

Sridevi's quest was to disseminate the traditional knowledge based innovations through capacity building at a rural front. She never left any opportunity on her way to achieve her goal of educating the rural and urban people about the crucial and essential values of the food, health and nutrition. The undeterred approach of Sridevi to realize her mission laid a stepping stone for her services to the rural and urban people through an NGO (Regd. Society) "Sri Datta Society for Nutrition". Under the aegis of this NGO, she has organized educative programmes, demonstrations and served the relishing nutritious products to emphasize the values of nourishment. "Sri Datta Nutrition" makes special efforts in ensuring the

Courtesy: Innovator



Late.Y.S.Rajashekar Reddy, Chief Minister of AP, at an exhibition stall of Sri Datta Nutrition during 2009.

adequate health supplements for rural people with proper awareness camps, brochures in Telugu language for easy understanding and with user-friendly audiovisual aids for an effective outreach to various communities. Its focus is on betterment of rural livelihood with healthy sustenance through affordable nutritional initiatives. The packages especially to the farmers and their families ensure awareness of nutritive values and affordability after a day's hard work in the fields. Sri Datta Nutrition also provides necessary training inputs for the target groups in rural areas on herbal nutrition and vital nourishment in food grains. Sridevi tried to address the problem of malnourishment through various awareness campaigns by putting up kiosks and delivering lectures at various gatherings at a variety of platforms and exhibitions organized by many organizations.

Thus, Sridevi made efforts in connecting the people in our society to the forgotten traditional nutrition rich diet with herbal values through demonstrations and exhibitions. Her learning and experiences at various training programmes gave the knowledge and skills to move ahead in pursuing her vision. She imparted her knowledge through counseling on health, nutrition and life style. Her approach included the nuances of exercising for pregnant women, significance of colostrums for babies, precautions for prevention of urino-genital infections with nutritious food and so on.

### *Financial and organizational support*

Sridevi's participation in various programmes brought encouragement and financial aid for the products. With an award of Rs 5000/- from Youth Services in her town, she could cater to few organizations dealing with persons with disabilities, in Nizamabad. These initial attempts paved way for good marketing access. At the same time, she understood the need to create awareness for training and providing low priced nutritional supplements to farmers and other rural people. For accomplishing her goal, a loan of Rs. 40,000/- under Prime Minister Rozgar Yojana (P.M.R.Y)<sup>86</sup> was applied which was granted. With this capital, she started her business. She also improved her networking skills and built professional linkages with several organizations which enabled her to establish as an

Courtesy: Innovator



Sridevi felicitated by members at FAPCCI with an appreciation certificate in "Big Business Mela"-2008

entrepreneur. Today, her products lines are most sought in the market. However, she continues her charitable initiatives to distribute her products to physically challenged people. About 1500 people in a camp for the disabled people in July 2012 and around 800 women on Women's day in March 2013 were recipients of her products free of cost. This illustrates her commitment to society and social consciousness. Balancing with both the goals of sustenance of livelihood along with free distribution of products as well as promotion of health and nutrition was a tough task to simple rural based homemaker. Yet, with her hard work and ability to continuously learn, Sridevi proved herself. Her association with organizations like Seva Foundation<sup>87</sup>, Federation of Andhra Pradesh Chambers of Commerce and Industry (FAPCCI)<sup>88</sup> and NABARD through Palle Srujana were fruitful in cherishing her goal.

In the journey to realize the goal of health and nutrition for unprivileged, Sridevi never stopped but twined in the support from number of organizations and people. She employed people for working on leased pulverization and such other machinery for bulk orders with an intention for employment generation to rural women. Centre for Bharatiya Marketing Development (CBMD)<sup>89</sup> gave the first bulk order. Many

organizations supported her all through in show casing and delivering her products. With the guidance of qualified dieticians and support of scientists, Sridevi has learnt the intricacies and techniques in preparing dietary supplements. Their encouragement paved way for distribution of her products at various programmes. It is a rare and laudable achievement for a rural woman, delivering lectures and facilitating distribution of products to the participants at various events organized by her mentors and supporting organizations.

Sridevi was connected to Palle Srujana by a rural innovator, Mr. Narasimha Chary from the same district. This connectivity broadened the scope for better understanding of her concepts and acquired a goal driven direction with a streamlined approach. Moreover, she gained number of social linkages for extending her products to wide cross section of people. All her efforts in communicating to various groups of people were well supported by many organizations like National Institute of Rural Development (NIRD), Indian Medical Association (IMA), District Rural Development Association (DRDA), Nizam Deccan Sugars Ltd, Indian Dental Association (IDA), National Institute of Nutrition (NIN), Federation of Andhra Pradesh Chambers of Commerce and Industry (FAPCII), Food Corporation of India (FCI), Bharat Sanchar Nigam Ltd (BSNL), educational institutions, Palle Srujana, Sneha society for rural construction and many more. The visibility of her products through the platforms of several public, private, voluntary, non-governmental organizations, academia and industrial sectors indicates the strength of her innovative products. Sridevi's strength of positive attitude, innovative thought process, the innate traditional values, charismatic communication and zeal to do social service are rare of its kind in a rural woman. Supporting such ignited rural women in tapping the unique innovative ideas and work out viable models of business can impact the rural societies in the country. A consortia of various public, private, NGOs and voluntary organizations in a combined strategy could work out on various modalities to use such rural traditional nutritional wealth properly for a larger social cause of eradication of malnutrition.

### *Awards and appreciations*

Sridevi's interest to work for the poor and disabled brought her laurels from all corners and due encouragement was given with awards, citations and certificates of appreciation; some of which are listed below :

- 'Best Social Worker (Individual)' award for 2005-06 in January 2007 by Department of Youth services, Government of Andhra Pradesh
- A merit certificate by India Red Cross Society (APSACS), NYK and IMA, Nizamabad in January 2009
- 'Progressive Industrialist' award with a citation of Rs.5000 in November 2009
- Many appreciation certificates from Sneha Society for Rural Construction (SNESOR), DRDA-IKP Nizamabad, SCR-Nizamabad Railway station, Nizam Deccan Sugars Ltd,
- 'Sangha Samskarta' title from ATMA-2012
- Ugadi Puraskar in recognition for social service in 2013 with a citation of Rs.8000 from Andhra Pradesh State Government.

### *A look back*

Sridevi's effort to sustain her livelihood with a noble cause to spread the nuances of nutritional supplements to various rural as well as urban sections evinces the need for a proper mentoring, hand holding and support which would not been possible for any single organization to take forward owing to constraints and entangled issues related to social, health, financial and business propositions in the present day. Sridevi's struggle to disseminate the acquired knowledge as nutritive supplements with employability opportunity for few people including disabled persons showcases dynamics of transformation of traditional knowledge to an enterprising venture at a village level. Encouragement to such spirited individuals from rural society would enhance the rural entrepreneurship that caters to the economic development and community welfare especially in the rural hubs. Awareness creation on skill development programs and funding resources at grassroots level saves the drain of funds with a scope

for proper utilization of public wealth. This support given by various organizations in such synchrony would promote the motto of rural development aimed by the public sector organizations to improve the scope for poverty alleviation and sustainable livelihood system at grassroots levels.

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## The Way Forward



This book has been written with a primary objective to bring to light the grassroots innovation system emerging across the country. The exciting journey of innovation through these 13 realtime stories clearly brings the existence of a vibrant platform silently emerging across the country parallel to the formal system of innovations in academic and other R&D institutions. These 13 cases are not ‘mere stories’ but represent the ‘labour of love’<sup>90</sup> driven by hard work, passion and commitment. All these cases relate to the agricultural rural sector and revolve around support rendered by public sector organizations like NIF and institutions of the ICAR;

voluntary platforms of Honey Bee and Palle Srujana. It is *emphasized* here that several other organizations across the country are also providing similar support to many more grassroots innovators in a variety of ways. This compilation of the stories of 13 selected grassroots innovators is a *small* glimpse of this larger picture.

Using a conceptualized framework developed through an iterative approach, 13 cases were shortlisted and selected for detailed work to capture the entire ecosystem evolving in the innovation. The underlying ethos of this work was primarily to understand the nuances of a system which has silently emerged across the country. The common thread emanating from all these stories was the individual drive of the innovator to look for a solution for a problem faced by him or his community. Most often, these problems at the local level cannot be specifically addressed by similar innovations from the formal R &D system. There was a ‘felt need’ for more appropriate solutions by the end users engaged in various activities in the agricultural PCS or those in the different occupations in

the rural locale. Almost all innovations in this study are either models or prototypes / products derived from existing technologies but fundamentally provide solutions for “*in situ*” problems. These are easily adaptable by the users and made with available raw materials, thus ensuring ecological sustainability. Most of these innovations have emerged due to the need to reduce the drudgery faced at the local level. For instance, seven of the thirteen innovations, focus on mechanization of existing devices and practices, while the remaining are improved products available for consumers (Figure 15). Few of these like Santosh’s carrot seed production system; Mallesh’s solar sprayer; Mallesham’s *Asu* machine; Sridevi’s offer of traditional nutritional supplements; Manusukhbhai’s basket of clay potteries; Rathore’s inspirational cycle irrigation pump and Nagabhushanam’s baking oven have been able to enter the markets beyond their villages. This indeed is ‘*not a small feat*’ from them considering the several challenges faced during the process of innovation.

All of these grassroots innovators exhibited a pragmatic approach, good value system and a high scientific temper. Some grassroots innovators have ideas and concepts but could not put to design as seen in case of Guravaiah. They had the freedom to think of out-of-the-box solutions. While many of them were successful in bringing their ideas to a proof of concept stage with the support of individuals or some voluntary organizations, some like Subhani and Satyanarayana had the insight to design the working prototypes and commercialize them at their level independently to a certain extent.

The start of the innovation process has been mostly in the local perspective to overcome the immediate problems. This is in fact observed in case of Narsimha, where he tried to solve the hyacinth problem faced by his community. The innovations of Mallesh, Satyanarayana, Vikram and Mansukhbhai are peer group centric efforts. Their innovations have also met the affordability and given an ease of working, thus making them adaptable for any user with no hazardous impacts on the environment.

Conservation of rich biodiversity in India, misappropriate use of known knowledge and biopiracy are yet other major problems faced in innovations that are based on use of biological resources and traditional knowledge or

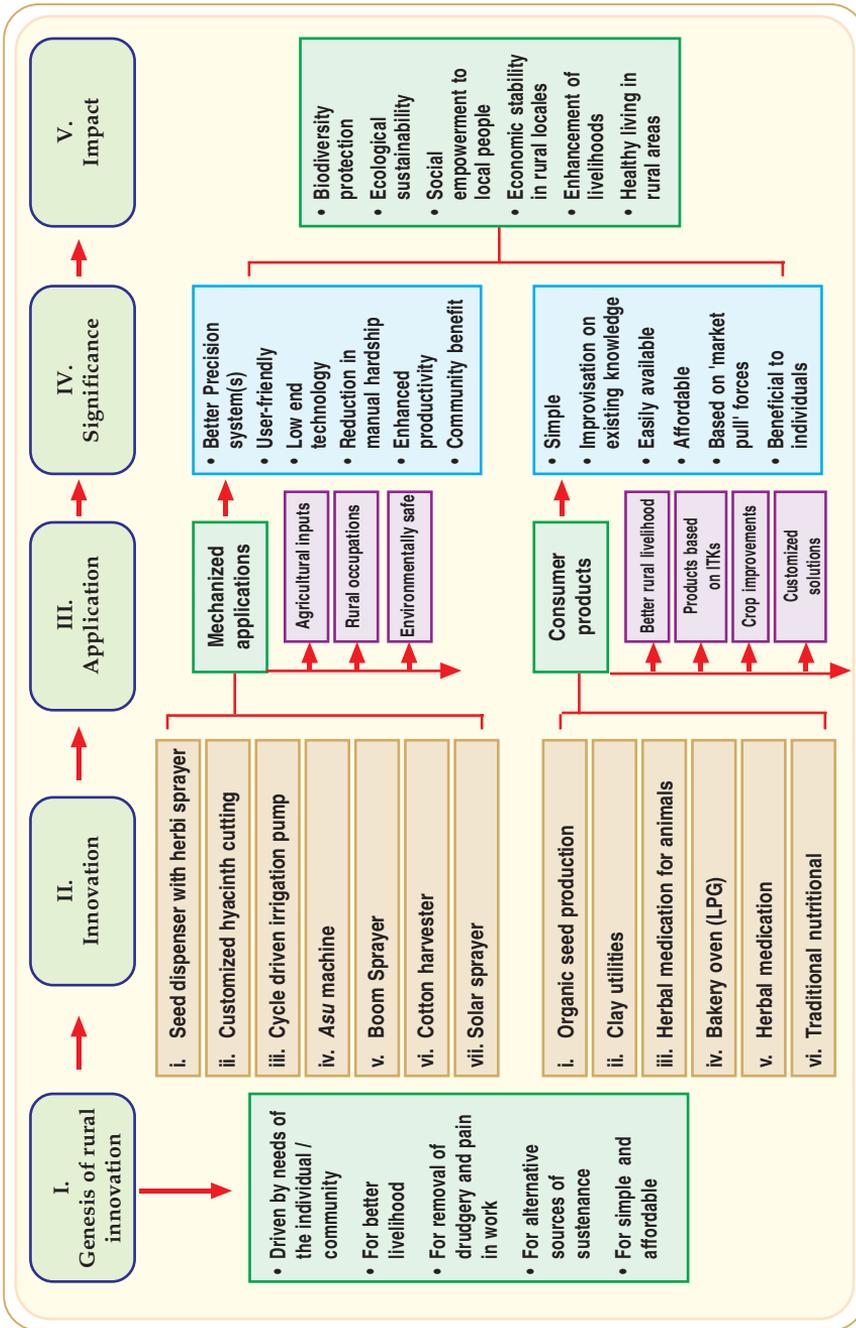


Figure 15. Flow chart depicting the type of innovations and their impacts on rural livelihoods

practices. The information and detailed knowledge of the existing resource base and practices in the local ecosystem is the strength of a grassroots innovation system. These knowledge holders are proven guides for practitioners in alternate medicine and for many researchers of the formal system. They help in identification, scouting and also in conservation of native biological resources. The efforts of innovators like Chandrashekar and Rajanna who have rich knowledge of the medicinal value of flora and fauna in forests need to be recognized and fostered. Acknowledging such sources of wealth of knowledge and using their experiences for development of better products and processes will enrich the ongoing efforts in the national health sector.

Other innovators like Malleshham have created history with a unique *Asu* machine for weaving the traditional Pochampally art that any qualified textile engineer would probably not get an opportunity to work on a technical intervention. The 'felt pain' in the traditional practice of *Asu* process and the zeal to explore for a solution drove him to an innovation which now has far reaching socio-economic impacts on the local community. A new business model has emerged through this innovation which is changing the lives of several families engaged in this traditional occupation. The efforts of Santosh to nurture seed production through organic farming practices, the purpose of Sridevi's extension of food supplements to the needy and the intention of Nagabhusham's gas oven for providing self-employment to rural people especially women are models of sustainable grassroots innovations with a prospective business potential.

Each case is different; yet the underlying reality is that these are grassroots innovations with similar attributes as discussed earlier in introduction. Coming up from rural ecosystem, each grassroots innovation is directed towards the alleviation of rural problems and embodies the feeling of concern towards fellow beings. But given an enabling platform, these innovations can be built into product lines entering the markets and promoting domestic manufacturing sector. In all these cases, there were blocks or times of uncertainty in the innovation process faced by the innovator. These are moments where a support system can play a role through technical guidance, or even through networking with relevant

agency for standardization or building the best practices for up scaling and commercialization, thereon. Lack of finance has been one of the main constraints in all the cases and resulted in delay of the process. Creativity in innovation process needs to be encouraged without any setbacks in the thought process of the innovator. A plea for an institutionalized approach for fostering grassroots innovation emerged in very clear terms through these case studies. In almost all the stories, there have been discrete attempts by several institutions like NABARD, NIF, KVKs and several other public institutions. Often, these support systems were triggered by the voluntary agencies. Policy makers need to dwell on these issues and a framework be established with a more proactive and objective system of timely interventions in place. The experience of young students with GRIs in five of the cases brings up the importance linking GRIs with university education programmes. These can form part of the curriculum and build more awareness in the educational institutions, organizations in public and private sectors and among the scientific elite.

It is true that *“If everyone is moving forward together, then success takes care of itself”* and grassroots innovation system is one system which needs everyone to be part of it. Only then can these simple, affordable and needed innovations can reach the society and bring rural prosperity.



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## End Notes

1. Ramesh Chand, "From slowdown to Fast Track: Indian Agriculture since 1995", Working paper 01/2014, National Centre for Agricultural Economics and Policy Research, ICAR. pp.26.
2. Science Technology Innovation Policy 2013, Ministry of Science and Technology Government of India. pp.22.  
Source: <http://www.dst.gov.in/sti-policy-eng.pdf> (accessed on 05-05-14).
3. Kalpana Sastry R, Tara O K, Grassroots rural innovations and perspectives of technology commercialization, paper in progress.
- 4a. Honeybee Network is a voluntary organization involved in gathering knowledge, understanding rural innovations and traditional knowledge and disseminating the same for sustainable livelihood. With major contribution from the Honeybee Network, NIF has been able to build up a database of more than 1, 60,000 ideas, innovations and traditional knowledge practices (not all unique) from over 545 districts of the country. NIF to filed over 550 patents on behalf of the innovators and outstanding traditional knowledge holders of which thirty five patents have been granted in India and four in USA.  
Source: <http://www.nif.org.in>
- 4b. Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) is a non- governmental organization set up to strengthen the creativity of grassroots inventors, innovators and ecopreneurs engaged in conserving biodiversity and developing eco-friendly solutions to local problems.  
Source: <http://www.sristi.org/cms/>
- 4c. Grassroots Innovation Augmentation Network (GIAN) is an incubator of grassroots innovations and traditional knowledge. GIANS have been setup at Ahmedabad & Jaipur for providing incubation support to grassroots innovators from the regions of West and North India, respectively. In addition, GIAN Cells are present at SSIT, Tumkur, TCE, Madurai in South India, Kashmir University in J&K, Sikkim Manipal Institute of Technology in Sikkim, NIF cell has been setup in Assam at IIT Guwahati.  
Source: <http://www.gian.org/>

5. National Innovation Foundation (NIF)– India is an autonomous institution of Department of Science and Technology, Government of India. It works on Honey Bee Network Philosophy. It provides institutional support to grassroots innovators and traditional knowledge holders from the unorganized sector of the society.  
Source: <http://www.nif.org.in>
6. Sustainable – agriculture & Environment Voluntary Action (SEVA) is an NGO in Madhurai, Tamilnadu. It has been involved in the activities such as documentation and dissemination of indigenous knowledge and grassroots innovations as well as conservation of local livestock breeds in Tamilnadu State. SEVA promotes self help groups with farmers, livestock keepers and grassroots innovators. SEVA has been publishing a local news letter in Tamil called “Num Vali Velanmai” for communicating indigenous knowledge, organic practices, innovations in agriculture, animal husbandry and natural resource management.  
Source: <http://www.sevango.in/>
7. The NGO Prithvi of Maharashtra State has a vision to create a sustainable change in the grassroots. Prithvi’s goal is comprehensive rural empowerment. Its mission is to empower villagers to take responsibility for the evolution of their communities, developing a platform to participate fully in India’s development and the advances of the 21<sup>st</sup> century, while retaining the values of rural life.  
Source: <http://www.prithvi.org.in>
8. Palle Srujana is a voluntary organization works for aiding and promoting creativity at Grassroots level in the State of Andhra Pradesh. It pursues the mission of National Innovation Foundation –India (NIF-India) in the state of Andhra Pradesh as part of nationwide Honeybee network. They scout across the rural parts (knowledge hubs) of Andhra Pradesh for knowledge and innovations. We document the knowledge acquired through scouting with sufficient recognition to the knowledge provider.  
Source: [http://www.Palle\\_Srujana.org/aboutus.html](http://www.Palle_Srujana.org/aboutus.html)
9. Peermade Development Society (PDS)-Kerala Peermade Development Society (PDS) is registered as a non governmental organization. PDS aims at the sustainable development of the tribals, rural poor, marginal farmers, women and children through developing various indigenous, community based and people participatory developmental programmes.  
Source: <http://www.pdspeermade.com/html/about.htm>

10. Innovation club-Orissa facilitates and diffuses the philosophy of Honey Bee. 21 numbers of Inno-clubs (Innovate Orissa Clubs) are working in the state. Each inno-club is a satellite of Ama Akha Pakha and ultimately a micro satellite of Honey Bee.
11. Dr. Anil K. Gupta is a professor in the Centre for Management in Agriculture at Indian Institute of Management, Ahmedabad. He is also the founder of Honey Bee Network and a fellow of the World Academy of Art and Science. Besides, he holds the Executive Vice Chair of the National Innovation Foundation.
12. HoneybeeAP is a virtual and voluntary organization and forms part of big social network of Honeybee in Andhra Pradesh with Coordinators like Brigadier P. Ganesham, J. Durga Prasad and many more. It works for the philosophy of Honeybee network.
13. Brigadier (Retd.) Pogula Ganesham VSM from Medak District of Andhra Pradesh was the Former Director (Production) of Bharat Dynamics Ltd. Presently he is the coordinator of HoneybeeAP, NIF. He is also the Founder President of Palle Srujana. Chief Editor of Palle Srujana a bi – monthly magazine that projects grass roots and rural innovations.
14. Creative Minds was established by Honeybee AP for pursuing of promoting grassroots innovations in the state of Andhra Pradesh, conceived “Creative Minds”. The objective is to provide entrepreneurial support to the grassroots innovations. Its role implies refining the product for market acceptance, carryout engineering, and Provide marketing opportunity and ensures sufficient financial support exists throughout the process of commercialization. Source: <http://pallesrujana.org/creativeminds.html>
15. National Academy of Agricultural Research Management (NAARM) primarily imparts foundation training to the new entrants of the Agricultural Research Service of ICAR. Subsequently, its role expanded to include research, capacity building of senior professionals of national and international NARS. Source: <http://www.naarm.ernet.in>
16. National Institute of Rural Development (NIRD) is a government institute to facilitate the rural development with particular emphasis and focus on the rural poor. It helps the rural development officials and non-officials in improving the knowledge, skills and attitudes through various trainings, workshops and seminars. Source: <http://www.nird.org.in/nirdcitizencharter.aspx>

17. National Bank for Agriculture and Rural Development (NABARD) is set up as an Apex Development Bank with a mandate for facilitating credit flow for promotion and development of agriculture, small-scale industries, cottage and village industries, handicrafts and other rural crafts. It also has the mandate to support all other allied economic activities in rural areas, promote integrated and sustainable rural development and secure prosperity of rural areas. Under this body “Rural Innovation Fund” (RIF) is provided to support innovative, risk friendly, unconventional experiments in farm, non-farm and micro finance sectors that have potential for livelihood opportunities.  
Source: <http://farmer.gov.in/nabard.html>
18. Council for advancement of Peoples Action and Rural Development (CAPART) is an autonomous body registered under the Societies Registration Act 1860, and is functioning under the aegis of the Ministry of Rural Development, Government of India. Today, this agency is a major promoter of rural development in India, assisting over 12,000 voluntary organizations across the country in implementing a wide range of development initiatives.  
Source: <http://www.capart.nic.in/orgn/>
19. National Agricultural Innovation Project (NAIP) was a World Bank funded in India. It contributes to the sustainable transformation of Indian agricultural sector to more of a market orientation to relieve poverty and improve income. The specific aim is to accelerate collaboration among public research organizations, farmers, the private sector and stakeholders in using agricultural innovations.  
Source: <http://www.worldbank.org/projects/P092735/national-agricultural-innovation-project?lang=en>
20. Richard M. Adams, Brian H. Hurd, Stephanie Lenhart, Neil Leary (1998), “Effects of global climate change on agriculture: an interpretative review” Climate Research- Vol. 11: 19–30  
Source: <http://www.int-res.com/articles/cr/11/c011p019> (accessed on 22-11-12)
21. Zero tillage (also known as no-till or direct seeding) is a method of plowing or tilling a field in which the soil is disturbed as little as possible by, essentially, not plowing the field. The crop is planted directly into a seedbed which has not been tilled since the harvest of the previous crop.  
Source: <http://www.gov.ns.ca/agri/agaware/teacher/84-85sustain4.pdf> (Accessed on 7-11-12)

22. Crop rotation is the practice of growing a series of dissimilar types of crops in the same area in sequential seasons or using diverse varieties of crops one after other to gain better benefits.  
Source: <http://www.ssca.ca/agronomics/rotations/index.html>
23. Crops are categorized into 3 types based on the seasons as-Kharif (June to September), Rabi (October to February) and Summer crops (March to May). *Kharif* crops are grown in both irrigated and rain-fed conditions. The season begins from the onset of the south-west monsoon and ends in September.  
Source: <http://agropedia.iitk.ac.in/content/sowing-time-rabi-kharif-crop>
24. Source:<http://www.fao.org/nr/water/aquastat/irrigationmap/ind/andhrapradesh.htm> from the data up to June 2000
25. The innovator named the innovation as 'Herbi sprayer'. According to him the spray of chemicals is for the targeted weeds in the fields. This helps selective herbicides kill specific targets, while leaving the desired crop relatively unharmed. Some of these act by interfering with the growth of the weed and are often synthetic "imitations" of plant hormones.  
Source: <http://en.wikipedia.org/wiki/Herbicide>
26. Nakarikallu is located at 16.3833°N 79.95°E. It has population of about 12,000.
27. An agricultural research centre in Lam village, Guntur District
28. College of Agricultural Engineering, Bapatla, Acharya N.G Ranga Agricultural University Guntur , Andhra Pradesh, established in 1983
29. Presently Dr. T Yellamanda Reddy, Dean of Agriculture at the Acharya N.G. Ranga Agricultural University.
30. Dr. T V Satyanarayana.FIE, Dean. Acharya N.G. Ranga Agriculture. University, Bapatla, Guntur.
31. The seed drill or dispenser allows farmers to sow seeds in well-spaced rows at specific depths at a specific seed dispensing rate; each tube creates a hole of a specific depth, drops in one or more seeds.  
Source: [http://en.wikipedia.org/wiki/Seed\\_drill](http://en.wikipedia.org/wiki/Seed_drill)
32. Coulter is a vertical blade attached to a plow that cuts into the soil.
33. A grass root innovator from Prakasam District of Andhra Pradesh. He was awarded consolation prize by President of India in Fourth Biennial Grassroots Innovation competition for his centrifugal sprayer.

34. Narendra is also a grassroots innovator who has knowledge on mechanics.
35. All three were mechanics from Narsaraopet, Guntur District, Andhra Pradesh, who helped Mr. Guravaiah to further assist in developing the model.
36. Indian Institute of Technology (IIT), Kharagpur students worked as interns for summer internship at NAARM under the guidance of Dr. Kalpana Sastry on this grassroots innovation of "Seed dispenser with herbi sprayer" by Mr. Guravaiah.
37. Samsung Innovation Quotient 2' is the second contest conducted by Samsung and CNBC TV18 that recognizes and rewards India's finest Innovators.  
Source: <http://siq.moneycontrol.com/>
38. National Institute of Technology (NIT), Warangal organized a meet "Technozion 2012" with a theme of Gandhian Engineering and recognize innovations as a part of the program for which Grassroots innovators were invited and felicitated.
39. Krishi Vignan Kendra (KVK)- Taking the note of the developmental activities of PIRENS the Indian Council of Agricultural Research, New Delhi granted its sanction for establishment of the Krishi Vigyan Kendra (the Farm Science Centre) in May 1992. However the actual implementation of its programmes could be started during March, 1993 only. Before launching its programmes and activities, a Benchmark survey of the selected villages was done to make a socio-economic appraisal and to understand the existing practices of the farmers. This enabled the KVK to identify the technological gaps and critical needs and requirements of the farmers. This formed the basis for framing operational modality like training, demonstration and on-farm-trials by the KVK. Simultaneously the farm development work was also started as an important requirement for the strengthening of training-cum-demonstration infrastructure of the KVK.  
Source: <http://www.kvk.pravara.com/KVK2.htm>
40. Water hyacinth is an aquatic perennial herb which belongs to the family Pontedericeae, It can live and reproduce floating freely on the surface of fresh waters or can be anchored in mud. The mature plant consists of long, pendant roots, rhizomes, stolons, leaves, inflorescences and fruit clusters. The plants grow up to 1 metre height. The inflorescence bears 6 - 10 lily-like flowers, each 4 - 7cm in diameter. The flowers are bluish purple, large and self-fertile. It propagates by vegetative, asexual and sexual methods. The vegetative process is through the production of horizontal stolons. Asexual propagation is by breaking apart into pieces each of which develops into a separate plant.

41. A technical brief of Practical Action titled “Water hyacinth control and possible uses” –by the Technology Challenging Poverty , an International NGO.  
Source: [http://www.solucionespracticas.org.pe/fichastecnicas/pdf/waterhyacinth\\_control.pdf](http://www.solucionespracticas.org.pe/fichastecnicas/pdf/waterhyacinth_control.pdf) (accessed on 24-12-12)
42. Muktapur is a small village in Nirmal Mandal of Adiladad District of Telangana State.
43. Mr.J.Durga Prasad presently the coordinator of HoneybeeAP, NIF and Vice President of Palle Srujana. He is the CEO of Creative Minds, an organization to take forward grassroots rural innovations with a commercial perspective.
44. Shodh Yatra is a journey for the search of knowledge, creativity and innovations at grassroots rural level. ShodhYatra is an attempt on the part of SRISTI to reach out to the remotest part of the country with a firm belief that hardship and challenges of natural surroundings are the prime motivators of creativity and innovations. On these lines Palle Srujana also takes up ShodhYatras that aim at unearthing of traditional knowledge and grassroots innovations that have not only simplified the lives people, but have also significantly contributed towards the conservation of bio-diversity. ShodhYatra is a journey of mutual exchange and sharing of knowledge. The knowledge and practices gathered have been pooled and shared with the villagers during the Shodh Yatra. This ultimately helps in dissemination of knowledge across the world.
45. Greater Hyderabad Municipal Corporation (GHMC), a civic regulatory authority responsible for the maintenance of hygiene in Hyderabad city.
46. Ecological succession is an orderly process of community changes which are directional and predictable. An example of this is a hydrarch where a pond community is replaced by a land community.  
Source: <http://books.google.com/books?isbn=0070083665>
47. The Agri Biz Idol Camp is an initiative of NAIP to identify, support and encourage young agri-students and entrepreneurs with high potential in business start-ups in agriculture. Information and knowledge sharing, stimulation of private sector participation, agro-technology opportunities through NAIP, Business Incubation opportunities through 22 NAIP BPDs were some of the key areas deliberated upon in the camp.  
Source: <http://www.naip.icar.org.in/-/agri-biz-idol-camp-may-5-9-20-1>

48. Central Research Institute for Dryland Agriculture (CRIDA) is a National Research Institute under the Indian Council of Agricultural Research (ICAR) established in 1985 with a mandate to carry out basic and applied research in rainfed farming.  
Source: <http://www.crida.in/>
49. Source: <http://www.mitticool.in/> (accessed on 10-1-2014)
50. Source: <http://www.nif.org.in/awards/profile/Earthen-kitchen-products/8> (accessed on 15-01-2014)
51. Source: <http://daily.indianroots.com/13083/> (accessed on 15-06-2014)
52. Source: <http://www.dare.co.in/people/featured-innovation/a-low-cost-clay-fridge.htm> (accessed on 17-01-2014)
53. Source: <http://indianbydesign.wordpress.com/2011/07/15/design-feature-mitti-cool/> (accessed on 15-01-2014)
54. Source: [http://en.wikipedia.org/wiki/M. R. Prajapati](http://en.wikipedia.org/wiki/M._R._Prajapati) (accessed on 15-06-2014)
55. Source: <http://www.iamne.in/they-used-to-call-me-mad-mansukhbhai-prajapati/> (accessed on 17-01-2014)
56. Source: [http://www.business-standard.com/article/opinion/geetanjali-krishna-the-story-of-mitticool-111073000009\\_1.html](http://www.business-standard.com/article/opinion/geetanjali-krishna-the-story-of-mitticool-111073000009_1.html) (accessed on 11-1-2014)
57. Bhoodan Pochampally is a Mandal in Nalgonda District of Andhra Pradesh in southern India and is popularly known as Silk City of India. It is most popular for its Pochampally Ikat style of sarees and material. Tucked amidst the beautiful hills, this is a result of the Bhoodan movement by Acharya Vinoba Bhave(1951) wherein land was donated by the erstwhile zamindars towards community welfare. Hence the name 'Bhoodan Pochampally', which is in fact the first village to be created by this movement.  
Source: <http://aptdc.in/pochampally/>
58. The word "*ikat*" means "to bind." It is a very ancient way of creating designs in fabric by resist-dyeing the threads before the fabric is woven. It is a fascinating technique of 'Tie & Dye' done with the warp and weft threads dyed in beautiful colours before weaving. The pattern that emerges as the subtle intermingling of pastel shades and brightly contrasting hues, very elegant makes an "*ikat*".  
Source: <http://pochampally.com/ikat-weaving-process.html>

59. Geographical Indications of Goods are defined as that aspect of industrial property which refer to the geographical indication referring to a country or to a place situated therein as being the country or place of origin of that product. Typically, such a name conveys an assurance of quality and distinctiveness which is essentially attributable to the fact of its origin in that defined geographical locality, region or country.  
Source: <http://ipindia.nic.in/girindia/>
60. A weaver's community in Andhra Pradesh, a social categorization based in the traditional family profession.
61. The Central Silk Board (CSB) is a statutory body, established during 1948, by an Act of Parliament. It functions under the administrative control of the Ministry of Textiles, Government of India. Promoting the development of silk industry by such measures as it thinks fit is the mandate of this organization.
62. Source: [www.hindawi.com/journals/ecam/2013/376327/](http://www.hindawi.com/journals/ecam/2013/376327/)
63. Ayush Herbs® bases its formulations on traditional Ayurvedic combinations and contains herbs grown naturally in their pristine Himalayan habitat, without the use of pesticides, insecticides, herbicides or chemical fertilizers.
64. The Centre for Cellular & Molecular Biology (CCMB) is a premier research organization in frontier areas of modern biology.  
Source: <http://www.ccmb.res.in/>
65. The Indian Agricultural Research Institute (IARI) is India's premier institution in the field of agricultural research, higher education in agriculture (post-graduate programme) and extension education. Since 1958, it holds the status of a Deemed University under the University Grants Commission Act of 1956 and is authorised to award post-graduate degrees of Master of Science and Doctor of Philosophy in Agricultural Sciences and its related basic disciplines.  
Source: <http://pgs.iasri.res.in/>
66. The Directorate of Oilseeds Research (DOR) formerly operating as All India Coordinated Research Project on Oilseeds(AICORPO) came into existence on August 1, 1977 with the Headquarters at Rajendranagar, Hyderabad. It operated with a Project Director as its administrative head and seven Project Coordinators for groundnut, rapeseed-mustard, sesame, linseed, castor, safflower, sunflower and niger. Subsequently, groundnut and rapeseed-mustard were delinked from the Directorate with the establishment of National Research Centre for each of these crops during 1979 and 1993

respectively. In April 2000, the AICRP on Sesame & Niger and Linseed have been separated from the administrative control of DOR. The Directorate has in its fold the mandate of working on castor, safflower and sunflower.

Source: <http://dor-icar.org.in/>

67. Jawaharlal Nehru Tropical Botanic Garden and Research Institute [previously known as Tropical Botanic Garden and Research Institute (TBGRI)] is conserving largest number of live germplasm collection of tropical plants among the Botanic gardens in Asia. TBGRI educational programme addresses the central theme and has launched various action oriented programmes to aim towards conservation and the sustainable utilization of biodiversity.

68. Source: [www.bgci.org/education/1686](http://www.bgci.org/education/1686)

69. Nagabairavapalem is a small village near Chilakaluripet town located in Guntur District of Andhra Pradesh.

70. Patan Saida is another innovator who has designed a Mast less wind mill and a locking system for toilets in trains.

71. The Palle Srujana team also includes Mr.J.Srikar who has retired as Deputy General Manager from NABARD. He is presently the Vice-President of Pallesrujana. He did pioneering work on desilting of tanks and silt application. He has worked closely with Farmer's clubs, Self help groups and water shed development committees. He practices and promotes organic farming. In this process he has developed the non-pesticidal pest management, SRI rice cultivation, water budgeting, horticulture, etc in NABARD programmes.

72. Source: <http://www.sristi.org/hbnew/html/vol-23-24/> (accessed on 22-01-2014)

73. M.R.Morarka-GDC Rural Research Foundation was established by Kamal Morarka, India's leading industrialist and philanthropist in 1991 in memory of his father Late M.R.Morarka funded by M/s. Gannon Dunkerley & Company Ltd. The Foundation plays the role to that of a catalyst, coordinator and facilitator, encouraging necessary participation of the rural community and entrepreneurs. Unlike other voluntary organizations Morarka Foundation is into more than just the conventional areas of voluntary actions. We more often than not take the lead to venture into new areas such as Organic Farming and Certifications, Agriculture Extension, Tourism Promotion, Waste Management, Vermi Compost, Conservation of Heritage etc.

Source: <http://www.morarkango.com/>

74. Source: <http://www.chauthiduniya.com/2013/10/jujharu-mahila-ne-diya-kheti-ko-nya-ayam.html> ; Samiksha category; page -2 (accessed on 20-01-2014)
75. Source: [http://7award.nif.org.in/awardprofile-details.php?profile\\_id=8 & page=8&st\\_id=-1](http://7award.nif.org.in/awardprofile-details.php?profile_id=8&page=8&st_id=-1) (accessed on 22-06-2014)
- 76a. Dhanvantri is derived from *Sanskrit* which means an avatar of Vishnu in the Hindu tradition. He is considered as physician of gods in Ayurvedic medicine according to Puranas and Vedas.  
Source: [wikipedia](http://wikipedia)
- 76b. Based on the interview with Rajanna the names in paranthesis are in colloquial Telugu language. It is infact that the traditional healer and practioners and more familiar with local language and base their practice.
- 76c. Civil society Hall of Fame a magazine, has reached out to the Indian people-individuals and groups who make a silent difference at the ground level and make the living environment more inclusive around them. It honours such people in appreciation of what they stand for and in the hope that their wholesome energy will influence others elsewhere. It finds across India everyday folks with no agenda to be famous, yet, special because of the values and causes around which they build their lives. They could be doctors, lawyers, teachers, accountants, activists. Such people are mostly invisible people and difficult to identify, but their quiet efforts are the seeds of real change. The Civil Society Hall of Fame tries to facilitate such a process in its small way and as a reminder of India's enormous diversity. The learning from the Hall of Fame is that the big story is in the small story. There is no single narrative for the whole country and there should be a national goal to carry as many people along as possible.  
Source: [http://www.civilsocietyonline.com/pages/hall\\_of\\_fame.aspx](http://www.civilsocietyonline.com/pages/hall_of_fame.aspx)
77. ICAR has established various research centres in order to meet the agricultural research and education needs of the country. The Technology Intervention Programmes also form an integral part of ICAR's agenda which establishes Krishi Vigyan Kendras (KVKs) responsible for training, research and demonstration of improved technologies. As a part of its activity ICAR has taken over the CTRI from ICTC during 1965 for conducting fundamental and applied research on Tobacco for the benefit of the farming community. The institute has six Regional Stations at Guntur, Kandukur, Jeelugumilli (Andhra Pradesh, Vedasandur (Tamil Nadu), Hunsur (Karnataka) and Dinhata (West Bengal) and a Burley Tobacco Research Centre(BTRC) at Kalavacharla, Andhra Pradesh.  
Source: <http://www.ctri.org.in/>

78. College of Home Science, Saifabad was established in 1964 and is part of Acharya NG Ranga Agricultural University. The college enhances the standard of individuals in general and rural families and communities in particular through Teaching, Research and Extension activities for empowerment of women and girl child in rural and urban households through self-employment, service support to industries and communities that would help them to become better resource managers and contribute towards national development.

Source: <http://www.minglebox.com/college/College-of-Home-Science-Hyderabad>

79. Schedule Caste Development Corporation- The main functions of SCDCs include identification of eligible SC families and motivating them to undertake economic development schemes, sponsoring the schemes to financial institutions for credit support, providing financial assistance in the form of the margin money at a low rate of interest, providing subsidy out of the funds made available to the States under the Scheme of Special Central Assistance to Special Component Plan of the States to reduce the repayment liability and providing necessary tie up with other poverty alleviation programmes. For facilitating loans to Scheduled Castes, the SCDCs tie up with the local banks, National Scheduled Castes Finance and Development Corporation (NSFDC) and National Safai Karamcharis Finance and Development Corporation (NSKFDC). Thus the SCDCs are playing an important role in providing credit and missing inputs by way of margin money loans and subsidy to the target group.

Source: <http://socialjustice.nic.in/scdc.php>

80. Swamy Ramananda Tirtha Rural Institute (SRTRI) was established in 1995 at Jalalpur Village, Pochampally Mandal of Nalgonda District, Telangana, The Institute was started with the noble objective of creating an appropriate platform for pro-active rural development initiatives in Telangana. The philosophy of the Institute rests upon holistic approach wherein the rural people are provided with unhindered access to skills in latest sustainable technologies using improved tools and equipment for enhanced productivity and quality dimensions. Special emphasis is laid on capacity building and income generating of those who are underprivileged, downtrodden, women, unemployed youth, and other vulnerable sections of the rural community. The prime focus is on smaller technologies, which are sustainable and rural friendly so as to enable the rural poor earn sustainable incomes and lead quality of life, and thus bring in confidence among them to trigger off to a greater heights.

Source: <http://www.srtri.com/about.htm> (Accessed on 27-12-13).

81. The India International Trade Fair (IITF), ever since its inception in 1980 has evolved as a major event for the Business community. It is a premier event organized by the India Trade Promotion Organization (ITPO), the nodal trade promotion agency of the Government of India. The event is held between 14 - 27 November every year at Pragati Maidan, New Delhi, India. The Theme of IITF 2013 is Inclusive Growth with Bihar as Partner State and Japan as Partner Country.  
Source: [http://en.wikipedia.org/wiki/India\\_International\\_Trade\\_Fair](http://en.wikipedia.org/wiki/India_International_Trade_Fair)
82. A.Subbaiah and Jeyakumar . 2009. Cotton: White Gold of India. Market Survey  
Source: <http://ffymag.com/admin/issuepdf/Cotton-Oct09.pdf> (Accessed on July 28, 2014)
83. Post Harvest Profile of Cotton.  
Source: [http://agmarknet.nic.in/cotton\\_profile.pdf](http://agmarknet.nic.in/cotton_profile.pdf)
84. Cotton Cooperation of India. 2014. National Cotton Scenario  
Source: <http://cotcorp.gov.in/national-cotton.aspx> (Accessed on May 28,2014)
85. NIN-National Institute of Nutrition moved from Tamilnadu to Hyderabad in 1958 to identify various dietary and nutrition problems prevalent among different segments of the population in the country. It works for evolving effective methods of management and prevention of nutritional problems. To dovetail nutrition research with other health programmes of the government and disseminate nutrition information is a perpetual activity. In this phenomenon, they conduct training sessions and bring out publications for awareness creation on nutrition.  
Source: <http://ninindia.org/nin.htm>
86. Prime Minister Rozgar Yojana (PMRY) is for providing self-employment to educated unemployed youth which was announced on 15th August, 1993 to provide opportunities to one million educated unemployed youth in the country. The PMRY has been designed to provide up to 7 lakhs micro enterprises by the educated unemployed youth. It relates to the setting up of the self-employment ventures through industry, service and business routes. The scheme also seeks to associate reputed non-governmental organisations in implementation PMRY scheme especially in the selection, training of entrepreneurs and preparation of project profiles.

87. Seva foundation has been a leading innovator in the delivery of vital eye care and diabetes prevention services to the world's most vulnerable including women, children, and indigenous peoples.  
Source: [www.seva.org](http://www.seva.org)
88. The Federation of Andhra Pradesh Chambers of Commerce and Industry (FAPCCI) is about nine decades old. It was started in 1917 as a Chamber of Commerce representing the entire old State of Hyderabad. It gradually evolved into an organization representing large, medium and small scale industries. The vision of FAPCCI is to foster and nurture entrepreneurship; attract global talent, technology and investment to promote a balanced regional development.  
Source: [www.fapcci.in](http://www.fapcci.in)
89. Centre for Bharatiya Marketing Development (CBMD), a unit of Swadeshi Jagaran Foundation, aims at striking a balance by strengthening the cultural root and build up upon it. CBMD works to guide Bharatiya enterprise to become self-reliant by competing globally, and thus promotes the national economy in the Swadeshi way.  
Source: <http://www.cbmd.org/>
90. A piece of hard work that you do because you enjoy it and not because you will receive money or praise for it, or because you need to do it.  
Source: <http://dictionary.cambridge.org/dictionary/british/labour-of-love>



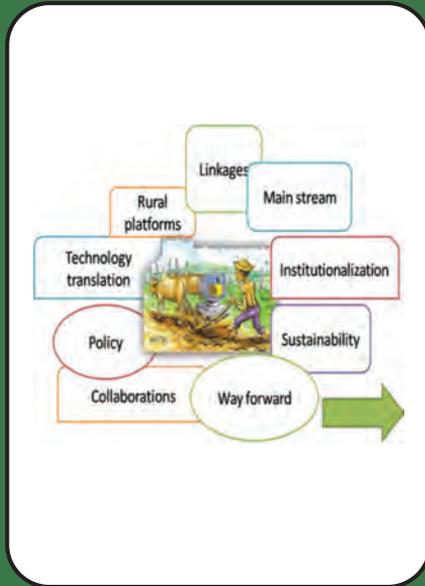


## About authors

**Dr R Kalpana Sastry** is presently working at the National Academy of Agricultural Research Management (NAARM) at Hyderabad, India. She received her doctorate from Indian Agricultural Research Institute, New Delhi in the area of Mycology and Plant Pathology. After joining the Agricultural Research Service, ICAR, in 1984, her focus in research till 1996 was in area of plant pathology of oilseed crops. Consequent to her appointment in Agricultural Research Management Division at NAARM in 1996, her research areas include agricultural innovations, intellectual property management systems and policy issues in agricultural research management for the national agricultural system in India. She is currently engaged in several projects on policy issues on intellectual property and technology innovation, agri-entrepreneurship initiatives in the National Agricultural Research System. A recognized faculty on IP and WTO issues in Agriculture at national and international fora , she is a PG Diploma holder in Patent Laws from National Academy of Legal Studies and Research (NALSAR), India. Presently she is also the Course Director of a one-year Post-Graduate Diploma in Technology Management in Agriculture (PGD-TMA) since 2008-09. This unique course is first of its kind in the country, which offers an excellent opportunity to systematically study the subject of Intellectual Property (IP) and Technology Management in Agriculture. She has guided several students and has been mentor for several internship projects for under and postgraduates students.

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**O K Tara** was an Academic Head and a teaching faculty in Microbiology in re knowned educational institutions in Hyderabad. She taught for 14 years to under graduate and post graduate students. She has been member of some of the academic committees for course designing. She is a part of few editorial teams for content development. Currently, she is working in intellectual property and technology management domains since 2 years at NAARM. Her areas of research focus include policy studies, rural innovations and traditional knowledge.



*If everyone is moving forward together,  
then success takes care of itself.*

*-Henry Ford*



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