



An ACCESS Publication



INNOVATIONS

in Sustainable Agriculture

SITARAM RAO LIVELIHOODS ASIA CASE STUDY COMPENDIUM 2016



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Preface

According to the latest FAO State of Food Insecurity in the World Report, almost 800 million people on the planet still go to bed hungry every day. This year at the annual Global Forum for Innovation in Agriculture (GFIA), it was estimated that because of climate change, food production is decreasing annually by two percent, at a time when we need 40 percent increase in the next 10 years. Higher temperatures and unpredictable weather events together with challenges such as rapid urbanization, population growth, alternate land use, water scarcity and high energy consumption are disrupting life sustaining agriculture in many parts of the world, derailing efforts to reduce hunger and poverty in some of the poorest regions. At the same time, agriculture is a major driver of human caused climate change, contributing anywhere from 25 to 30 percent of global greenhouse gas emissions.

It has therefore become important to develop agricultural systems and practices for high quality production and economic profitability without adversely affecting the environment and natural resources. Many innovations for sustainable and smart agriculture are being practiced in the Asia region. These innovative sustainable agricultural practices are aimed at saving natural resources, improving productivity, increasing the efficiency of supply chains and beating the test of climate change. By tapping into the multitude of sustainable farming practices agriculture can continue to supply food for the human population, as well as economic profitability for the world's 1.3 billion farmers. Sustainable agriculture also can play a critical role in the global reduction of greenhouse gas emissions and the mitigation of climate change.

The SitaramRao Livelihoods Asia Case Study Compendium2016 has brought together 11 such cases that provide evidence of sustainable approaches to agriculture. The competition was opened to cases covering themes such as sustainable production of crop, livestock and aquatic animals, organic farming systems, food safety and agricultural standards, sustainable management of agricultural land and water resources and environment, agroforestry, water and soil conservation, urban farming andpreserving bio-diversity and indigenous breeds among others. As in 2014, the competition was open to contribution from other countries in the region as well.

Overall 40 cases were received from India as well as other countries in the region such as Sri Lanka and Bangladesh. The cases were put through a rigorous evaluation process and were assessed by an eminent jury comprising of experts at IRMA, our Technical Partner for the competition, who shortlisted the top case studies.

On behalf of ACCESS I would like to thank Prof. Shambu Prasad, Prof. Durga Prasad, Prof. Rakesh Saxena and Prof. Shyam Singh at IRMA for critically examining the cases and collating the final list. I'm sure the rigour put in by them and their expertise has contributed to bringing the best cases to the fore. I would also like to thank those who have shown interest in the case study competition and submitted their cases. I express my gratitude to the Livelihoods Asia Advisory Group as well Mr. Vipin Sharma, CEO, ACCESS for their guidance in the conduct of the Competition. Last but not the least I would like to thank my colleagues Ila and Amy for facilitating the 3 - stage process in a seamless manner.

I hope this compendium will prove to be a useful resource on Innovations in Sustainable Agriculture and prove to be of value to the sector.

Puja Gour

Vice President

ACCESS Development Services

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Community Managed Sustainable Agriculture, Economically Viable, Ecologically Sustainable

Jayaram Killi

1. Introduction

Society for Elimination of Rural Poverty (SERP) is implementing the largest poverty alleviation programme in the country Velugu in the state of Andhra Pradesh. SERP believes that poor have a strong desire and innate ability to come out of poverty. Further they have a strong sense of self help and volunteerism. They are poor on account of various obstacles - social, psychological, political and economic, and it is these obstacles which are suppressing poor people's innate abilities. SERP believes that only by building their own institutions can they unleash their innate energies and come out of poverty. The process of social mobilisation and empowerment does not happen on its own and it needs to be induced.

Velugu comprises of two large World Bank financed poverty eradication projects, and the SGSY programme of Government of India and State Government's Interest Subsidy Scheme. The programme was initiated in the year 2000 in 6 districts and has subsequently been expanded to all the districts in phases. By 2008, the programme covered all villages of Andhra Pradesh and had succeeded in organising 65 lakh women into self-help groups (SHGs). These self-help groups have been federated into Village Organisations (VOs) and the VOs in turn have been federated into Mandal Mahila Samakhyas (MMSs). The Mandal Mahila Samakhyas have been further federated into Zilla Samakhyas. All poverty eradication initiatives are formulated and implemented by these institutions.

The process of mobilization starts with the poor organizing into SHGs of 1015 members to form groups that save together and inter-lend small amounts of money to each other to stimulate household economic activity. The SHGs also collect repayment from the group members. It is this practice of collective thrift and credit that builds an asset base for the poor, disciplines them to work together and gives them confidence. The more the group transactions of saving and lending, the higher the build of social capital and trust in the groups from these repeated interactions.

SERP initiated Community Managed Sustainable Agriculture (CMSA) as a part of its mandate to eradicate rural poverty, since agriculture is the most important means of livelihoods for a majority of the rural poor. This initiative was taken up to address the major causes of agriculture distress - high costs of agriculture, extensive use of chemical inputs, displacement of local knowledge and unsustainable agricultural practices like mono cropping among others.

Agriculture is vital to the economy of Andhra Pradesh, but farming in the state has been fraught with a number of challenges. Seventy percent of the workforce depends on agriculture in the state and generates a quarter of the state GDP. Since adoption of the Green Revolution in the seventies, Andhra Pradesh continues to be one of India's major producers of rice, cotton, groundnut and lentils. However, agricultural growth rate and growth rates of yield of major crops has begun to decline in the last decade.

CMSA is managed entirely by community institutions – federations of selfhelp groups (SHGs), with knowledge and capacity building services from SERP which has supported and nurtured a powerful institutional model of federations of poor women. The village organization is entrusted with overall programme management at the village level and is the center of all CMSA activities in the village, which starts with forming “Sasya Mithra Sanghas”. The Sasya Mithra Sanghas and VOs develop a CMSA plan on capacity building, production, maintaining internal controls and marketing. Mandal level (sub-district) federations monitor implementation, handle extension services, coordinate with service-provider NGOs, and liaison with Department of Agriculture's Krishi Vigyan Kendras (KVKs). District level federation oversees implementation, forms tie-ups for marketing, and coordinates with the District Rural Development Agency to link up with relevant government programs.

Farmers pay registration fee for extension services. Until 2015, Rs. 2.92 Crores was collected as registration fee. On an average, CSMA cost per farmer is Rs. 700 or Rs. 200 per acre per year and the participant farmers fund a small part of it. Eventually, the project aims to move to a self-financed user-fee based extension system.

Village Activist (VA) and Cluster Activist (CA) are the best practicing farmers. VAs are identified by Village Organisation (VO) and Cluster Activists (CA) are identified by Mandal Mahila Samakhyas. Both the VA and CA are responsible for organizing farmer field schools (FFS) and village level capacity building programs. CAs are responsible for managing data and coordinating with line departments.

Table 1: Cost of CMSA Extension System

S.No	Cost item	Amount in Rs. per year
1	Honorarium of village activist	12000
2	Honorarium of cluster activist	48000
3	Subcommittee meetings	24000
4	Total cost	84,000
5	Total farmers in a cluster of five villages	800
6	Registration fee@120 per farmer per year	96,000

2. Technologies Promoted Under CMSA

Technologies promoted under Community Managed Sustainable Agriculture (CMSA) are blend of scientifically proven technology, local wisdom, and, farmers' innovations. Over a period of time these technologies are building good ecology where there is a balance between friendly insects and crop pests, and this is leading to reducing the costs on pest management to 'zero'. Following interventions were promoted under Community Managed Sustainable Agriculture (CMSA):

2.1 Non Pesticide Management (NPM)

The main principle underlying NPM is that pests can be managed by understanding their behavior and lifecycle. The emphasis is on prevention rather than control. A comprehensive strategy is evolved for pest management. These include: deep summer ploughing, community bonfires, seed treatment, bird perches, border crops, trap crops, yellow and white plates, intercrops, light traps, pheromone traps, delta traps in groundnut, alleys in paddy and cutting of the tips in paddy at the time of transplantation. The above practices are called as 'non-negotiables' and are mandatory for all NPM farmers. The application of botanical extracts is only as a last resort.

Another key part is the Comprehensive Soil Fertility Management. As part of this the focus is on building soil microbial activity. Every crop removes substantial amount of nutrients from soil. However the share of grains would be in the range of 15%. The core principle of natural soil fertility enhancement is to return the crop residues to the soil, either directly or through animal feed route during the crop period. To sustain the productivity level, the nutrients removed by the crop have to be replenish soil nutrients particularly soil carbon. Mulching, incorporation of straw and other crop residues into soil will replenish the soil. Role of earthworms is critical in soil fertility management. Soil is treated as living organism and the focus is on enriching soil health.

2.2 Household Nutritional Security Model (36X36 model)

36*36 model has been promoted by CMSA as a tool to achieve nutritional security at the household's level. As the crops diversity ranges from tuber crops to fruit crops, from vegetables to pulses, all the nutritional requirements for a family are met. This model is unique as it promotes nutritional security and round the year income to the family, in the smallest land area possible.

2.3 Poorest of the Poor (POP) Strategy

PoP Strategy in CMSA is to facilitate the land lease to the landless laborers and promote CMSA in these lands. 0.5 acre land will be leased in to PoP households, and they undertake SRI paddy cultivation in 0.25 acre and vegetable cultivation in the remaining 0.25 acres. It is designed to achieve two objectives. The first objective is that the PoP family should earn a net income of Rs. 50, 000 in a year and second is that by growing paddy and vegetables the PoP family shall have food security. Apart from selling the produce, they can save something for their own consumption.

2.4 Rain Fed Sustainable Agriculture (RFSA)

Soil and moisture conservation works which include conservation furrows at every 4mts, trench around farm, farm pond and compost pit. Main objective of this intervention is to harvest rainwater and to increase cropping intensity.

2.5 System of Rice Intensification (SRI)

System of Rice Intensification (SRI) is a cost effective and resource efficient method of cultivation of paddy. SRI is promoted to reduce ground water exploitation and to increase yields.

2.6 Marketing Premiums for Pesticide Free and Organic Products

In addition to reducing the cost of production, crops grown without the use of pesticides and fertilizers are commanding higher prices in the market. Although CMSA produce is not certified as 'organic', there is a growing recognition of the benefits of pesticide and fertilizer-free vegetables, lentils and cereals, especially in the urban retail market. The premium in prices fetched is currently in the range of 14 to 33 percent for vegetables, red gram (lentils), chilli and rice. Also this price realization comes directly to the producer without middlemen in between, as marketing operations are handled by the district and sub-district federations.

3. Scale of Interventions

Table 2 shows intervention wise number of farmers benefited and the incomes realized by them over a period of time. Total population refers to the population in CMSA villages.

Table 2: Scale of Interventions

S.No	Intervention	Districts	Mandals	Population covered
1	Non pesticide Management and Comprehensive soil fertility management (NPM)	13	392	14,06,044
2	Rain fed sustainable Agriculture (RFSA) in convergence with MGNREGA	13	105	12,450
3	System of Rice Intensification (SRI)	13	392	21,820
4	House hold level nutritional security model (36X36 models)	13	392	40,982
5	Poorest of the poor (POP) strategy	13	250	21,683
6	Marketing premiums for pesticide free and organic products	5	25	10,250

Source: Internal MIS

The key investment in CMSA is not in subsidizing external inputs but to build the knowledge base of the farmers. The idea is to move from the mainstream external input based model to a model based on local resources and knowledge. The knowledge investment refers to knowledge and understanding of local natural resources and how they can be used for seed treatment, pest management, soil fertility management practices etc. Knowledge also refers to understanding sustainable agronomical practices, revisiting or rediscovering traditional wisdom, etc.

In this paradigm, the farmers are encouraged to experiment and innovate and their innovations are shared with other farmers. Respect is accorded to farmer's own initiatives. This approach is different from the mainstream attitude where the farmer is a passive recipient of 'knowledge' produced informal agriculture research stations or universities. It is a very liberating

approach and the momentum in our programme is fuelled by countless innovations of farmers and the pride they take in their ‘research’ efforts.

Farmers upgrade knowledge by sharing, observations and experiments. The transfer of technology is through community based local practicing farmers, which has helped the farmers learn from each other. Farmers Field School (FFS) is the key activity for transfer of technology, sharing of best practices and demonstrating the effectiveness of CMSA techniques. Village activists and cluster activists, who are paid by the communities, facilitate the knowledge sharing processes and are accountable to them. The creation of a community based extension system has made technologies offered by CMSA as an ‘open source platform’ for poor farmers to tap into. These farmers customize and tailor these technologies according to their needs and bring back the knowledge to the Farmer Field Schools. This accumulation of knowledge has catalyzed agriculture from input centric to a knowledge driven activity.

Since 2012, SERP has been engaging Digital Green, a social enterprise to build on its existing extension systems to use digital extension approach to accelerate the adoption rates. The focus has been on low cost and effective peer-to-peer learning processes, thus, empowering women farmers’ households to increase their productivity and incomes in a sustainable manner.

The digital extension system is a technology-enabled means of agricultural extension, which brings together various stakeholders and farmers to produce and share locally relevant information. The project uses videos as a basis for disseminating information on themes such as Non-Pesticide Management (NPM) agriculture practices and institution building approaches. The medium is optimally designed for interpersonal behavior change communication with smallholder farmers, as it overcomes problems of illiteracy. It is an intuitively accessible technology as local farmers convey the advice as well as access information through video.

To blends technology with social organizations such that village-level mediators’ i.e Cluster Activists use locally produced videos to motivate and train small-holding farmers and increases the adoption of sustainable agricultural practices. This, ultimately enhances productivity, lowers input costs and mitigates the effects of climate change. The project derives its impact from integrating an innovative use of appropriate technology into existing, people-based extension systems and improving their effectiveness.

SERP-CMSA functionaries and Digital Green personnel guide communitylevel Video Resource Persons (VRPs) to produce 3-4 videos each month by

modularizing NPM, institution building and related practices into short, 8-10 minute segments. The videos feature local farmers on a variety of topics including testimonials and demonstrations of improved production techniques, market linkages, and government schemes.

Based on the season, at the start of each month a schedule for dissemination of these videos is prepared for each SHG in each of the project villages. Small groups of 15-20 women farmers belonging to self-help groups participate in weekly screenings of the videos, which are mediated by Cluster Activists in an interactive, reflective forum. Following the dissemination of videos the Cluster Activists need to encourage farmers to adopt the relevant seasonal practice.

The flow of information from the project villages is supported by an opensource data management framework developed by Digital Green, called COCO (Connect Online, Connect Offline). This allows relational data to be captured and analyzed in locations with limited or intermittent internet connectivity. Disseminations conducted and the achieved adoptions are reported on fortnightly basis.

The project had reached out to over 1, 71,730 farmers in 2, 159 villages in 13 districts. Over 40 Video Resource Persons from the grass root level were trained and they have produced 128 community videos. 1600 outreach functionaries (of various cadres) have been trained to use these videos through a 'Human Mediated Extension Approach' with 77,665 disseminations (video shows) resulting in 1, 19, 354 adoptions of new practices.

Digital Green is working with SERP-AP to further grass root level process in motivating farmers to form Farmer Producer Groups as well as focus on value chain interventions.

Capacity building is the key component in CMSA. Financial support is only in the form of capacity building and transfer of technology. Components of capacity building includes learning about life cycles of pests and enabling climatic condition for disease prevalence and spreading, farming systems, sustainable use of resources, maximizing output from a unit land area, effective utilization of inputs like seed, organic fertilizers, sun light, water, land etc. Conservation of Renewable Natural Resources and genetic biodiversity both flora and fauna, and SRI in paddy received special attention.

The results of the intervention have been so beneficial to the farmers that there has been an exponential increase in the area under sustainable agriculture. It is an expansion driven by the positive experience of the farmers. CMSA was first piloted in 2004 with only 250 farmers in 10 villages and on 400 acres. It has now reached around 1.4 million farmers in 8,772 villages and 2.2 million acres (gross cropped area) are under cultivation.

CMSA is biased towards SC/STs, small and marginal farmers. As per our estimation total SC/STs in CMSA villages are around 8 lakhs and CMSA covered 5.38 lakhs of SC/ST farmers which accounts for 67.25% of the total SC/ST population and about 90% of the SC/STs who have land.

these is the creation of single - window system, which lowered the transaction cost of adopting the technology, which became an “open source platform” for these farmers. Furthermore, it’s scale – up through community institutions also helped the program acquire “social movement” characteristics. CMSA was swiftly adopted as the results of this technique were quickly visible in terms of farm economics, health and environment.

4. Impact of the Project

CMSA is based on the premise that ecologically sustainable agriculture makes sound economic sense. As per the study conducted by Acharya N G Ranga Agriculture University (ANGRAU), farmers through adoption of CMSA methods were able to save Rs. 220 crores per annum by avoiding chemical pesticides and fertilizers. Further ANGRAU reported 8-25% increase in yield depending on the crop. Average net benefit per farmer from different interventions under CMSA is Rs. 9000.

4.1 Increased Yields

Third party evaluation done by ANGRAU reveals that CMSA methods enabled the farmers to increase their yields by 1-2 qtls per acre. Table 3 shows increase in yields in different crops:

Table 3: Increased Yields due to Adoption of CMSA Methods

S.No	Name of the district	Crop	Increase in yield (qtls/acre)
1	Kadapa	Paddy	2.0
2	Chittor	Paddy	2.5
3	Visakhapatnam	Paddy	2

Source: ANGRAU, Third Party Evaluation Under RKVY in 2011

4.2 Increased Savings

Farmers adopting CMSA methods are able to save considerable amounts by avoiding chemical pesticides and reducing chemical fertilizers. Internal studies conducted by SERP-AP reveal that savings range between Rs. 1200/ acre to Rs.16, 000/- acre based on the crop. Table 4 shows crop wise savings by CMSA farmers:

Table 4: Crop wise Savings due to Adoption of CMSA Methods

S.No.	Crop	Total savings (Rs./acre)
1	Paddy	1650
2	Chilies	16,300
3	Red gram	1550
4	Groundnut	1200
5	Cotton	5800
6	Vegetables	200

Source: Internal MIS

4.3 Net Additional Income

ANGRAU study in 300 villages in 13 districts reveals that CMSA methods increased net additional incomes to farmers. The net additional incomes range between Rs. 3000 to Rs. 7000 per acre based on the crop. The below table shows the net additional incomes realized by CMSA farmers:

Table 5: Net Additional Income due to Adoption of CMSA methods

S.No	Crop	Net additional income(Rs./Acre)
1	Paddy	5590
2	Maize	5676
3	Cotton	5676
4	Chilies	7701
5	Groundnut	10483
6	Vegetables	3790

Source: ANGRAU, Third Party Evaluation Under RKVY

4.4 Reduced Health Risks

CMSA Farmers report a noticeable drop in pesticide related health problems. Women who have traditionally performed the task of spraying the crops and suffered numerous health problems due to the resultant high exposure to pesticides are now strong advocates of the NPM/CMSA movement. A quick survey of three districts has shown that the number of cases of hospitalization due to pesticide poisoning has reduced from 242 cases per year before adoption of NPM to 146 cases per year—a 40 percent drop. Table 6 shows that farmers who have adopted non-pesticide management agriculture have been totally free of pesticide related hospitalisation.

Table 6: Cases of Hospitalization due to Pesticide Poisoning

No of districts	Cases of hospitalization		
	Before NPM	After NPM	
		Inside NPM village	Outside NPM village
3	242	Nil	146

Source: Season End Reports, SERP

4.5 Increased Access to Food and Nutrition

Achieving self – reliance and self sufficiency in food production at community level are very important aspects of CMSA. CMSA ensures year round food security. Crop diversity and multistoried cropping systems ensures nutritional security to farm families. Perennial species such as Red Gram, Moringa, Guava and Papaya take care of very critical nutritional requirements for the family throughout the year. Pesticide free produce is integrated into the existing food security scheme.

Poorest of the Poor (POP) strategy enabled 5000 landless labourers to access irrigated land and adopted SRI method of paddy cultivation. This strategy increased availability of food grains at household level. Further CMSA methods enable the farmers to reduce expenditure on food grains.

4.6 Lowering of Risk Perception, Increasing Investment in Agriculture

CMSA methods build confidence on agriculture among the farmers particularly in resource poor farmers. SERP conducted a sample study in seven districts. The study reveals that large farmers prefer to give their land on lease to farmers under the CMSA fold. Picture 2 shows number of resource poor farmers taken additional land on lease:

4.7 Business Innovation and New Livelihood Opportunities

Village organizations have begun to benefit from jobs and enterprises catering to inputs for sustainable agriculture and by providing services like quality control and procurement of CMSA produce. 6156 jobs have been created in villages through the establishment of Organic Manure Outlets for supply of bio-pesticides and organic nutrients, and agricultural implements hiring centers (custom hiring centers). In addition, about 10,500 small and marginal farmers are generating additional income through the operation of vermi-composting units. Apart from individual benefits to farmers, the most important outcome of this intervention for the society is the positive impact this approach has in enabling farmers to adapt to climate change. When this

approach is taken to scale it can help in mitigating climate change and global warming.

4.8 Social Capital

CMSA invested heavily on building social capital and created huge social capital viz Community Resource Persons (CRPs), Cluster Activists (CAs), Village Activists (VAs), subcommittee members etc. Role of social capital is critical for scaling up of CMSA. Village Activist (a practicing farmer) and a Cluster Activist (for a group of five villages, he/she is also a practicing farmer) facilitate the knowledge sharing processes. These practicing farmers are role models, who have adopted CMSA practices successfully in their fields and improved their net incomes. They are paid by the SHG federations, the VOs and the MMSs to work as para extension workers, and are completely accountable to them.

The key benefits of the decentralized extension system, led by practicing farmers and women SHGs, are that the adoption rates of sustainable agriculture practices are very high (above 90%) resulting in drastic reduction in pesticide and fertilizer consumption.

There are 392 state level CRPs, 8772 village activists, 1465 and 1530 subcommittee members are there in the CMSA program. In total 12, 159 trained community level people are available in 13 districts. Services of the social capital created in CMSA are being utilized by National Rural Livelihoods Mission (NRLM) for sustainable agriculture livelihoods programs in Chhattisgarh, Jharkhand, Maharashtra, Rajasthan, Madhya Pradesh, J&K, Haryana and West Bengal.

CMSA is not confined only to provision of extension services. Since it is anchored in the SHG network, members are able to get credit for agriculture, credit for expanding their asset base etc. The setting up of NPM enterprises and custom hiring centres by the VO is another service to the farmer. Many VOs have also set up community seed banks to provide quality seed to the members. Many VOs are providing marketing support. CMSA has promoted decentralised marketing initiatives to obtain market premiums for pesticide free produce. In CMSA there is convergence of existing government schemes like RKVY, NREGS, SGSY, Mahila Kisan Sashkthikaran Pariyojana, National Horticulture

Mission, etc. The most important scheme is the National Rural Employment Guarantee Scheme (NREGS). So far, in 2008 in a short span of four months period, 10,349 compost pits were dug for effective composting and timely supply of compost. 1197 farm ponds were dug to harvest rain water and

recharge ground water. 12,293 Vermi compost units were constructed. Land development activities were taken up to benefit poorest of the poor families. Tank silt application was done in 5246.8 ha of 7,539 farmers. The response of the poor farmers to these interventions has been very positive. In the coming months the programme will intensify and cover many more farmers.

Several ICT tools were used to monitor the program and to reach out the farmers. Robust mobile based MIS for monitoring and decision making. SERP has tied with a mobile software company to build a mobile-based monitoring and MIS gathering system for facilitating better policy decision making at

the State level. Each Cluster Activist is given a mobile with the m-CMSA app and they are responsible for entering the implementation data of various interventions and agricultural details of the participant farmers. This data is collected at the central server and presented as a dashboard and publicly available on the project website.

An SMS-based service has been provided to CMSA farmers to connect them with *mandi* agents and potential buyers in the urban markets in collaboration with Intuit. Farmers are given regular updates on the price offered by various buyers in the nearby *mandi* as well as the nearest urban market. This information has helped the farmers get a better price for their produce by increasing their bargaining power. The transaction time in the *mandi* has also been reduced. This initiative was first piloted in 5 districts and has now been scaled up to 12 districts and more than 25,000 farmers have participated in it.

The Community Managed Sustainable Agriculture Program has gone through several phases since its inception in 2004. In 2004 – 06, piloting was done for proof of concept with 250 farmers in 400 acres in about 10 villages. Farmers used Integrated Pest management (IPM) methods with botanical extracts and technical support was provided by NGOs. During the Incubation Phase between 2007 and 2009, focus was on moving from IPM to Non Pesticide Management (NPM). Non-negotiables for pest management were standardized and movement was towards comprehensive soil fertility management. Farmers started adoption of non negotiable developed under NPM and stopped using chemical pesticides.

In the Rapid Expansion Phase between 2010 and 2014, the program was expanded into new mandals and villages and also several new concepts were introduced in the program. Mandal Mahila Samakhyas started owning up the programme. New concepts like soil and moisture conservation activities, household nutritional security models (36X36 models), System of Rice Intensification, Poorest of the Poor strategy (1/2 acre irrigated land lease

model), organic certification through Participatory Guarantee System (PGS) etc. were introduced in the program. Farmer Field Schools were stabilized. ICT tools like mobile based MIS system, digital extension were brought into the program. Samakhya were assisted by para professionals and community resource persons. Program was supported by Government of India through Mahila Kisan Sashikaran Pariyojana (MKSP). Huge investments were made on building social capital.

In the Stabilization Period between 2012 and 2015, geographical expansion is stopped. Focus is on quality improvement of the program. Social capital built in the program is being used to spread the concept at the national level through National Rural Livelihoods Mission (NRLM).

5. Augmenting CMSA for Next Generation Livelihoods Pathways

From 2015 onwards, CMSA has moved into next phase of building Farmer Producer Organizations (FPOs). Farmers in 110 mandals are being organized into Farmer Producer Organisations (FPOs) under World Bank supported Andhra Pradesh Rural Inclusive Growth Project (APRIGP). Farmers are being mobilized into Farmer Producer Groups (FPGs) and these groups will be federated at mandal level as Farmer Producer Companies. Focus is now shifting from production systems to value chain investments. Partnerships are built along the value chain. Private players have been roped in to support the farmers in production, post-harvest management, value addition and marketing of their produce.

With proven impacts on productivity, income, nutrition, jobs and ecological benefits, Community Managed Sustainable Agriculture has emerged as a very powerful tool for poverty eradication. Society for Elimination of Rural Poverty is now making serious efforts to ensure direct benefits to the poorest of the poor households by adopting innovative approaches under CMSA such as mobilising the CMSA farmers into producer companies and linking them to markets through private sector partnerships and value chain investments. CMSA has the potential to bring sustainability in agriculture and agriculture based livelihoods.

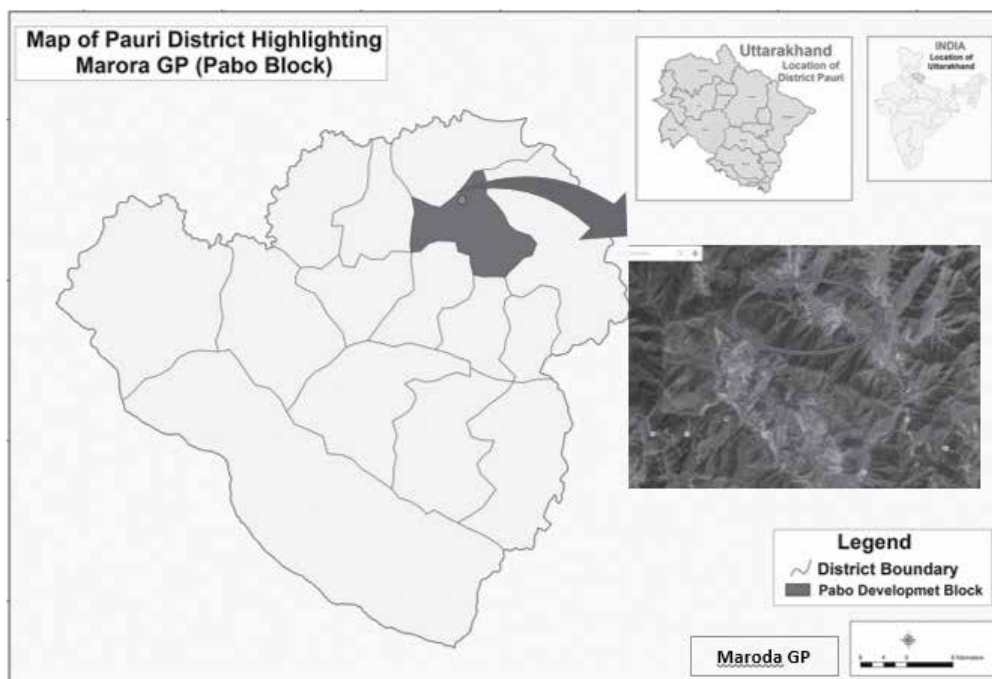
Regeneration of Barren Lands by Local Communities - An Opportunity for Sustainable Livelihoods

Kapil Lall and Dr. N.S. Barphal

1 . Geographical and Demographic Profile

The Maroda Gram Panchayat is located in the Pabo Block of Pauri Garwhal district in Uttarakhand which comes under the western Himalayan region (zone-1). It is located 30°08.627' N, 078°53.013' E, at an elevation of 1200-1600 mts.¹ above mean sea level.

Figure 1: Map of Pauri District Highlighting Marora GP (Pabo Block)



The region has a sub temperate to humid climate which remains pleasant throughout the year. During winters the climate is very cold and the area is covered with dense forested slopes.

It receives erratic rainfall generally commencing from mid-June and extending till mid-September. Occasional rainfall is also experienced during

¹ Source: Field GPS Readings

winters. Average rainfall in the District is ranging from 121.59 mm (2011) to 81.09 mm (2014).²

As per Census 2011, Maroda village consists of 156 households spread in an area of 300.34 ha with a population of 643 persons³. The major occupation of the village is rain fed agriculture. Due to erratic rainfall in the region, agriculture is becoming unremunerative leaving behind hardship for farmers to feed their family.

2. The Rationale for the Initiative

Hill and mountain habitats have five overarching specificities. They are: (i) inaccessibility, a product of altitude and terrain coupled with inadequate access infrastructure that hinder mobility, imposes isolation and “closeness”; (ii) fragility, a product of altitude, steep slopes, and other associated biophysical conditions that prevents higher intensity of land use, and limits both the physical and economic scope of input use; (iii) marginality, that results in limited and low payoff options and high cost of upgrading resources; (iv) diversity resulting from a high degree of spatial, temporal, physical and biological variability over short distances that at one level makes it difficult to achieve economies of scale but at the same time offers potential for higher productivity and specialization; and (v) niche which implies potential for products and services having a comparative advantage over the plains.⁴

Farmers from the village have migrated to urban areas or to the plains, which is a result of fragmentation of landholding and environmental degradation leading to water and fodder scarcity, impacting viability of agriculture and livestock related livelihood options that remain the mainstay of the hill economy. The families of farmers cultivate crops in limited area for just fulfilling their family needs resulting in increased area of fallow land in the region. Due to subsistence livelihood, migration and remittance economy operates in the region. Therefore, there is a need to develop and improve agricultural standards of the region, to enhance the livelihoods of the village community.

However, the landholdings of the farmers is fragmented and therefore not viable for commercial production as it requires more labor resulting in increased cost of cultivation. Further, since the agricultural fields are terraced, small, modern agricultural implements cannot be used. Thus, apart from focusing on increasing productivity, there is a need to aggregate the landholdings and take a common activity, which decreases the above mentioned challenges, supplement agricultural income and improves livelihood of the community.

² <http://hydro.imd.gov.in>

³ Census of India 2011

⁴ Source: W.S. Jodha, Mountain Perspectives and Policies, ICIMOD, 1999

In this direction, Integrated Livelihood Support Project (ILSP) was launched in the year 2012 but due to flash floods in 2013, the project actually started its activities in 2014 in the location post restructuring of the project. ILSP was launched in a participatory mode; the main objective of the project was to reduce poverty through developing livelihood of the villagers in the Micro Watershed (MWS) area. Under the project, community decides and plans the development activities to be carried out in the Gram Panchayat and they themselves implement the decided activities. At gram panchayat level, Gram Panchayat Watershed Development Plan (GPWDP) is prepared which enlists the different activities decided by the community and the budget allocated for each activity. Along with watershed activities, sustainable agriculture was given importance to increase livelihood options at producer group level. The community of Maroda Gram Panchayat proposed establishment of collective orchard of pomegranate through the project in the untended/abandoned lands of the village so as to develop an income generating source. The ILSP project team facilitated the community in taking forward the initiative by providing technical support and guidance.

3. Prevailing Issues

The hilly regions of Uttarakhand have certain key features that make it different from other Himalayan states of the country and highlight its potentials for development. In the hilly regions of the state, majority of the population resides in the rural areas. These hill rural areas offer tough working and living conditions for its inhabitants. The area does not provide conducive terrain for the development of industries or other sources of employment generation, resulting in the hill districts of the state having agriculture as their mainstay. The tough environmental and geographical remoteness of the hilly areas has pose challenges for the farmer. This has further led to the challenges for agriculture which is marked with problems of poor technology, lack of irrigation facilities, poor land structure and fragmented land holdings. Due to these problems, the agriculture in these areas is subsistence in nature. The major issues which prevail in these regions are mentioned as under:

1. Migration.
2. Increased man animal conflict.

3.1 Migration

Migration poses challenges in the rural areas resulting in risk of losing the younger, most vital and dynamic share of the workforce. As per the Census 2011, males constitute 42.77% of the population and females 57.23% and 11.82% of the population is under the age group of 0-6 years⁵. This clearly

shows that the village has more females than males. In another study, it is revealed that majority of the migrants from the households of Pabo Block are males⁶.

Pauri Garwhal is one of the districts in Uttarakhand which has shown negative growth rate but the urban growth rate in the district has registered in positive. (Source: Census of India 2011) which is indicative of decreasing trend of rural livelihood options. The decadal growth rate in Pauri has declined to negative 1.41%⁷ in 2011 as compared to census 2001. The detail of the growth pattern of the population in the district is shown in the table given below.

Table 1: Growth rate of Rural-Urban population in Uttarakhand during 2001-2011

District	Persons		Males		Females	
	Rural	Urban	Rural	Urban	Rural	Urban
Pauri Garhwal	-5.49	25.37	-5.02	19.20	24.88	41.69

Source: Dr. Prashant Kandari, 2013

These inferences clearly reveal that migration from the hill regions has been triggered from the villages and resulted in increase in area of fallow/barren land. Further, these untended lands are covered by resilient and invasive weeds and shrubs (such as Lantana and Parthenium) that are very difficult to clear. Such factors have caused a perceptible decline in agriculture, which is still the backbone of rural economy. According to the Ministry of Agriculture, Government of India, the net sown area in the state has declined by around 10% in 2013-14.

3.2 Increased Man Animal Conflicts

The tracts of untended land have given birth to another problem: increased Man-animal conflicts. There is a marked rise in incidences of conflicts with wild animals. Populations of wild boars and monkeys, too, have increased and have made farming more difficult. Adding to this, leopards have started descending the slopes and wandering into human settlements in search of food. The wild vegetation that has infested vacant farmlands is providing camouflage for leopards and the prey alike. As per a study conducted in Pauri Garwhal District, man animal conflicts have been recorded under high category between 900 and 1500 m altitudinal variations, and in Pauri district, Pabo block is the worst affected, it comes under high conflict zones based on severity and frequency of human and livestock kill by leopards. Under the study digital elevation model was re-classed into 30 classes at 100 m altitudinal intervals. Grids of 2X2 Kms were generated for entire Pauri district. Around

⁵ Census of India 2011

⁶ Source: Dr. Prashant Kandari, 2013

⁷ Census of India 2011

50% grids reported to have high human conflicts (Table 2) which clearly shows that 49.54%⁸ of area has witnessed human-leopard conflict. Grids are categorized as low, medium and high conflict zones.

Table 2: Zone wise Human-Leopard Conflicts in Pauri District

Categories	Number of Grids	Low Conflict Zone		Medium Conflict Zone		High Conflict Zone	
		No. of Grids	% Area	No. of Grids	% Area	No. of Grids	% Area
Human-Leopard conflict	109	19	17.43	36	33.03	54	49.54
Overall Conflict	1006	365	36.28	435	43.24	206	20.48

Source: International Journal of Science, Engineering and Technology Manoj Agarwal et al, 2016, Volume 4 Issue 2

As the area is covered with shrubs which are hiding places for the wild animals, the community proposed to restore these areas. Through the restoration of these barren lands the shrubs and resilient weeds are being removed and the hiding spaces for wild animals are being reduced. In addition, the area can sustainably be used for fruit cultivation.

4. Need of Collective Action

The landholdings in the hilly regions of Pauri district are fragmented and the landholdings are scattered in different small patches. The entire patch of area is not available as a contiguous area; therefore, there is a scope for collective community efforts for horticulture based interventions, and promotion of cluster based approach for such intervention. The selected area for the establishment of collective orchard was identified covering the barren lands of 80 farmers in the village.

This collective approach was needed to allow the village community to work together and reap the bulk harvest and provide a platform wherein they will be able to share their day to day chores. This initiative has helped in orchard establishment and land preparation activities in a collective manner, the work load on the field being divided equally amongst the land owners and community members.

Further, the collective farming had helped in marketing of the produce providing easy access for buyers and reach to the market. This will help in fetching good price for the harvest and provide a livelihood opportunity for community at village level itself.

⁸. Source: Manoj Agarwal et al, 2016, Volume 4 Issue 2

5. Why Pomegranate Orchard

The fruits grown in Uttarakhand have seasonal and location advantages as these crops mature at least three weeks earlier than in other temperate areas of the country i.e., Himachal Pradesh and Jammu and Kashmir. To implement the innovation various fruit crops were considered for cultivation which suits the temperate climate of the region. These included stone fruits, citrus and pomegranate. After several rounds of discussions between community and the MDT (Multi-Disciplinary Team) pomegranate cultivation was taken up because of the properties of the pomegranate mentioned below:

- A variety locally named as Dadim/Daru is commonly found in the area which is sour in taste, therefore, in place of Dadim, Bhagwa variety was selected for commercial purpose in the region, due to its sweeter taste and bigger size of fruit than Dadim variety.
- The pomegranate plant is robust in nature which suits rainfed condition of hilly regions.
- The plants are easy to propagate through vegetative propagation.
- Life cycle of pomegranate plant is upto 25 years.
- Early fruit bearing (3 year onwards after plantation) as compared to other fruit crops.
- It is an off-seasonal harvest in the prevailing climate of the region, which will fetch a good price to the farmers.
- Irrigation is required mainly at the time of fruit bearing stage.
- The plant requires average of 8 ltrs./day/plant of water during fruit bearing stage i.e. during Monsoon period in Uttarakhand (June September).
- Production per plant is 4-5 kg/plant of a 3-4 year plant which increases to 20-25 Kg/plant after 9-10 years of the age of plant.
- Shelf life of pomegranate is more as compared to other fruit crops grown in Uttarakhand.

6. Strategies Adopted in Implementation of Innovation

Under the project a series of activities were carried out to implement the pilot project in the MWS areas. In this direction, village community with support of ILSP Multi Disciplinary Team initiated the Pilot Project and started it from May 2015 in Bhandaru hamlet of Maroda Gram Panchayat (Pabo Development Block) in Pauri District. Collective orchard of Pomegranate was established in 8 ha barren land in the village. This is the first innovative initiative under collective farming by community that is being carried out in such a large scale in the region. With the active efforts of the community, plantation of 2000 pomegranate saplings was done in the month of August 2015. The steps taken to implement the innovation are mentioned below:

6.1 Problem Identification

After inception of integrated livelihood support project to implement participatory watershed development component, a series of participatory rural appraisal (PRA) exercises were carried out to identify the different problems, issues and possibilities in Natural Resource Management (NRM), agriculture and other village based interventions with the help of community. During the PRA (Participatory Rural Appraisal) exercises, it was found that the agricultural land was depleting and there was increase in the barren land.

Farmers generally grow staple food crops for own consumption, the vast majority of farmers do not reach self-sufficiency. Farmers also indicated that they normally grew sufficient grain and pulses for about three to four months consumption and had to rely on remittances or wages from the Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS).

Further, farmers also claimed that they have two main issues that prevent better yields: low and erratic rainfall, and wild animals. Farmers complained that they are losing half of their crops to wild animals such as wild boars, deer species etc.

6.2 Community Mobilization and Decision Making

The village Gram Pradhan, Mr. Prabhudayal Singh, took the lead to start the initiative in his Village Panchayat, in the month of April 2015. Community members joined in to implement the initiative in the month of June 2015.

6.3 Identification of Site and Beneficiaries

A hamlet named as Bhandaru Tok is situated in Maroda Gram Panchayat covering an area of 8.00 ha. The area, about a decade ago, was a major

producer of cereals and traditional millets but as mentioned earlier the whole land in the hamlet has now turned into barren. The particular area belongs to 80 families of Maroda Village. The suggestion of site and beneficiary selection was carried out with the help of Gram Panchayat and the community. The farmers were selected on the basis of contiguous patch of land. Second criterion of selection was need based. The farmers who intended to take up the initiative were prioritized.

6.4 Layout

The layout design was prepared by community with facilitation of MDT team of ILSP. Pits were dug having a depth of 60-70 cm at a spacing of 5X5 mts. The planting distances recommended are 4 x 4 meters or 5 x 5 meters. Through proper training and pruning of the trees, these distances provide sufficient free space for inter culture operations. There was better air circulation and also better interception of sunlight.

6.5 Land Preparation

The entire patch of land was covered with shrubs of Lantana and Parthenium and other weed species; it took the community 8 days to clear the entire area under the leadership of Gram Pradhan. Pits were dug at a spacing of 5 X 5 mts. for pomegranate saplings.

6.6 Manuring

The farm yard manure was applied in the dugout pits. After that fertilizer single super phosphate was applied. Also insecticide was applied to prevent the growth of ants and termites were applied before planting of the saplings.

6.7 Planting Material

Community placed the demand for 2000 saplings of Bhagwa variety (Tissue Culture plant) of pomegranate for the plantation. ILSP MDT team facilitated the procurement of saplings.

Table 3: Characteristics of the Bhagwa Variety of Pomegranate

Name of variety	Breeding method	Parentage	Important characters
Bhagwa	Hybridization	Ganesh X Guleshah Red	Attractive red rind, arils – bold size, red and sweet. Released by MPKV, Rahuri, The average fruit size is 400 Grams.

6.8 Mulching

Since the area was barren inter-cultural activities were difficult. Therefore post plantation weeding and maintenance was an issue in the orchard. To avoid these issues 100 micron thick mulching sheet of 60X60 cm was provided for each plant. This helped in:

- Reducing labor cost for weeding.
- Reducing the weed problem in 60X60 cm. area around the plants.
- Increasing and retaining the soil moisture level by reducing evapotranspiration, which will help the plant growth especially during dry season.

6.9 Plantation

In the month of August 2015 the plantation of 2000 sapling of pomegranate of Variety Bhagwa (High quality tissue culture plant) was carried out under technical supervision and guidance of MDT of the ILSP project.

6.10 Irrigation

Water was collected from available perennial water source which was located 900 mtrs away from the project area. High Density Polyethylene (HDPE) pipelines were used to collect the water from the source to the Low density Polyethylene (LDPE) tanks which were constructed at different locations of the collective orchard in order to serve water for irrigation to the entire 8 ha area. MDT team of ILSP demonstrated the collection of water from this source.

With this effort community has supplementary irrigation facility for entire farm, and also have the 75000 liters harvested water in 3 LDPE tanks. To increase water use efficiency, the project provided low cost gravity based drip irrigation system to the collective orchard site, so that the community could understand and know about the comparative advantage of new technologies over the traditional irrigation system.

6.11 Skill Development

To enhance the capacity of the community, onsite training for pruning was carried out which has provided an increased capacity of the community in taking field activities on Pomegranate Plantation.

6.12 Watch and Ward

With an equal community and project contribution watch and ward activity is also carried out. In order to support and increase the community's efforts to reap a good harvest, the project provided barbed wire fencing for the prevention of damage to the plantation from wild boars and other animals. Community is successfully taking care and maintaining the collective orchard.

7. Outcomes

The pilot project was initiated with an objective to provide a livelihood opportunity to the community therefore the outcomes of the initiative were well set before the initiation of the project which are mentioned as below:-

- Reuse of cultivable wasteland
- A new option of Agro based livelihood in wasteland
- Collective farming will increase cooperative essence among community
- Low risk of Man-Animal conflicts
- Easy to impart technical inputs
- Subsistence farming to commercial farming
- Collective marketing with help of community based organizations
- Increase in biomass of watershed area; therefore help in mitigating climate change
- Increase in other livelihood activities- transport, packaging material, value addition, seasonal labour requirement

8. Institutions Involved

The Uttarakhand Watershed Development Unit (UWDU) through Government of Uttarakhand has received a credit from International Fund for Agriculture Development (IFAD LOAN -856-IN) for implementation of Integrated Livelihoods Support Project, (ILSP) for the period of 2012 to 2019 but due to natural calamities the project started in 2014 and which is now upgraded till 2021. The UWDU is PIA for Project Component -2: Participatory Watershed Development.

Under the Integrated Livelihood Support Project, PSWMD (Project Society, Watershed Management Directorate) has the responsibility for implementing component-2 (i.e. Participatory Watershed Development). To implement component-2, Watershed Management Directorate (WMD) is using processes that have been established through a series of watershed development projects in the state, but with an increased focus on food security, livelihoods

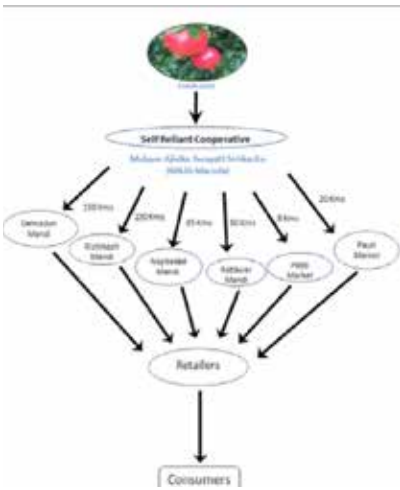
and market linkages. The project will protect and improve the productive potential of the natural resources in selected watersheds, alongside the promotion of sustainable agriculture with formation of PGs and LCs, and with improved access to markets.

9. Market Linkage

Integrated Livelihood Support Project initiated the identification of the market potential for the agricultural and horticultural produce with other watershed activities to enhance the livelihood opportunities of the marginal farmers under the project component Access to Market. Maroda Gram Panchayat is one of the 6 Gram Panchayat of Bidoli MWS where in 62 producer groups have been formed having 7223 member farmers with support of the project. Further a cooperative society was registered under the Self Reliant Cooperative Act 2003 named “Molyyar Ajivika Swayatta Sehkarita Maroda” for supporting the market linkage activities for agricultural and horticultural produce for the area. Molyyar Ajivika Swayatta Sehkarita has already started the collection, grading, value addition activities from past one year from different producer groups of Bidoli MWS.

Farmers from the different producer groups are the board of members in the Cooperative Society. They have responsibility for management as well as business activities carried out by the Cooperative Society. The proposed supply chain for pomegranate is shown in the figure below:

Figure 2: Proposed Supply Chain for Pomegranate from Maroda Gram Panchayat



Source: Market Survey

10. Sustainability & Replication of Innovation

This pilot project was the collective orchard in the region; viewing the successful orchard development, farmers from different villages visited the orchard and showed their interest in developing the collective orchard in their villages too. As a result this year, 26 ha of barren land have been brought under collective orchard development and establishment with the help of community participation. Considering the hill state's climatic conditions, walnut is another such fruit which has various advantages like:

- It is less susceptible to damage from wild animals
- It requires less irrigation
- Walnut has long shelf life; prompt marketing is not a need

Therefore, after the successful initiation of pilot of pomegranate plantation in Maroda Gram Panchayat other communities has shown interest for plantation of walnut under the same model, in response to this plantation of walnut has been carried out in 10 ha of barren land in two gram panchayats, namely Maroda and Ulli.

Table 4: Details of Established Collective Orchards in FY 2015-16

S. No.	Name of activity	Gram Panchayat	Area (Ha)	No. of Beneficiaries	Estimated harvest after 3 years(kg)	Estimated harvest after 6 year(kg)
1	Collective Pomegranate Plantation	Maroda	8.00	80	6000	
2	Collective Plantation of Walnut	Maroda	5.00	34	-	1750
3	Collective Plantation Walnut	Ulli	5.00	38	-	1750
4	Collective Pomegranate Plantation	Bidoli (Chula)	2.00	14	2400	
5	Collective Pomegranate Plantation	Masso Masshetha	3.00	23	3600	
6	Collective Pomegranate Plantation	Masso Thapliyal	3.00	28	3600	
TOTAL			26.00	217	15600	3500

In the table 4, the estimated production after 3 years of plantation of pomegranate will be around 15 tons which is estimated to fetch an amount of about Rs 12.48 Lacs. at the rate of 80 Rs/Kg. This will help enhance the livelihood of the member farmers.

11. Conclusion

This initiative is an achievement as the community members have come together and initiated the process to earn and enhance their livelihoods.

Agriculture in hilly regions of Uttarakhand is mainly rainfed, besides small and fragmented land holdings, which are posing a serious threat to entire agrarian economy of the hill districts of Uttarakhand. This model of collective orchard farming in the abandoned land is an example for the entire state. Through this model of collective farming the threats of climate risk and non availability of labourers for farm operations will be drastically reduced.

There is a need of timely intervention from institutions like State Agriculture Universities (SAUs), International Council of Agriculture Research (ICAR) institutions, State Agriculture Department and other NGOs which is essentially required to keep farmers and their families to continue horticulture/agriculture not thinking of migration from their ancestral homes.

The process has begun in earnest but the mere production of pomegranate and walnut is not sufficient for the growth of livelihood. The community is also thinking of developing processing units at the Gram Panchayat Level, which will help them fetch more income. In the meanwhile, the MASS (Molyaar Ajjivika Swayatt Sehkarita)-Maroda is establishing its business and supporting in marketing of the farmers produce, on their path to self-sufficiency.

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The Mendha-Lekha Village Model of Sustainable Development Involving Sharing of Common Resources for Rural Transformation - A Case Study of The Experiences of a Tribal Village in India

M.V.Ashok & P.L. Kulkarni

1. Background

Mendha (Lekha) is a group of three villages falling under the administration of a single Gram Sabha (village assembly), situated in the predominantly tribal district of Gadchiroli in Maharashtra. Mendha-Lekha is located 30 km from the district headquarters and is spread over two small and closely situated *tolas* (hamlets). The total area of the village is estimated at 1900 hectares. Nearly 80 per cent of this area is forested. There are approximately 400 people in the village, largely without any class and caste hierarchies. The entire population is composed of the Gond tribe, which has ruled and inhabited the surrounding forests since time immemorial. The livelihood of the villagers is heavily dependent on subsistence farming and on the forests, which provide a range of food, fuel, timber and fodder. The average landholding is five acres. The major source of income is from the collection of non-timber forest produce (NTFP) and daily wages from labour work with government and private agencies. About two decades ago, the village was facing problems of unemployment, drunkenness, corruption by government officials and exploitation by traders and moneylenders. Approximately 80 per cent is under forest cover, a figure that is the highest in the state and is among the highest in India.

2. Towards Community Conservation

The story goes back to the late 1970s when the State Government of Madhya Pradesh state of India proposed a major hydroelectric project in Bastar district of the state. The proposed project would have displaced tribals of not only Bastar district but some tribal areas of adjoining areas of Maharashtra state.

The tribals of these areas came together under the banner of Jungle Bachao, Manav Bachao Andolan (Save Forests, Save Humans Movement). This movement spread to the Gadchiroli district of Maharashtra also. Faced with stiff resistance, the project was finally abandoned. The movement for 'self-rule' in Mendha (Lekha) was initiated by Mohan Hirabai Hiralal, a prominent activist of the Jungle Bachao, Manav Bachao Andolan, and Devaji Topa, the then Sarpanch (Village Head). They realized the importance of information and transparency in their movement towards 'self-rule'. And, therefore, as a first step, they got hold of all official documents relating to the village. They gave the slogan: Dilli Mumbait Amche Sarkar, Amchya Gawat Amhich Sarkar (Our representatives are the government in Delhi and Bombay and we are the government in our village).

In the early 1980s, the villagers started movement towards 'self-rule'. Production, sale and consumption of liquor was banned and equal status for women and revival of traditional village institutions were emphasized. Through protracted struggle against unnecessary government interference and assiduous efforts, Mendha (Lekha) has been able to attain self-reliance in terms of primary education, forest protection, etc. Mendha (Lekha) has a gram sabha (village assembly) consisting of all adult members of the village (a male and a female from each family). All decisions are unanimously taken by the gram sabha. All outside agencies (government officials, independent researchers and NGOs) intending to carry out activities in the village have to seek permission of the gram sabha. The villagers also constituted the 'Van Suraksha Samiti' (VSS) or Forest

Protection Committee comprising the Gram Sabha and some forest officials. The VSS frames rules and regulations for the use and protection of forest, punishments for violators and grants permission to outside agencies to carry out their activities in the forest, etc. Mendha (Lekha) is also the first village with standing natural forest to have come under the Joint Forest Management (JFM) in Maharashtra. About 1,800 hectares were brought under the JFM in Mendha (Lekha). They have also formed a Mahila Mandal (women's council) which mainly deals with saving schemes and improving the status of women in the village. The Mahila Mandal is also responsible for the implementation of liquor prohibition and any other responsibility that the gram sabha may entrust it with. With the help of outside agencies, the villagers have also formed abhyas gats (study circles) which act as informal forums for free and frank discussions on various issues ranging from immediate village problems to forest and wildlife conservation. These study circles are informal groups which assemble whenever need arises and help the gram sabha and the VSS in the process of informed decision-making.

Thus, Mendha (Lekha) has scored enormous successes on many fronts. Today the villagers have unhindered access to the forests subject to certain regulations and permission of the gram sabha; the Forest Department is allowed to extract only non-timber forest produce (NTFP) and bamboo under the JFM. The villagers draw up their own schemes and seek government help only in their implementation; for example, the villagers decided to dig three community wells for which the government provided grant. The village charges a fee for all outside and commercial activities allowed inside the village by the gram sabha; and the funds raised in this way go into a village bank account. The village fund is used for carrying out developmental activities in the village and for providing loans to needy people. The village has also built up a well-stocked granary which provides security against hunger. It is interesting to note that the villagers have successfully laid claim to preferential treatment in all daily wage works created by the government agencies in the village and adjoining forests. They have also been able to start some cottage industry in the village. The village has 15 cow dung based gas plants (All disputes are amicably settled in the gram sabha and they have succeeded in implementing total prohibition in the village. Women have power of veto on the decisions taken by the gram sabha; this testifies to improvement in the status of women.

Mendha (Lekha) is an outstanding example of experiment in ‘self-rule’ without undue interference from governmental institutions and without dependence upon outside funding to carry out developmental activities. Mendha had started witnessing the fruition of grass-roots democracy through ordinary people’s initiatives long before Panchayati Raj got a fillip with the 74th amendment in 1996. Besides these outstanding cases of alternative developmental initiatives which are well documented and thoroughly studied, there are numerous others which are underreported and not so thoroughly investigated. Below we briefly look at some such cases.

3. Village Institutions Managing Forest-Related Issues

In Mendha, the movement towards self-rule and protection of the surrounding forests in the late 1980s led to the creation of three key village institutions.

3.1 The *gram sabha* (GS)

The village council for Mendha is called the *gram sabha* (GS). In the past, village elders took most decisions. However, through the village discussions that took place during the late 1980s movement towards self-rule, a decision was reached to constitute a village-level decision-making body. The GS was

created, and is responsible for all village-level decisions including those related to natural resource use and management. It was agreed that the GS would use a consensus process for decision-making, and that these decisions would prevail over any government or other decisions. The GS initiated the move towards self-rule by acquiring factual, legal and political information about the village including various revenue and customary use documents. The move initially faced strong opposition from officials but villagers eventually succeeded in acquiring every important document. The GS is composed of at least two adult members (one male and one female) from each Mendha household. All adult members of the village can attend the meetings. The GS has its own office and an office administrator maintains the records of all meetings organized in the village. It meets once a month and issues are discussed and revisited, if necessary until a consensus is reached. On average, about 75 per cent of the members attend GS meetings, with equal participation from men and women. In 1999, a decision was taken to declare a traditional holiday on days when the GS is convening to make it possible for the maximum number of people to participate. Outsiders (including government, industry, NGO representatives, etc.) are occasionally invited to discuss their plans and programmes with the villagers. The GS also functions as a dispute resolution body for small village-level disputes. For larger conflicts, a meeting of elders from 32 surrounding tribal villages is called. The GS also decides what activities will be assigned to other village institutions based on interests, responsibilities and capacities.

The GS is responsible for the following forest-related decisions and activities:

- Carrying out watershed development in the forest
- Holding discussions on forest use activities and other issues such as forest fires and soil erosion from the forests
- Formulating forest protection rules and ensuring adherence to these rules
- Selecting representatives for the official *van suraksha samiti* (see the Joint
- Forest Management programme below)
- Delegating responsibilities for forest protection
- Handling NTFP extraction and trade-related issues

In carrying out these decisions and activities, the GS works with forest department staff. Most often, these will be the local forester and two guards who are directly responsible for the forests falling within Mendha village boundaries. The GS can also interact with the four forestry officers who oversee these three functionaries. The GS has also registered itself as an NGO, the Village Management and Development Organization. In this role, the GS carries out a number of village *Gram sabha* meetings, Mendha Lekha development and welfare activities. It focuses on equitably distributing the

costs and benefits of development projects and programmes amongst the villagers. The GS has also been a strong force in coordinating the efforts of many government departments and NGOs wanting to offer various forestry protection or development programmes. So far, the GS has deliberately avoided receiving major external funds, unless originating from government programmes targeted for the region. Each member of the GS donates 10 per cent of her or his wages to the GS corpus fund from their employment generated through the GS. Any money left over from GS projects or programmes also goes into the fund. In addition, any donations or payments made by visitors go into the fund. The GS now has its own account in a local bank, and uses a unique accounting system that spreads the responsibility and accountability for withdrawing and spending money among many villagers. Mendha (Lekha) village is a pioneer in many ways. A look at certain decisions/ actions initiated by the Gram Sabha of Mendha village is necessary to get a proper insight into the high level of mobilization, commitment and awareness among the villagers. Some of the initiatives are as under:

- Gram Sabha of Mendha village has obtained a PAN (Permanent Index Number and TAN (Tax Deduction Number) of the Income Tax Department of Government of India) in its name and has got VAT (Value Added Tax) registration also of the Income Tax Department of the Government of India. All activities are taken up in the name of the Gram Sabha. It complies with all legal and statutory formalities including payment of taxes.
- Mendha Lekha is probably the first village implementing the Government of India scheme for employment guarantee called Mahatma Gandhi National Rural Employment Guarantee Assistance (MNREGA) through the Gram Sabha.
- The village has a rule wherein every villager contributes 10% of his/ her income to the village fund.
- The Gram Sabha comprises of every adult member of the village. Since all works are done in the name of the Gram Sabha, they have nominated a few individuals to shoulder the responsibility of implementing different works/ activities. These nominations are of temporary nature.
- The Village has opened different bank accounts for different programmes/works and each has a set of nominated persons to oversee the implementation and operate the bank accounts. The accounts maintained are: MGNREGA , Bamboo activity, Forest Protection Committee (Receipts from Forest Dep't towards plantation work, nursery, etc. Forest Rights A/c (Receipts from Forest Dep't, Nyay Samiti (For depositing fines levied by Tanta Mukti Samiti (Conflict Resolution Committee), Grain Bank, etc.
- The Nyay Samiti is for resolving fights/ quarrels between / among villagers.

Grain Bank (Dhanya kosh) – every villager/ farmer has to contribute 2.5 % of his agriculture produce to the grain bank. The grains are used for supply to poor, needy (including those affected by failed monsoon), during marriage in the family, etc as may be decided by the Gram Sabha. If the grains are returned within a year, no interest is levied. For time taken beyond one year, the villager has to return additional quantity of grains (around 3 to 4%).

- All villagers who are nominated to various committees do the work on voluntary basis.
- Only those who exclusively work for the Gram Sabha for more than 8 hours a day earn an honorarium of Rs. 150/- per day.

3.2 The Mahila Mandal (MM)

Mahila Mandal is an association of all women in the village (of all ages and classes) who are members. The MM meets periodically and the President of the MM is chosen at every meeting for that meeting. Often the GS meetings also work as MM meetings. Forest related activities carried out by the MM are:

- Regular monitoring of the forests;
- Punishing those who breach forest protection rules.

3.3 The Abhyas Gats (AG)

The AbhyasGat is a study circle which operates as an informal gathering of people. Meetings are convened as and when desired for discussions on any issue. Outsiders are sometimes specially invited if the village wants some specific information or desires debate on a certain issue. These dialogues have helped the villagers develop their conversation skills, increase their awareness of the outside world, learn about their rights and responsibilities, and obtain important inputs and information which help them take informed decisions at GS meetings. In turn, outsiders have gained insights into village life and the process of village self-rule. For example, discussions initiated by outsiders at the AG significantly helped the village overcome the problem of encroachments on forest land. Discussions in the AG have also been focusing about the negative impacts of fire and hunting on the ecosystem. Frequently, the AG members establish smaller, specialized study circles to pursue particular issues and research (e.g., bird and habitat inventories, honey extraction).

The *gram sabha* often interacts with other key village-level administrative structure, the village *panchayat*. The *panchayat* is an executive council of elected representatives from one village or a group of villages. It works with the government administration and the judiciary. In most government

schemes and programmes the elected *panchayat* is responsible for receiving funds and implementing projects. The *panchayat* for Mendha is composed of the elected members from Mendha and two other adjoining villages. In 1999, a decision was taken by these three villages to select rather than elect their members to the *panchayat*. By doing so they hoped to eliminate the corruption involved in the election procedure. The selection has to be unanimous and the process takes place in an open meeting where Villagers trying to identify birds found in their forest the merits of each candidate are discussed freely.

4. Establishment of Forest Protection Activities

Efforts towards forest protection started in 1987 through various discussions in the *gram sabha*. Several decisions were taken, including:

- All domestic requirements of the village would be met from the surrounding forests without paying any fee to the government or bribes to the local staff.
- Approval of a set of rules for sustainable extraction.
- No outsider, including governmental, would be allowed to carry out any forest use activities without the permission of the *gram sabha*. If someone was caught doing so, the material would be seized by the village and the offender would have to accept any punishment decided by the village.
- No commercial exploitation of the forests, except for NTFP, would be allowed.
- The villagers would regularly patrol the forest.
- The villagers would regulate the amount of resources they could extract and the times during which they could extract resources from the forests.

To implement these and other minor decisions regulating extraction, an unofficial *van suraksha samiti* (forest protection committee, see below) was formulated, including at least two members from each household in the village. Originally, a procedure for collecting fines from those who did not adhere to the village forest protection rules was established, but this failed to work because people did not want the responsibility of collecting fines and, most often, fines were not paid. As a result, the system for applying sanctions to Mendha village members became one of peer pressure, creating family shame and social ostracism. In the commercial sector, the *gram sabha*—representing a strong and united village opposition to forest practices and revenue sharing—succeeded in stopping the timber industry’s bamboo and teak extraction from the late 1980s/early 90s. Mendha villagers speak proudly of the fact that the forests now ‘belong’ to them, and that they have implemented effective forest protection activities. Indeed, despite the state’s 1992 declaration of 1900 hectares of the customary zone of the village as Reserve Forests, the villagers continue to view the entire area as their forest and include it in their activities governing regulated use and protection.

4.1 Establishment of the Joint Forest Management Programme

The efforts of the villagers at forest protection were not initially recognized in official circles. However, in 1992 an opportunity arrived to remedy this when the Maharashtra state adopted the Joint Forest Management (JFM) resolution. In general, the JFM scheme envisages the handing over of degraded lands and forests to villagers for raising valuable timber species. Plantations are created and valuable forests regenerated, with the forest department and villagers jointly responsible for forest management. After 5–10 years, valuable timber is harvested and local villagers involved in forest protection are entitled to receive up to 50 percent of the revenue generated. The scheme, however, was not applicable for districts like Gadchiroli where most of the forests were still close canopy natural forests. Since Mendha's forests were healthy standing forests, the government did not plan on creating plantations for revenue generation, and there were no guidelines for benefit sharing for standing forests. The villagers, however, persistently demanded that they be included in the JFM scheme, pointing out that they should not be punished for protecting their forests thus far. With the help of some supportive forest officials, the villagers succeeded, and they entered into a JFM agreement in 1992. Subsequently, an official *van suraksha samiti* (VSS)⁴ was formed and Mendha became the first village with standing forests in the state—and one of the few in India—to be brought under the JFM scheme. After the introduction of the JFM programme, the villagers discussed the scheme in greater detail with outside experts. Subsequently, the villagers managed to bring in many provisions that were not usually within the mandate of the JFM resolution. These included meeting the actual needs

of the villagers and not interfering with the rules set out by the villagers for controlling the extraction of resources from the forest. Thus, the rules (some written, but most unwritten) followed by the villagers are a mixture of what the official resolution states and what the villagers have decided.

4.2 Forest Protection Committee (FPC)

Mendha was the first village to be brought under the JFM scheme. The villagers managed to bring in many provisions that were not usually within the mandate of the JFM resolution. These included meeting the actual needs of the villagers and not interfering with the rules set out by the villagers for controlling the extraction of resources from the forest. Thus, the rules (some written, but most unwritten) followed by the villagers are a mixture of what the official resolution states and what the villagers have decided. The villagers constituted a Forest Protection Committee (FPC) for carrying out the following forest-related activities:

- All domestic requirements of the village would be met from the surrounding forests without paying any fee to the government or bribes to the local staff.
- Approval of a set of rules for sustainable extraction.
- No outsider, including governmental, would be allowed to carry out any forest use activities without the permission of the Gram Sabha. If someone was caught doing so, the material would be seized by the village and the offender would have to accept any punishment decided by the village.
- No commercial exploitation of the forests, except for NTFP, would be allowed.
- The villagers would regularly patrol the forest.
- The villagers regulate the amount of resources they should extract and the times during which they could extract resources from the forests.
- For ensuring adherence to the village forest protection rules, a system of peer pressure, creating family shame and social ostracism is adopted.
- Appointing an official firewatcher in the village

5. Present Forest-based Employment and Livelihood Opportunities

After the village initiative towards forest protection started in the late 1980s, all outside commercial activities in the forest were stopped. Beginning in 1994, the forest department designed a Forest Working Micro-plan for Mendha village. Despite limited involvement of the villagers, the *gram sabha* did discuss and accept joint bamboo extraction by the forest department and the villagers. The micro-plan has been in operation since 1997-8, ending an almost decade-long ban on commercial extraction from forests (except for NTFP). The following are the present-day forest based employment and livelihood opportunities for Mendha villagers:

- Food: There is substantial dependence on the forest for food, including honey, roots, fruits, mushrooms, bamboo shoots, fresh leaves, and hunting for wild meat.
- Under the JFM agreement with the forest department, the villagers have the first right to any daily wage employment for forestry works in the surrounding forests. These activities include bamboo extraction and plantation of forest species.
- Non-violent honey extraction and specialized marketing.
- Fuelwood: Permission from the VSS is required for each cartload. As per the village rules collection Bamboo grove harvested under JFM, of only dry wood is allowed, with some exceptions for collecting green branches. Currently, biogas plants are being constructed in the village to reduce the dependence on firewood.

- Timber and bamboo: For household needs, collected from the surrounding forests as usufruct rights. Bamboo is a vital material in the villagers' lives.
- Fodder for livestock: Each family owns about 5-6 heads of livestock on an average. Rearing of livestock is for both consumption and sale. Cattle depend entirely on the forests for fodder. Cattle dung, as manure for the fields, is an important added incentive to maintain livestock.
- NTFP: Collection for domestic consumption and for sale. Food and commodities are sourced from various species' flowers, fruits and leaves.

Mendha Lekha has two major achievements in the form of implementing

MGNREGA and undertaking auction of Bamboo. Though the process was initiated much earlier, MGNREGA implementation was actually taken up (allowed to be taken up) for the first time in December 2012 while bamboo auctioning is being done since 2010-11. A total of six villages including Mendha, have taken up sale of bamboo through auction by the Gram Sabha. Mendha village is doing it since last two years. Besides for a livelihood the other activity is collection of Tendu leaves (an important Non Forest Timber produce) which are purchased by traders.

6. Social Impacts

The following are some important social impacts of the village initiative towards self-rule and forest protection:

- Increased empowerment by striving and achieving the capacity and confidence to assert their rights and reaching a stage where the village is respected even in official circles. Today all government and nongovernment people come to the village (if they need to), instead of calling the villagers to their offices. They sit with them and converse with them on equal terms and often in their language.
- Inclusion in decision-making processes.
- Established a reliable reputation as effective partners in development and forest protection. Through a non-violent strategy Mendha has established strong and good relationships with many government officials, who in turn have helped them at many crucial points.
- Established informal yet strong institutional bodies. The village has initiated a democratic and transparent process of informed decisionmaking and implementation, which creates clarity in understanding and collaboration in community effort.
- Stronger equity: They have created almost equal participation of all villagers in the process of decision-making, including women and the poor;

- Inspired others: The village effort has set an example for many surrounding villages, which have a lower economic status. Many villages have begun to work towards the same model of fostering self-reliance and a better quality of life.
- Managed financial transactions with confidence: The GS has its own bank account and manages it well.
- Strengthened livelihood security to all: The GS tries to ensure basic economic security to all villagers through access to forest resources or other employment opportunities, including forest based industry like honey and other NTFP collection.
- Strengthened inter-departmental coordination and cooperation among various government agencies.

Villagers have achieved inter-agency coordination and cooperation among all line agencies functional in their area. For example, the *gram sabha* organized joint meetings of representatives of all the government functionaries in the area with the villagers. These meetings facilitated a face-to-face dialogue among these agencies and resulted in a pooling together of otherwise segregated resources for certain developmental activities in the village.

While earlier there was a strong opposition to Mendha and its efforts at self-rule and forest protection in surrounding areas, a visit in 2004 found the situation quite transformed. Adjoining villages such as Lekha and Tukum are now trying to follow in the footsteps of Mendha. Despite a multi-community society, Lekha village now meets regularly and discusses issues related to village development as well as forest conservation.

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Driven by Sustainability, How One Organization Radically Transformed Itself – The MASS Success Story

Harveen Kour

1. Background

Idukki is a small district of Kerala and a cradle for plantation crops. The district has an area of 4,479 km² and is the second largest district of Kerala (the largest being Palakkad). Rugged mountains and forests cover about 97 percent of the total area of the District. There is only a strip of Middle land (3% of the area) in the western part of the district and low land area is totally absent in the district. There are no rail and air-linksto the district and it is only accessible by road. The region has a hilly terrain with forest cover. The overall topography creates problems of accessibility as well as lack of irrigation making huge portion of land unsuitable for cultivation.

With 51.7%¹ of the area being under cultivation, agriculture is still a predominant part of the economy and the largest employer in the district supplemented by dairy. The total population of Idukki is 1,108,974 out of which the working population is 415,947.² 85,723 of this population are cultivators and 112,391 are agricultural labourers. Hence, 47.6% of the working population and 17.8% of the total population is associated with agriculture in one way or another.

The climatic conditions in this region allow for cultivation of tea, coffee, rubber, coconut, cardamom and other spices. 90,000 hectares of land is under various cash crops. Mainly, the region has small and marginal farmers. Most of whom are tribal villagers who were an insular community and did not mingle with other people. They had a non-democratic community who only obeyed the word of the 'Moopan', the tribal chief. Many families living in this region are isolated from urban India with few communication and uneven Ghatroad links. There was no electricity, telephone connection, community hall and education facilities.

However, in high land areas some corporates have large tea plantations. Several progressive farmers of the district have also started taking up floriculture, mushroom cultivation, medicinal plants, spices etc..

1 Kerala State Planning Board, Government of Kerala (2016) Sourced from: <<http://spb.kerala.gov.in/index.php/district-profile-idukki.html>> Accessed on 17 Sep 2016.

2 District Administration, Idukki. Sourced from: <<http://idukki.nic.in/occupations.htm>> Accessed on 18 Sep 2016.

3 Ibid.

4 Ibid.

2. The Issues

Small-scale agriculture in this region has been largely unorganized. In the early 2000's, farmers were in serious economic trap due to lack of buyers to procure their product in time, lack of knowledge of market rates as well as exploitation by middlemen. They were dependent on receiving the prices from domestic village based traders and had no direct market linkages. The region faced climate change related challenges with reduced rains and changing weather patterns. Farmers had to deal with issues of drying and processing spices during rainy seasons especially due to lack of adequate storage facilities which often led to produce being spoilt. Decrease in yields of spices was occurring due to decreased pollination.

Low price realisation, vulnerability to price fluctuations, high market insecurities were a cause of worry to farmers because of income insecurity. These financial uncertainties deeply affected the lives of the farmers. They were thus often forced to sell their products at low rates and got caught in debt traps paying huge interests on loans. Farming was becoming increasingly a non-profitable business and the farmers were on the verge of suicide.

The region was also known for rampant use of chemical pesticides which had been affecting the health of generations of farmers apart from having damaging effects on the environment. While initial chemical use led to high yields as compared to organic farming, the farmers were spending significant percentage of their earnings at hospitals as they slowly became afflicted with chronic and terminal illnesses like cancer and asthma. Over a period of time, the natural soil fertility was lost which further led to lowering the productivity of the crops.

3. The Genesis

What the farmers needed then was a fair price for their products and a sustainable way of production to enhance soil fertility which would thereby improve productivity and their health. In 2001, forty farmers producing coffee, cocoa and other spices from Kottayam in Kerala, India led by Bijumon Kurian came together to form Manarcadu Social Service Society (MASS), a cooperative community organization. The story of MASS indeed begins with his vision to support the farming community for better livelihood through sustainable production. Slowly but steadily under his leadership, MASS has delved into other agricultural related aspects as well in order to become a strong farming community that it is today.

MASS is a farmer led organization which began with a group of ambitious farmers who wanted to support their community in adapting sustainable agricultural practices, increase market access and improve their livelihoods.

MASS farmers came together to jointly address the various issues plaguing the farming community and kick-started the organic movement aimed at providing safe food in the region. Principles of empowerment are deeply engrained in the organization, as its genesis was an absolute grassroots movement that brought like-minded farmers together. Right from the beginning their focus was on sustainable means of production not because of any market demand but because of deep commitment of the farmers and the leadership to produce in a sustainable manner. These farmers were supported by the company Plantrich which was already engaged in organic production and export.



MASS comprises of various smallholder farmer representatives with average land size of 1.6 hectares per farmer with 889 hectares of area under production. 20% of the membership comprises of women. MASS is growing 100% organic Robusta coffee Parchment i.e. wet-processed, Robusta Cherry (dry-processed), Arabica (wet-processed) and Arabica Cherry (dry-processed). The coffee quality is mild and low acidity with exotic full-bodied taste and fine aroma. In addition, the members of MASS currently produce cocoa, cinnamon, black pepper, white pepper, vanilla, cardamom, cloves, nutmeg, ginger, turmeric, coconut and pineapple. Producers farm in the deep jungle, in fertile soils, using traditional farming practices.

4. Mass As A Successful Business Enterprise

In the initial years MASS faced several uncertainties and challenges. There was some degree of reluctance among farmers to move to organic production due to fear of low productivity and lack of awareness on sustainable production methodologies. They also received threats from local middle men who were also the ones who sold the fertilizers to the farmers. The formation of cooperative would lead to a stronger bargaining power for the farmers which the middlemen wanted to thwart. Implementation of organic standards as well as fair trade⁵ standards at the field level required extensive training on various concepts which required financial support which was not adequately available. Lack of finance was also affecting timely procurement of the harvest, quality improvement of processed products, adherence to quality while scaling up and adequate provision of inputs to farmers.

The farmers were also unsure of how a democratic set up could be implemented in the farmer community and how it could be made

⁵ Following Reynolds (2014: 499), we refer to 'fair trade' as the overall movement, while 'Fairtrade' refers to the certification and labelling system overseen by Fairtrade International.

functional. It required time and effort to create a participative and decision making environment. Streamlining marketing efforts in the face of lack of financial back-up, difficult logistics and non-availability of latest processing technologies were other such issues that MASS had to address to be run as an effective business organization. But working together they were able to handle these challenges effectively.

Over the years, MASS has steadily and consistently taken innovative steps and evolved as a successful business enterprise. It is important to note that the success of MASS as a strong and competitive business enterprise today has been due to the initiative of its leadership and a stable and efficient second tier of management that is running the operations smoothly and professionally. Several strategic decisions taken by the leadership have yielded multi-fold benefits for the cooperative and the individual farmers. MASS has focussed on vision oriented projects and growth of the cooperative and brought about significant changes in the economy and day-to-day life of the farmers.

Farmers have benefitted from production bonus; access to modern agricultural equipment which has enabled an increase in the productivity & quality; getting trained by technical experts to enhance productivity of their produce; group certification programmes for organic and Fairtrade certification; access to good quality seeds & seedlings at subsidized rates; scholarships for their children's future education; health check-up camps; procurement of agricultural produce from the farm gate and support through Plant doctor service for their production issues.

4.1 Organization and Governance

MASS farmers are clustered in different areas and each local cluster is governed by an elected group. There are also subcommittees in place in different project areas. They organize monthly meetings and take democratic decisions especially on matters like investment of Fairtrade Premium thereby creating an ownership for the organization. The model has been quite successful in creating a strong second layer of management which has contributed to its growth and has increased the participation of youth and women in subcommittees as well as enabled them to take leadership roles.

The implementation of decisions is operated by a seven-member Board of Directors who are democratically elected from different sub committees once in three years. They include the President, Vice President, Secretary, Treasurer and three Board members. All the statutory, financial, policy and Fairtrade developmental plans are decided at the General body meeting held every year at the headquarters. Every year, the Annual General Body meeting

(AGM) is conducted at the headquarters at Manarcadu for one whole day. Members participate from different subcommittee levels. The notice with annual report is sent to the member farmers 21 days before the meeting. Most of the time in the AGM is utilised for discussions and collective decisions. The AGM collectively discusses about the financial aspects, Fairtrade premium utilisation, and subsequent year Fairtrade premium plans. Once the AGM majority approves all the discussed points, the projects are rolled out. The election to the Board of Directors takes place every three years.

4.2 Supporting Farmers and Grassroots Voices

As a farmer cooperative which supports sustainable livelihoods of the members, the cooperative keeps only 2% of the profit towards running expenses and the majority of the price differences are paid back to the members it self. In order to instil confidence in the organization, 'Jaivashree' a bi-monthly newsletter was started which has given space to the farming community to voice its concerns and issues. The cooperative runs a 'Plant Doctor' service to support the entire farming community with systematic advice on organic farming, issues that the crops face and climate change adaptation measures.

4.3 Sustainability and Organic Agriculture

MASS got organic certification in 2006. The cooperative follows principles of reducing waste, recycling and implementing energy-efficient projects. MASS is focussing on developing environment friendly agri-inputs for the promotion of sustainable agriculture and creating awareness among farmers on how organic and fair trade certifications can help in creating sustainable and profitable farming systems. Farmers are using biogas technology and 'vermi-compost' (worm composting) on their farms, which converts into bio-energy for meeting the household energy requirements. MASS has set up an Organic Bio Training Centre in Santhigram, Idukki District which apart from supporting farmers runs awareness programmes to educate the farmers about the harmful effects of using chemicals and pesticides. It is also attracting many bio-tourists.

4.4 Fair Trade

In 2006, the group was motivated to get Fairtrade certified due to an assurance of market, Fairtrade minimum price and additional Fairtrade Premium which would help in improving the livelihoods of farmers. In 2009, MASS embarked on its Fairtrade journey to help small-scale and poor farmers. They developed their organization according to Fairtrade standards and got certified.



The Fairtrade Standards are designed to tackle poverty and empower producers. The key objectives of the standards are to ensure that producers receive prices that cover their costs of sustainable production; provide an additional Fairtrade Premium which can be invested in projects that enhance social, economic and environmental development; facilitate long-term trading partnerships; enable greater producer control; set clear future direction to ensure that the conditions of production and trade are socially, economically fair and environmentally responsible⁶. While in the beginning the farmers under Fairtrade certification were only 345, now 1495 farmers are under Fairtrade certification. At the organization's general assembly, farmers have been jointly deciding on several Fairtrade Premium projects in order to improve their business and their communities based on local priorities to tackle the uncertainties that they faced. For example, they have invested the Fairtrade Premium in a programme to supply organic manure and pesticides to increase productivity. The group also has UTZ certification.

4.5 Quality And Productivity Improvement

Crop rehabilitation, crop renovation and soil conservation exercises have been undertaken to improve the productivity and quality of the crops. MASS distributed seeds of turmeric and ginger, and more than 100,000 cocoa seedlings under a Fairtrade premium project to improve the productivity of the crops. It has also started a pilot study to improve the productivity and quality of coffee as the quality of coffee from India is considered quite low in the international markets because of which the coffee farmers are not getting enough returns as per the investments.



4.6 Training and Capacity Building

Considerable investments have been made in training the farmers in regards to quality improvements, production enhancement, plant protection, cultivation and harvesting methods of various products as well as climate change adaptation. The capacity building programme was accelerated 2010 onward when the cooperative started investing the Fairtrade Premium. They now have several trained lead farmers including women who run capacity building programmes in the sub-committee levels on a bi-monthly basis in different areas. There has also been a special focus on building capacity among women farmers with a hope to attract more female farmers to join the cooperative. Many women have become part of the Board as well.

⁶ Sourced from: Fairtrade International, Accessed on 14th August 2016 from: <<http://www.fairtrade.net/standards/aims-of-fairtrade-standards.html>>

4.7 Social Initiatives

MASS is taking up several development activities for member farmers concerning financial, social and cultural aspects. As most of the cooperative's farmers live in highland areas which lack proper medical facilities, MASS provides a health insurance scheme for 600 farmers and runs 'pop-up' clinics. MASS have awarded full scholarships to gifted children. A proportion of the Fairtrade Premium also goes into a fund to help farmers pay for their children's educational costs. The cooperative has invested Fairtrade Premiums in a project to construct small ponds on farmers' land so they could conserve water.

4.8 Fostering Relationships with Traders and Stakeholders

The group has consistently focussed on fostering trader relationships for organic and fair trade products since 2008. This has helped in creating long term partnerships with farms and has boosted the growth of MASS. The cooperative is actively working with local NGOs and a government programme to promote organic farming in the region.

4.9 Branding and Market Linkages

Various endeavours focused towards building a brand for MASS has enabled it to make direct exports and drive direct market linkages. The group has been quite sensitive to meeting market requirements and has pro-actively started adapting to international needs. For example, while they had a strong market presence for the Robusta coffee that they were already producing, they effectively responded to the international demand for good quality Arabica coffee as well. MASS made concerted efforts and got its own brand 'Caffee de mass' registered in the year 2015 and started marketing coffee products in the domestic market through a chain of coffee shops called 'Café de Monde'. These are early days for MASS's brand efforts and this will enable it to penetrate the domestic market and create consumer recognition. .

4.10 Infrastructure Development

As the cooperative has grown, the organization has invested in cooperative infrastructure in terms of coffee processing equipment and upgrading the regional networks. They have purchased vehicles, weighing equipment and a coffee huller. They have set up 15 farmer-driven collection and knowledge centres and implemented other energy-saving equipment to make their process as efficient as possible. MASS set up improved infrastructure for processing, solar drying of spices and storage. A cocoa fermentation unit was



established at Manathore, Kottayam District (Kerala) with a capacity of ten tonnes of cocoa beans per day which provided employment for ten workers including three women. To improve the quality of the coffee pulping, Fairtrade Premium was used to set up a pulping and processing centre at Idukki and from the year 2015 onwards coffee is being pulped at the centre. It also has a bio-research centre with a capacity of 6 MT for daily cocoa fermenting, coffee pulping and 10000 square feet of drying yard and poly house as well as mechanical drying.

4.11 IT Based Initiatives

MASS has developed a tab-based web application for conducting the internal inspection of the member farmers to avoid clerical mistakes, to make a paper free office, and for 100% traceability for procurements in the future. Different applications for group messaging systems are being used for effective communication among the staff and lead farmers. A toll free number has been implemented for the services of 'plant doctor' which helps the member farmers to address pest and disease related issues in farming.

4.12 Establishment of International Sustainability Academy (ISA)

MASS has established ISA, the first-of-its-kind sustainability education initiative in Idukki. Several of their founders are pioneering sustainability practitioners in India. The goal of this academy is to churn out sustainable professionals and sustainability entrepreneurs so that they can seamlessly integrate sustainability into businesses, livelihoods and daily lives of the communities. It provides sustainability certification and grooms participants for professions such as Chief Sustainability Officer, Sustainability Auditors, Supply Chain Manager, Plantation Manager, Certification Manager and other such employment options. They have created courses that mix theory and practice making the learning an experiential process. Sustainability elements are so engrained in MASS that even this campus is eco-friendly along with an incubator farm which runs on renewable energy. The ISA campus situated at Idinjama in the Western Ghats, which is one of the top 25 bio-diversity hotspots of the world. It is a project area of MASS & students have access to many community farms and sustainable projects during their course period.

5. Key Results Achieved

With the advent of sustainable agricultural practices, organic and fair trade certifications, a fair price has been ensured to the farmers. This has also attracted more and more farmers to join MASS as it has been successful in eliminating middle men involvement in the supply chain and ensured a fair price for the farmers.

5.1 Increase in Turnover

MASS which was once a small group with weak negotiating power, weak trader and market linkages with lack of means to adapt to international standards came a long way. With more than ten diverse products MASS started supplying to Germany, Netherlands, Switzerland, UK and the Middle-East markets.

The organic and fair trade business of MASS grew from 20.6 million (2.06 crores) INR in the year 2008-2009 to 135 million (13.5 crores) INR in the year 2015-16. 90% of these earnings were from sale of produce. MASS has not received any donations so far and is self-sufficient. Its profits have increased from INR 5000 in the year 2006 to the current INR 1.12 lakh in the year 2015. With the advent of Fairtrade certification, the export volumes of MASS substantially increased. The products of small member farmers were successfully marketed in the national and international markets. From 181 MT of Fairtrade sale of spices, coffee cocoa in 2011 to 600 MT in 2015-16. From a turnover of a few hundred thousand (lakhs) in 2008, MASS crossed business of about 150 million INR (15 crores) in the FY 2015-16. This has resulted in good premium returns to farmers for their projects which has been fully utilized for the developmental activities of members.

5.2 Strong Farmer Community

With its own processing centre, MASS has built a strong farmer community and gained goodwill in the national markets. They now have 20 men and 15 women farmers to support various field level activities. Due to the proper management and conduct of the general assembly so far, MASS is running as a democratic organisation with collective decision making processes which is supporting the growth of MASS. Given MASS's long experience in sustainable agriculture production, the Government of Kerala State Horticulture Mission selected them to adapt, implement and certify 3750 ha land as organic in various districts in Kerala in a period of three years.

5.3 Influence Onmarket Prices

Due to sustainable production methods, Fair Trade Certification and a business outlook that has benefited more than 3000 farmers, MASS has reached a level where it influences the market price of certain organic products like cocoa and black pepper.

5.4 Fairtrade Premium Projects

After the first year of certification, MASS received a premium of 20,700 INR which has grown to 44 million (4 Crores) INR by 2015. Fairtrade Premium was one of the key enabling factors in MASS's growth as a business organisation and provision of sustainable livelihood of member farmers.

Fairtrade premium projects have been used to supply seeds, organic inputs, family health insurance to members, cash to aged farmers, education scholarships to children, infrastructure investments in terms of processing, eco-friendly pulping for coffee, cocoa quality upgradation through box fermentation, processing of fresh products under mechanical drying system at bio research centre, mobile lab to check quality of the products and soil. Many such successful premium projects have led to the success of MASS that it is now in a position to extend support for farmers' socio-economic development.



5.5 Quality and Productivity Improvement

The ginger and turmeric quality and productivity has improved considerably. The quality of the cocoa beans has also improved to an extent that is ready for the export market.

5.6 Traceability

The use of modern technology and IT initiatives has enabled MASS to establish farmer level traceability. This has also helped in easy regulation of the certification systems.

5.7 Women Empowerment

Role of women in farming was often side lined and they had no participation in various forums or meetings. The focus of MASS on women participation and leadership development has led to a shift from traditional roles of women as mothers and homemakers.

5.8 International Recognition

MASS was internationally acknowledged in 2014 at Fairtrade International's General Assembly in Bonn, Germany, as one of the most successful producer organizations from the Asia Pacific region.

6. Way Forward

Today, MASS is a strong cooperative community of organic and Fairtrade farmers with a total membership of 3000 farmers, 1690 of whom are Fairtrade-certified. With aspirations soaring high, the members of the farmer groups through a collective decision making process formulated a vision 2020 statement and a 2022 plan. The aim is to reach a farmer strength of 5000 members from all over Kerala and reach 300 million (30 Crore) INR financial turnover and a target of 60 million (6 crores) INR for Fairtrade Premium. MASS aims to launch online E-centres to support and coordinate with farmers from remote areas for the projects. This centre will facilitate various government schemes for farmers related to procurement and E-medical Check-up service to the farmers in the rural areas. MASS is actively working on domestic market development for spices and organic vegetables under the brand name "Only Organic" in the domestic market.

MASS farmers have come a long way in the last 16 years. Following their model many small farmers can transform their lives.

Promoting Sustainable Agriculture, Agroforestry and Livelihood Enhancement in Thar Desert, Rajasthan

*Apurva Bhandari, Preeti Aggarwal, Kanupriya Bhagat,
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1. Background

In the western part of Rajasthan State lies the extensive Thar Desert - which is covered in rolling dunes of sand for almost its whole expanse. It is noted that the annual precipitation in the north-eastern part of Thar is 200 mm to 300 mm; where, it has dry fauna with temporary vegetation during rainy seasons. However, in other regions of the Thar Desert, the amount of precipitation and vegetation continues to decline further. Due to this situation, the local residents rear pasture animals and grow single crop during rainy season. Being an arid area, the rainfall varies each year and income is not stable. Further, the residents are socially isolated as they reside in nearly 500 villages scattered around the desert with limited communication and road connectivity. Moreover, the desertification is noted to increase exponentially (JICA, 2003¹); which, impacts existence of several villages and makes its infrastructure severely fragile.

Agriculture of the region has been adversely affected due to erratic rainfall, desertification and decreasing arability of existing soil. Sankalp Taru (ST) Foundation recognized the need to work with rural communities to slow down on-going desertification and provide sustainable means of livelihood. ST Foundation are pioneers in creating socio- environmental impact in the areas identified as critical based on their self- sustainable and livelihood supportive ecosystem models. In this case study, a collective action model that integrates rural farmers, village panchayat and government schools was proposed and implemented amongst the village communities of Barmer district of Thar Desert, Rajasthan. It is important to note that success of project was dependent on engaging these key stakeholders, as the land for planting trees would be provided by them. Therefore, there was critical need for equally involving them in key decision making processes – beginning from selection of trees species, identification of beneficiaries and project monitoring. Further, it was emphasised that planted trees should thrive and survive, making it critical to engage the community in nurturing and upkeep of planted trees. A strong engagement with these entities would ensure

1. JICA, 2003. India Afforestation and Pasture Development Project Along Indira Gandhi Canal. Field study report. Accessible at: https://www.jica.go.jp/english/our_work/evaluation/oda_loan/post/2004/pdf/2-41_full.pdf

development of enthusiastic and self-sustainable model, resulting in higher survival rate of trees typically in the tune of more than 95%.

ST started this project with an aim of improving local ecological and socioeconomic conditions of rural population in Barmer region. The programme was designed to improve local livelihood option by increasing production of fruits, firewood and fodder along with conservation of biodiversity by planting native species. This would aid in converting barren land into viable livelihood options and thereby contribute in alleviation of poverty in the desert region of western Rajasthan State region.

Broadly, these can be segregated in two categories of goals:

a) Environmental goals:

- Increase green cover in rural areas of Barmer, Rajasthan, compared to baseline areas
- Increase the biodiversity index of the study region by planting native tree species
- Optimize available water resource and promote adoption of sustainable agricultural practices

b) Socio-economic goals:

- Improve livelihood of marginal farmers by identifying agro-forestry based livelihood options
- Identify ways and means of using barren land to earn livelihood
- Promote women empowerment in rural areas by promoting tree plantation and maintenance
- Engage youth and students in tree plantation activities and promote environmental education in local government schools

2. The Operational Model

ST, with support of local community and corporate donors, adopted following operational model to promote successful adoption of sustainable agriculture and agro-forestry in Barmer district, Thar Desert, Rajasthan for livelihood enhancement of marginal farmers:

Community plantation: ST Foundation plant trees in community (Panchayat) land and create an ecosystem involving community members who help in growing and nurturing trees in long term. Through this model, a community forest is developed to promote bio-diversity by planting native

species and to create a natural habitat and empower women by improving their livelihoods by training them on producing allied agro products

- a) **Rural livelihood support programme:** Under this approach, ST Foundation plant trees in farmers' land in rural areas, where ST works with the farmers and provides them with fully grown fruit bearing saplings, micro-drip irrigation system and other planting material. ST Foundation trains beneficiaries on sustainable farming methods giving rise to sustainable and engaging programme in long term. Once grown, these medicinal and fruit bearing trees act as source of livelihood for the beneficiaries
- b) **Clean and Green school programmes:** In this model, trees are planted inside the school campus. School students and teachers are involved in the plantation activity and use interventions such as workshops, educational movies, practical training to achieve a self-sustaining ecosystem. They develop a sense of responsibility among school community so that they nurture planted trees in long term.

3. Interventions

ST aimed to achieve its objectives by using agro-forestry techniques with large consensus and participation of the benefiting community, including rural farmers, panchayat and students. This was identified as key to achieve higher survival rates of planted tree sapling in the region under consideration. Following intervention areas have been adopted by ST.

3.1 Agro-forestry

According to Food and Agriculture Organization (FAO, 2015²), agro-forestry is defined as “a land use management system in which trees or shrubs are grown around or among crops or pasture land. It combines shrubs and trees in agricultural and forestry technologies to create more diverse, productive, profitable, healthy, ecologically sound, and sustainable land-use systems”.

In case of arid climate, it can play a significant role in mitigating the effect of variable and harsh climatic conditions that continue to impact crop production. It was identified that through successful adoption of agro-forestry techniques, the soil fertility can be raised, followed by improvement in crop growth and achieving sustainable production of food, animal fodder, fuel, and several other products for day-to-day utilization on farms like compost, medicine etc. In addition, the productivity is assured even in periods of persistent drought and famines that are not infrequent in these dry regions. According to recent report by Tewari and Singh (2006³), agro-forestry can aid

2. JICA, 2003. India Afforestation and Pasture Development Project Along Indira Gandhi Canal. Field study report. Accessible at: https://www.jica.go.jp/english/our_work/evaluation/oda_loan/post/2004/pdf/2-41_full.pdf

3. <http://www.fao.org/forestry/agroforestry/80338/en/>

in increasing production of food due to i) introduction of fruit and fodder producing trees and ii) increased soil fertility resulting from the organic matter produced by deciduous tree organs. It is important to note that more products and services provide opportunities of higher income and reduce dependence on high doses of fertilizers and other subsistence products.

During the project, following interventions were proposed by ST for agroforestry:

1. Focused group discussions and awareness drive to encourage horticulture based farming. Through these, farmers and community members were encouraged to plant pomegranate and pear saplings.
2. Tissue culture saplings (TC) were introduced in rural farm and community land. The plant tissue culture technique involves development of mature plant cells under sterile conditions and its replantation in actual field later on. It is widely used method to produce clones of a plant and offers certain advantages over traditional methods of propagation. It is noted that these plants can generate high yield, have a low gestation period, are resistant to diseases and are easier to transport, making this a revolutionary idea as it encourages high participation and enthusiasm amongst the farmers.
3. Farmers in most parts of Rajasthan have to cope with severe water deficit and degraded land prone to rapid top layer depletion because of intensive cultivation. The soils could not retain moisture and were deficient in soil nutrients and organic matter. Therefore, through micro drip irrigation systems, ST ensured sustainable use of water and fertilizer. Drip irrigation is a form of irrigation that saves water and fertilizer by allowing water to drip slowly and directly to the roots of many different plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. At ST high quality micro drip irrigation systems by Jain Irrigation System is used that can sustain the arid conditions of the region, again encouraging higher participation and enthusiasm amongst the farmers.
4. ST interacted and consulted with prominent agronomists in India to develop an in-depth understanding of the geographic and socioeconomic condition of region to aid successful delivery in later stages. Under their guidance, ST is able to include research-based interventions, which develop and sustain the local ecology of the area. One such intervention is intercropping, where farmer's plant pulses in-between pomegranate and pear saplings. These fast growing pulses help farmers survive economically till their plants gestation period is over (2-3 years).
5. The approach adopted by the Foundation is that of *permaculture* (or *agroforestry*), in which ST provides well-grown fruit bearing saplings, fertilizers and pesticides to the farmers. Maintenance of trees is

undertaken by the farmer owning the land and they are regularly advised and monitored by ST's on-ground representatives. The beneficiaries enjoy sustainable returns and gain horticultural skills.

3.2 Community Involvement

Emphasis on community involvement is laid during programme development, as ST believes that higher community involvement would result in higher survival rate of trees. Following steps are taken to plant trees and involve community members in key decision-making processes of the programme.

A need-assessment survey is conducted before deciding if the area is suitable for plantation. This survey assesses the land area, distance from major cities and roadways, land fertility, project complexity and community participation expectations

Community meetings/farmer meetings are conducted where the idea of afforestation is conveyed to the locals. This process plays a key role in determining if the project will be successful on ground as equal participation from the community is expected.

After creating excitement amongst the locals, the following steps are taken:

Step 1- Identification of Land

After the initial discussion, interested farmers and panchayat heads join hands with ST to conduct afforestation programme for a duration of 2-3 years. The beneficiaries are carefully selected using a set criterion to maximize socio-environmental impact of the programme. Their suggestions along with ST's technical support pan out the next steps of the programme. Resources are leveraged mutually from both parties to make this model sustainable. ST works on a co-investment model where 10% of monetary investment comes from the farmers while the remaining is invested by ST. Through this approach ST has continued support throughout the programme as farmers engage in nurturing the plants till their gestation period is over and they can enjoy the fruits of their harvest.

Step 2- Selection of species

Fast growing, native species with high productivity are recommended for restoring the lands in order to increase productivity and enrich biodiversity. ST also proposes to engage local community members in the selection of species. Based on the analysis of existing vegetation in the area, ST proposes to plant certain species of trees that are suitable to grow in the terrain. However, to produce fodder for livestock they also propose to plant Khejri (botanical name - *Prosopis cineraria*) trees. Khejri is also considered a religious plant in the area whose growth would generates good will in the

community and helps execute the project smoothly. They intend to procure grown saplings (more than 1.5 years old) to maintain a healthy survival rate and quick growth. These saplings are procured from the local nurseries, creating good will in the local community and minimising transport cost.

Step 3- Plantation programme

ST carries out the project in Build Grow Transfer (BGT) model, where ST will develop the site, plant saplings, maintain the planted block with the farmers for agreed upon period (preferably for 2-3 years) and transfer the developed green block to local community/farmer. In order to create rural employment, ST also employs resources from the local community to carry out plantation and post plantation care. They also undertake fencing of the planted block and engage/mobilize locals to ensure further protection-making the entire plantation process community driven. Along with this, ST also conducts community programmes throughout the duration of the programme. Through these interactive workshops, farmers are taught about latest and organic farming techniques while training them on making their own fertilizers like vermin-compost. These workshops are another way of connecting with the community and creating a self-sustaining ecosystem where locals take responsibility of the trees and their protection.

Step 4- Clean and Green School programme

As mentioned above, community involvement is key factor in making this programme successful. Through the Clean and Green programme, ST connects with students and teachers and promote greenery while using interventions such as workshops, educational movies and practical training to create a healthy ecosystem. They try to develop a sense of responsibility among school community so that they nurture planted trees in long term. ST believes they are shaping young minds of tomorrow while connecting with the entire local community including students.

4. Proposed Innovations

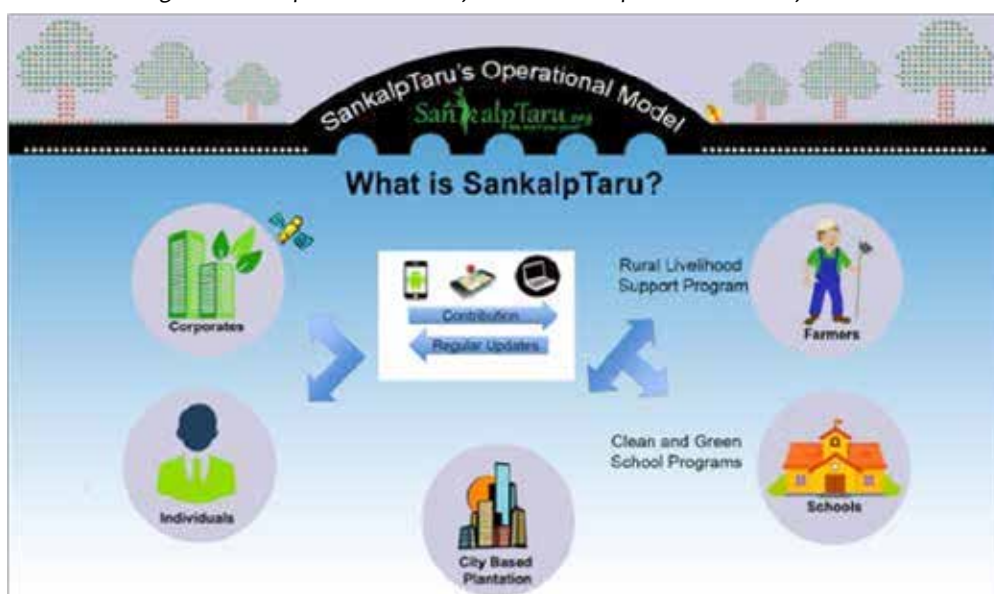
4.1. IT Framework

ST aspires to bring transparency and visibility to the whole plantation programme. An online portal and a mobile application (ST G-1 application that can be found on Google Play Store) were developed to enable individuals and corporate participation in community plantation projects. These portals aimed at channelizing the support from key stakeholders by providing a transparent and user-friendly platform where survival of trees can be tracked using a GPS tracker.

It can be noted that a live dashboard enables donor partners to effectively manage their CSR programmes. ST's unique mobile application module further enables rural ground operations team to capture photos and GPS coordinates of the planted trees and share instantly with the respective planters from the village itself using a 2G mobile phone network. While adopting ICT brings more transparency, visibility, excitement and automation to the whole process, our operational excellence ensures higher survival rates of planted trees.

The key features of ST's IT framework for individual and corporate donors have been underlined below:

Figure 1: SankalpTaru Online Platform Connects Sponsors and Beneficiaries

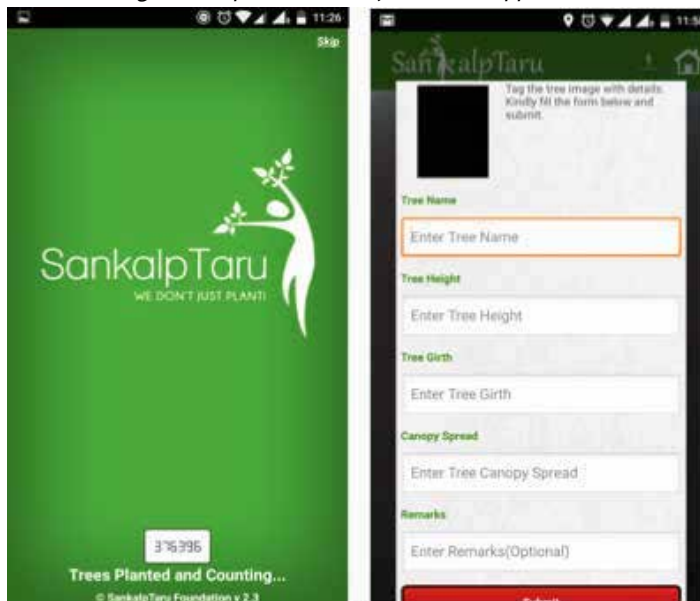


Individual planters (Application Users)

- Individuals across globe can conveniently make significant contributions planting trees at any of our project locations with just a few taps and clicks on their mobile phones or desktops. They can plant an E-tree in a virtual forest using phones and computers, through 'ST G1' application; while an actual tree would be planted on ground in a rural village supporting livelihood of marginal beneficiary or supporting community as a whole.
- Individuals can wish, gift, greet, celebrate or commemorate by planting trees.
- It provides opportunity for building connection with community linked with the on-ground live tree plantation

- Individuals will receive regular notifications regarding the trees planted via emails. One can locate, visit and even navigate to their trees on Google maps plug in.

Figure 2: Representation of the ST G-1 Application



- Provide an estimate of Carbon footprint saving by the individual and help in fulfilling an individual's carbon footprint projects On ground application team (Application Users)
- Every time an E-tree is planted by a user, ST's on-ground crew team deployed at the project location receives a notification on his phone, which has ST G1 application installed. A tree is then planted on ground by the programme beneficiaries or students, depending upon the project location and socio-environmental theme of the location
- User friendly platform which enables on-ground team to easily upload photographs and videos of activity
- Automated updates to participant via emails provide transparency, clarity and closeness to the planter far away.
- Through the application, the on- ground team provides regular post plantation updates to the planter.

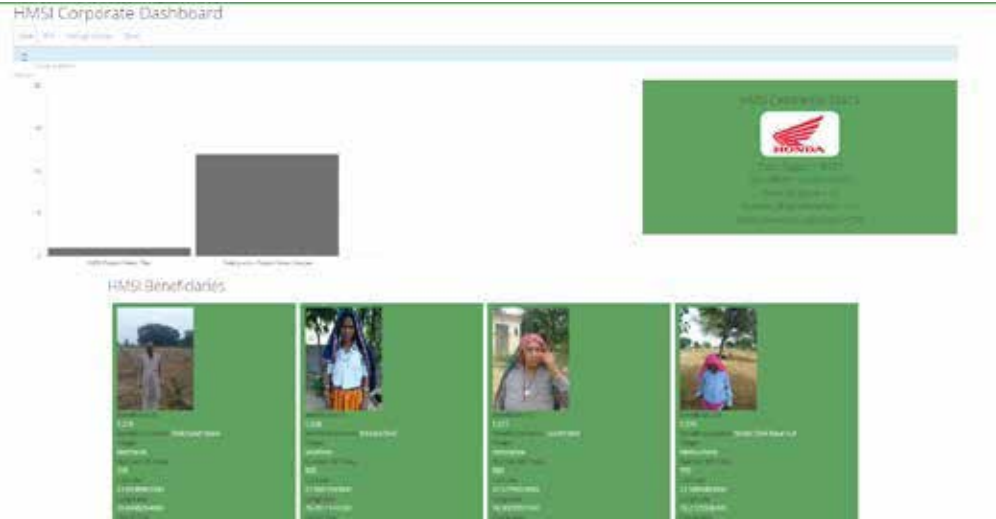
For corporate sponsors such as ATC TIPL (Viom Networks), Google, Honda etc., the trees are photographed and tagged on the same application and the information is uploaded to the corporate's mini forest (Figure 4). The link is later shared with the sponsor who can now view and track the status of their programme.

ST also offers dashboard system to track, report and manage these plantation programmes. These efforts not only bring in transparency but also provide convenience to corporate sponsors to monitor the plantation programmes.

Figure 3: Representation of virtual forest



Figure 4: Corporate Dashboard to Track Planted Trees and Beneficiaries



4.2 Innovative Water Management Techniques

Given the severe water deficit in the area, several cheap and innovative water management techniques are used to rejuvenate water table and promote efficient usage of water:

Introduction of micro-drip irrigation system

Drip irrigation saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly to the root zone, through a network of valves, pipes, tubing, and emitters. This method is chosen instead of surface irrigation for various reasons, often including concern about minimizing evaporation and optimizing water usage. As Barmer experiences shortage of water and high temperature, using drip irrigation systems promotes higher survival rates of plants

Gravity run drip irrigation System

A gravity fed irrigation system is a cheap effective way to provide water for smaller crop areas. The basic system is very simple consisting of an elevated reservoir with a pipe coming out the bottom that feeds water into a basic drip irrigation system that is all controlled by hand. This makes for a popular choice, as it is affordable for marginal farmers with no additional electricity cost attached to it.

Harvesting rainwater from school rooftops

Another effective and low cost innovation is rain water harvesting from school rooftops, which catch rainwater and store it in underground or above-ground tanks for later use. One way to collect water is rooftop rainwater harvesting, where any suitable roof surface can be used to intercept the flow of rainwater in combination with gutters and downpipes (made from PVC in this area) to provide schools with water. This model was implemented in schools where Clean and Green programme were conducted and it generated successful results. Through this they were able to collect water for irrigation and domestic purposes.

Solar powered bore wells

Given the extreme temperature and prolonged hours of direct sunlight, solar power bore wells were a success in Barmer. The solar water pumping system is capable of running all types of electrical water pumps with applications varying from irrigation to household demands, we use these pumps to draw water from the bore-well and irrigate the fields using drip irrigation.

5. Impact – Triple Bottom Line Approach

ST has been instrumental in going beyond a typical tree plantation programme and creates multiple benefits to the environment, village

community including farmers and school students. St has developed a customized impact assessment matrix in close-ended questionnaire format to estimate Environmental, Social and Economic impacts of the intervention (Annexure I) and summarized in subsequent sections.

5.1 Environmental Impact

Plantation programmes have been developed to meet the needs of farmers and with the main objective of protecting biodiversity.

- Environmental sustainability is achieved by planting various native species which increases the biodiversity index. Increase in green cover enhances the growth of natural eco-system creating a natural habitat attracting wildlife species. In addition to increasing the green cover, the project aims at stimulating a community participation driven ecosystem which works towards nurturing plant species, restoring and managing the forest block without disturbing the natural vegetation.
- Topographically, problems associated with water conservation and land deterioration are high. Barren land which remained un-utilized for years, served as a source to restore/rejuvenate the water table as trees helps in maintaining the soil moisture leading to lesser evaporation.
- To overcome the problem of managing water resources, technical and management strategies were developed. Water bodies were rejuvenated by improving the catchment area to harvest rain water which could be further used for livelihood activities including irrigation.

Table 1: Impact

Environmental Impact	Year 2016
No. of Trees planted	100,000
No. of plant species planted	50+
Water bodies revived	4
No. of green schools	110+
Barren land greened	120 hectares

Mechanism to track environmental impact

The IT platform helped ST to track real time environmental impact as trees are geo-tagged.

5.2 Social Impact

ST's multi-facet approach revolves around creating a wide social impact which goes beyond a typical plantation programme adding benefits to the

communities. The green belting project has brought numerous advantages to the biodiversity of the entire region, and the local populations has not only economically benefitted but also have secured livelihood by being engaged in long term employment and sustainability.

Rural employments have always been a social and economic problem. With increased focus on community participation ST has been able to successfully create a self-sustaining eco-system where every villager feels responsible to take care of the plantation blocks.

The increase in agricultural activity by implying the identified agroforestry techniques has created more employment opportunities and alleviation of poverty.

The beneficiary screening processes have always given marginal farmers first preference; bringing maximum socio-economic impact. Given the social obligations, women empowerment has been generated promoting gender equality as they are now allowed to work in their own farms and community and help generate additional income for their families.

The Clean and Green school programme running under ST's ward has been quite successful as well. There is an improved participation from students in nurturing trees planted in their campuses. Eco-clubs have been formed consisting of students and teachers, Maru Vatika (Desert Garden) have been developed where students take lot of interest to grow and nurture desert species

Table 2: Social Impact

Social Impact	Year 2016
No. of farmer beneficiaries	200
No. of family members supported	1000
Students engaged	10,000

5.3 Economic Impact

With ST's focus on agro forestry based plantations, they ensure a good income generation source for the rural beneficiaries. An average family in the Indian arid zone comprises of 7 to 8 members with large land holdings and livestock heads. Although traditional land use systems like mixed cropping, agro forestry are common, the land use system in the arid zone of Barmer, Rajasthan have evolved under different socio-economic and cultural set up.

- Farmers predominantly grow Bajra, a rain fed crop for just 4 months and earn from its yield. To provide extra source of income to the small and marginal farmers, through agro forestry and horticultural techniques, fruit bearing saplings (pomegranate) were provided to the farmers. The fruit production generated another source of livelihood.
- Through agro forestry techniques, ST was able to increase green cover in Barmer by planting 100,000 trees of native origin while increasing green cover by 120 hectares. By providing micro-drip irrigation systems and by optimizing water usage, more barren land was brought under irrigated cultivation than otherwise possible. The afforestation programme has increased productivity of pulses and vegetables as intercropping techniques are used; allowing multiple harvests of grain and fruits which were otherwise not possible.
- Training on intercropping, organic farming, composting and cultivation of non-timber based forest products (such as Fodder cake of babool and neem, Ayurveda products made of neem) were also given, so farmers were able to practice integrated farming while producing supplementary products to support their livelihoods. In community based plantation, these fodder cakes were also used to increase milk production in cattle and generate additional income.

The project provided a windbreak and a more acceptable and enjoyable ambience for living. The afforestation project has contributed positively towards increased income generation and employment. The success of the project has also been acknowledged by the Indian Institute of Corporate

Affairs under the SD-CSSRR programme 2014-2015 “Community plantation project at Thar Desert”. Also, it made a notable increase in annual collective income of INR 33 million.

In addition, impacts in Thar Desert have been exhaustively covered by print media.

The national agency working on corporate responsibility and governance, Indian Institute of Corporate Affairs (IICA), has continued to support ST’s work:

6. Challenges

Similar to any development projects, this project was also initially affected by several challenges during pre-and on-ground implementation. These were mainly related to reforestation goals, site characteristics, factors limiting survival and growth, appropriate species and genetic source, proper planting tools, and the best out planting season etc. During the planning and implementation phase, appropriate steps were taken to control following

challenges and promote afforestation in the study area. The key challenges have been summarized below:

- Barmer is an arid, drought prone area with acute water shortage, making scarcity of water the biggest challenge while promoting afforestation projects. The district receives just 270-300 mm of rain annually, which is spread roughly across 15 days. Hence, to retain this water and overcome water scarcity challenges, ST promoted adoption of robust rainwater harvesting techniques to store rainwater for domestic and irrigation purposes.
- Extreme temperatures in Barmer also attract insects and pests, such as termite that are present in large quantities owing to easy infestation in wooden material in arid environment. It is observed that these termites can cause substantial damage to grasses, shrubs, trees and crops, which will render a huge economic impact on marginal farmers. Therefore, there is a need for appropriate scientific/technical interventions that aims to educate locals for adopting appropriate preventive and curative actions.
- Increasing green cover by involving local community in planting trees using agro-forestry techniques was a challenge initially, owing to prevalent and traditional practices of people. Several initiatives in the past have been aimed to promote afforestation and greenery in western part of Rajasthan but have been mostly limited to plantation of Babool (*Acacia tortilis*) with minimum benefits to the associated communities. Given their past experiences, locals were hesitant towards change and adopting agroforestry techniques to plant native plants that could grow in the area but were not growing given the invasive nature of Babool plantation. Several community meetings were conducted to overcome this mental block and promote greenery by planting native plants.
- Similarly, given the communities past experiences, locals lacked confidence in the project and expected it to fail at an early stage, generating minimum participation to sustain and maintain afforestation programmes. Community and farmer confidence was slowly built over time as the trees weathered the harsh climate and still sustained themselves.
- Despite being given key roles in local-level planning and management, in reality, there may be low actual involvement of local communities in PRI decision-making processes. This made it a challenge for ST to understand the underlying local issue and device a sustainable plan to help the problem.

- Clear property rights regimes were of utmost importance while executing afforestation projects on ground, making it a challenge as community members were reluctant in signing a NOC (No Objection Certificate)

with ST to execute the project on-ground. After many discussions and confidence building, this exercise was accepted by local panchayat heads.

Local students are very enthusiastic about tree plantation and promoting greenery, however, they lacked the resources to do so. Lack of water is a major issue, additionally; unavailability of monetary funds is also a challenge. Through ST's clean and green school programme, the students are being given the resources they need to promote greenery in their vicinity.

- Women of Rajasthan are often viewed as an economic liability in their natal home and a burden in the marital home. No monetary remuneration for women's household work, lack of control over money generated or earned by them and lack of negotiating power have contributed a great deal in the perpetuation of a negative image in family and society. It is now widely acknowledged that women are being pushed into the informal sector and are engaged increasingly in low skill and low paid occupation. There are few opportunities for women to move into non-traditional occupations and even if such an opportunity is available, they cannot take advantage of these opportunities on account of family and societal restrictions. To address this challenge, ST encouraged women beneficiaries to participate in afforestation programmes that could be conducted in their barren fields, aiming to promote greenery while promoting women empowerment by giving them sustainable livelihood options.

7. Scale and Sustainability of Programme

Unlike any other typical forestry projects, ST provides planters transparency and visibility in tree plantation activities, making this programme unique and rewarding. They closely work with marginal farmers, village communities and government schools where trees are being nourished and grown. During this process, they aim to generate a sense of ownership amongst these farmers, village community and school children to make the whole project self sustainable in the long run. They believe that a higher survival rate of trees can be achieved if local resources are engaged and mobilized during programme management. It can be noted that social impact of afforestation programme can be increased through provision of larger employment opportunities, especially among women, through large-scale community participation.

On the other hand, the clean and green school programme can aide in developing environmental consciousness among children as they would be torch bearers of maintaining the existing bio-diversity in the future. In terms of the environmental benefits, when a sapling grows into a tree it not only

helps to create a natural eco-system but also act as carbon sink and supports in mitigating impacts of large scale global warming. Further, produce of afforestation is reaped by marginal beneficiaries as an incentive that helps in reducing poverty and providing additional source of livelihood to the families.

It is important to note that this afforestation and community engagement model is “plug_and_play” in nature, where, it can be applied in other geographies with high deforestation levels. ST is currently applying this model in the cold arid desert of Leh (Ladakh) that has shown positive community mobilization and ownership results. ST has been able to mobilize local communities and students to grow Apricot Orchards and Salix showcasing how they have increased green cover and provide additional sources of livelihood for participating communities. Another important point to note is the active involvement of corporate sponsor during project design and implementation stage, as they are one of the key stakeholders of the project whose support is essential during implementation. Using this model, they have been able to plant and sustain more than 450,000 trees in a short span of 3.5 years.

In the long run, ST aims to plant more than million fruit bearing and medicinal trees in the next 5 years, where the harvested fruits and other non timber forest products would add to the economic development of the local community by reducing poverty and malnutrition, while promoting gender equality and empowering women. Further, these planting trees would directly contribute in mitigating carbon emissions while reaping environmental benefits worth millions. In order to achieve these objectives and aligning with market linkage and tree-produce processing units, they intend to achieve the following objectives:

- Build a Research and Development division, where they can work on high yielding grafted saplings, organic farming, micro-irrigation techniques and other innovating techniques
- Collaborate with scientific research institutions in order to promote biodiversity and ecological balance in respect with the local environment
- Develop a demonstration center for sharing learning and increasing knowledge exchange
- Collaboration with international agencies who can replicate the model and continue to impact lives at large

8. Acknowledgment

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Paving New Pathways in Paddy Plantation

R. Vimala

1. About MAVIM

MAVIM stands for Mahila Arthik Vikas Mahamandal - the State Women's Development Corporation of the Government of Maharashtra. The name MAVIM is closely associated with the SHG movement in the state. Being a state nodal agency for the implementation of SHG centered programs, MAVIM, at present, works with women in 13000 villages in 278 blocks in all 34 rural districts of Maharashtra.

MAVIM has district level offices across the state that primarily functions as support units to strengthen community level structures developed by MAVIM with SHG members.

The three-tiered community structure has Self Help Group (SHG) as the base tier, Village Level Committee (VLC), a collective forum of all SHGs in a village, as the middle tier and Community Managed Resource Centers (CMRC), the federation forms the top tier.

In MAVIM's view, SHG is a vehicle for the social, economic and political empowerment of women. SHG is a group of 15-20 women living in vicinity, who regularly meet to save money and access loans from these savings. They are fundamental and autonomous units that enable its members to realize and nurture their strengths. Individual SHGs come together at village level as VLC, to expand the scope of their activities and also for mutual learning and effective negotiations with elected local governing bodies.

CMRC is a federation of around 150-200 SHGs in a cluster of twenty villages situated close to each other. CMRC is a registered formal body and functions under a governing body formed by drawing representatives from all VLCs in the CMRC area. CMRC extend support to SHGs by accessing external resources and opportunities. These responsibilities are executed by CMRC staff - CMRC manager, animator in-charge for livelihood and grassroots institution building and SHG motivators, *Sahayogini* among others.

Programs or business proposals are first considered at the CMRC level. If the CMRC decides to go ahead, it takes responsibility for execution of the program in its area. In the case of entrepreneurial activities, SHG members are free to decide whether to participate in an enterprise or not. CMRC

extends further training and support to the SHG members interested and willing to participate in coordination with MAVIM district office.

2. MAVIM's Approach

Rural women are usually hesitant to accept entrepreneurial activities that are new to them. However, they are willing to invest their resources in activities that they are familiar with. Therefore MAVIM seeks to explore business opportunities in areas they are already engaged in. Initiatives are taken in order to improve productivity and sustainability of such enterprises and available resources, either through technical support or by introducing changes in practices. MAVIM promotes enterprises that are not only economically beneficial but are also useful socially and environmentally.



MAVIM believes in community participation. It involves local community as a whole, even men while promoting women's initiatives. This helps to mitigate family or community resistance if any arises.

MAVIM also work in convergence with various government departments, which helps to access their schemes for the community. These government programs also include training, hand holding support incentives which help the women, with limited access to these Departments on their own.

MAVIM's approach for entrepreneurship development and its three-tier approach at grassroots level enables it to design programs around community needs and execute them with local participation. Introduction of SRI Technique to paddy cultivators in Chandrapur was one such initiative.

3. Chandrapur Context

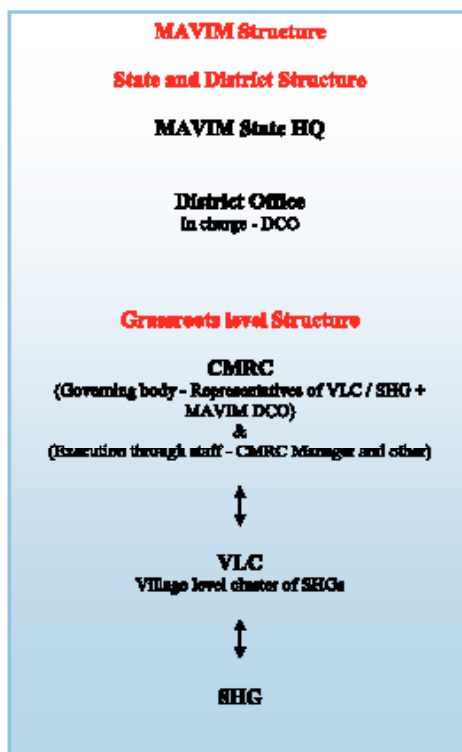
Chandrapur is located on the eastern edge of Maharashtra's Vidarbha region. For the last decade the region has been in national headlines due

to the agricultural crisis, leading to growing numbers of farmer's suicides. Unlike the other worst-hit districts in the region, which are mostly cotton growing, Chandrapur is a rice producing district. The district predominantly has tribal population. Over 30% of its area is under forest cover and 40% area under agriculture. The district is one of the highest rice producing districts in the state.

Although Chandrapur is not a crisis hit district, it has its own share of agricultural problems. The average land holdings are small; ranging from 3-6 acres per family. Also, the land quality differs from place to place. In villages nearer to forest areas, the quality of land is poor. The agriculture of the region is highly dependent on rice. To ensure a good yield, the farmer makes high investments in costly seeds, chemical fertilizers, and pesticides. The excess use of chemicals and hybrid seeds not only makes farming expensive but also results in degradation of the land. Input cost of cultivation goes up every year, but the output is uncertain. This dwindling agricultural economics is also reflected in the women's SHG accounts. Large portion of the loan, taken by the women SHG members, would be spent on paddy cultivation, but the returns on their investment were minimal and uncertain.

A study conducted by MAVIM, revealed a high rate of loan defaults among farmers. Women identified agriculture as their primary source of expenditure. It was also found that SHG-bank linkages were usually for crop loans. However, there were defaulters due to the uncertainty in climatic conditions and poor yields. Even though farmers took crop and kisan loans, not many availed crop insurance, despite a high dependence on nature.

MAVIM also observed that women were less involved in making agriculture-related decisions, even when they toil in the farms. Women performed labour intensive activities, such as planting and weeding, which required them to bend and work for long hours in the field. This caused considerable amount of drudgery for women who had the added responsibilities of household work.



MAVIM's approach to women's entrepreneur activities –

- Improve what they do already
- Look for social and environmental benefits
- Facilitate women's initiative, also ensure community participation
- Convergence with Government Departments

The harsh conditions of women cultivators in agriculture in particular and paddy plantations in general prompted MAVIM to explore alternatives to address multiple problems identified in Chandrapur in consultation with Department of Agriculture.

Search for a method that will help reduce input costs of cultivation, minimize women's drudgery and help revive land productivity, led MAVIM to SRI – System of Rice Intensification.

SRI is known as an agro-ecological method for increasing productivity of rice by changing management of plants, soil, water and nutrients. This technique is proven most suitable to rain fed rice cultivation and is known to reduce the input costs drastically, apart from increased yields and ecological benefits.

4. SRI Initiative

The initiative was started in 2010-11 by MAVIM in partnership with Department of Agriculture. While MAVIM wanted to replace conventional cultivation practices for the benefit of farmers, the Department of Agriculture wanted to promote the technique through training and on-site support to develop demonstration plots.

After a series of meetings with women and an awareness drive, the CMRCs were able to convince a group of women to participate in developing demo plots by allocating a portion of their land. Community level meetings were also organized to inform them about the initiative. SHG level meetings helped women to convince their family members.

In the first round in October 2010, after meeting with 30 villages in 3 blocks, around 715 women received training and capacity building inputs on SRI on their respective plots.

SRI is a type of precision farming, which requires doing the right things, in the right place, in the right way, at the right time. If the steps are followed, results are assured. Hence training played a major role in preparing women mentally and otherwise.

Training began with classroom sessions, which were followed up by practical demonstrations. Theoretical classes prepared women participants mentally, while practical sessions equipped them with skills needed for each stage of cultivation. Practical helped them to internalize the necessary skills.

Practical sessions started with land and soil testing, to give the appropriate treatment to land before plantation and then covered each stage in the SRI cultivation process starting from formation of mat soil bed nursery, to land improvement through addition of organic matter, to spaced out plantation, preparing organic fertilizers and pesticides, mechanical de-weeding with cono-weeder and so on.

Table 1: New Practices Promoted on Demo Plots

Land preparation	<ul style="list-style-type: none"> • Demo field was leveled • Land prepared by adding organic matter prior to cultivation
Nursery Management	<ul style="list-style-type: none"> • Through seed beds
Transplanting	<ul style="list-style-type: none"> • Seedlings planted when 10-12 days old, as planting of young seedlings prolongs the vegetative growth period and facilitates the production of maximum number of tillers • Plantation properly spaced out (25x25cm), by using rope for marking
Fertilizers	<ul style="list-style-type: none"> • Organic fertilizer and vermin compost used • Urea briquette was hand placed under the soil
Pesticides	<ul style="list-style-type: none"> • <i>Dashparni Ark</i>, organically made extract from local leaves of ten varieties was made and used for spraying
Weed management	<ul style="list-style-type: none"> • Cono-weeder used as it adds biomass to the soil.

Women diligently developed their demo plots by following the process systematically.

The new method required the use of merely 3-5 kg seeds per one-acre plot, whereas 30-50 kg seeds were used in the traditional method. This created doubts in women's minds, but they were convinced once they saw the results.

After two months growth, when they compared the plants in demo plot with the traditionally cultivated crop, they saw much advanced and good growth, with more than 100 tillers per seedling in the field.

At this stage, the beneficiaries were taught to use the cono-weeder. With the cono-weeder, weeding could be carried out by only two people. In traditional method this is a tedious and back breaking work the women. The weeder works well if land is watered the previous day and the plant spacing is maintained.

The women were then trained in disease and pest management on the plot. Women were taught the technique of preparing organic pesticides with commonly available leaves. Some SHGs prepared this pesticide *dushparnee* collectively and still continue to do so.

Finally, after the harvest women were convinced after seeing the output. “The plants were so full of panicles that I could not chop them in one stroke,” shared one cultivator.

The technique was a game-changer in improving the productivity in the district. The results were impressive. The demo plots gave higher output with lesser input as compared to plots under traditional cultivation practice.

Women in various stages of SRI cultivation - Nursery making, precise plantation, manure making and cono-weeder



1: Preparing organic manure to develop land quality 2: At the ready mat seed bed, before plantation



3: Women cultivators with cono-weeder, sprayer and other agricultural tools



4: Precise plantation with rope measurements



5: Growing plants

4.1 Cost-effectiveness of SRI

After the first harvest of demo plots, a comparative chart was prepared to assess cost benefit ratio in SRI and traditional method. Table 2 below compares the input costs in traditional vs. SRI method of cultivation.

Table 2: Comparison of input costs – Traditional vis-à-vis SRI

	Traditional method		SRI	
	Quantity	Cost (Rs.)	Quantity	Cost (Rs.)
Seed	30-50 kgs / acre @ Rs. 50 / kg	1500 - 2500	2.5-3 kgs/ acre @ Rs. 50 / kg	125-150
Fertilizers	4 bag DAP& Urea	2500 - 3000	Use of organic fertilizers (Zink Sulfate / rock phosphate)	1000
Pesticides	Chemical spray	2000	Organic spray	200
Labor	Paddy cultivation- 10 labor for 7 days	1500/- within 3 days.	5 labor for two days	500-700
De- weeding	10 labor expenses 5 to 7 days	2500	2 labor expenses within 3 days	300
Tillers	Up to 20 to 30	—	Up to 50 to 110	—
Produce	9 to 10 quintal	—	11 to 13 quintal	—
Av. input cost		10,000-12,000		4000-5000

As the table shows SRI technique resulted in more than fifty percent decrease in input costs as compared to traditional method of cultivation. It required less seeds and also minimized expense on chemical fertilizers and pesticides by replacing them with organic manures and bio-sprays. This shift from chemical fertilizers and pesticides to organic methods will help in achieving long term environmental benefits and revive the land productivity.

On an average, the productivity increased 2 quintals per acre. The rice cultivators usually sell the surplus rice, after they have stocked enough for household consumption and some portion is used as seeds for the next year. With higher productivity they had higher surplus for markets leading to higher incomes

4.2 Sustaining SRI cultivation

In its first year in 2010-11, SRI was piloted in three blocks - Pombhurna, Bhis and Chimur. Although it was well received by the women cultivators and they were convinced about the benefits of SRI, it was important that they continue to adopt SRI practices in the subsequent years. In the pilot phase,

the cultivators received incentives apart from training and on-site support by provision of quality seed UB, sprayers and organic fertilizers by Department of Agriculture, while MAVIM provided cono-weeders to cultivators. There were no such incentives for the second year.

With an aim to encourage women cultivators to take up SRI, CMRCs with support from MAVIM's district office organized awareness campaign like in the first year, starting three to four months prior to the plantation to build a positive environment amongst the cultivators. Department of Agriculture extended help whenever needed. Also, since the women were convinced about the benefits, they continued to cultivate their demo plot with SRI method. MAVIM also expanded the area to include new CMRCs from four other blocks - Talodhi, Mul, Chandrapur and Gondpipri.

Women cultivators continued to adopt SRI in the in the subsequent years. The following table shows increase in the number of participants. The number of blocks has increased from 3 to 7, with a corresponding increase in the number of villages from 15 to 35, in the last five years, during 2010-11 to 2015-16.

The total land under SRI technique increased from 485 acres in the first year to 1271 acres in the fifth year. Average land size under SRI cultivation has gone up from half an acre in the initial demonstration stage to an average of one acre now.

Table 3: Year-wise Progress in Total Coverage under SRI Cultivation in Chandrapur

Year	No of Talukas	No. of Villages	No. of Women Cultivators	Land Cultivated	Total Paddy Production (Quintals)
2010-2011	3	15	535	485	4887
2011-2012	7	29	941	914	10630
2012-2013	7	31	1034	1012	11863
2013-2014	7	33	1107	1110	12537
2014-2015	7	35	1166	1188	13316
2015-2016	7	35	1183	1271	15120

5. Economic and Social Impact

5.1 Less Production Cost and More Produce for Sale

As can be seen in Table 2, there is a reduction in the input and production cost which is the direct economic benefit to women. On an average there is an increase in income by Rs. 6000 to 7000. Besides, the women also earned more from the sale of increased produce which was 2 quintals per acre. With an average rate of Rs. 20/kg in the local market, one woman farmer earned approx. Rs. 4000 more because of increase in yield.

Thus, a family cultivating 2 acres of paddy under SRI on an average during Kharif season earns Rs. 20000 approx. more as result of reduced input cost and enhanced production.

The SRI yield was produced organically and its quality was better than that of other rice sold in the market. Yet the traders were not ready to pay the premium for organic rice. While there were no takers for hand pounded and organic rice locally, MAVIM helped the SHGs to sell their organic produce in outside markets, such as in agro-exhibitions organized in Nagpur and Chandrapur.

The exhibitions, organized every year, provide a platform to SHG products. Women get reasonable rates for their organic rice; Rs. 60 / kg on an average, which is three times the rate in local markets.

5.2 Drudgery Reduction

Overall SRI technique has contributed to drudgery reduction for women. The SRI method advocates ensuring spacing between plants and plantation of less seedlings. The requirement of less seedlings reduces movement from nursery to the field. The introduction of cono-weeder has helped in reducing in the labour required for weeding of the entire field. This has helped in reducing the drudgery of women in paddy fields.

5.3 Environmental Benefits

SRI ensures a shift from chemical-intensive farming to organic farming, which is environmentally beneficial and a sustainable approach to farming. It will revive the land productivity in the long run.

Uses of organic manure and bio-fertilizers are lowering the toxic content in the crops and the cultivators are getting better quality grain for consumption.

5.4 Social Impact

The social impact of SRI initiative cannot be undermined. Although the project is implemented with the initiative of women; men in the family were also involved in the process. Women's engagement in the initiative has led to their active participation in agricultural decision making thereby empowering them. Now they ensure proper usage of agricultural loans, crop insurance, as they feel more involved in the production process.

The SRI initiative has enhanced cluster level activities also strengthening the grassroots institutions. From pre-cultivation awareness campaign to marketing through exhibitions, CMRCs are active with the women and try to expand the cultivation area by motivating more women every year.

6. Problems and Challenges

Although the benefits of SRI cultivation are evident, there are problems and challenges in its expansion.

Women cultivators adopting the SRI feel convinced about the method and therefore the number has steadily increased since the launch of the initiative in 2010-11. However, they cultivate only a portion of their land - half to one acre - with this method and do not use the technique for their entire plot of land.

Why are they still balancing the new method with the old? Is it to mitigate the risk by following the conventional and corresponding resistance to shift to new practices? Or are there any external impediments? The challenges are both internal and external – pertaining to unpredictable climatic conditions and limited reach to market.

There is still a hesitation to completely shift to the new method of cultivation. Some women said the family members do not agree for a total change. When the women insist they are allowed to continue it on the demo plot area.

Another problem shared by women cultivators relates with the technique of SRI cultivation. There is a timetable to follow; the plantation is done when saplings are small, about 15-20 days old. Since the saplings are small, while planting them, land should be just wet and not too watery as in the case of traditional plants. This means rain should be timely, or the land should have an appropriate slope to drain the excess water. If the saplings are a little older, then they cannot be planted using SRI method. Therefore, when the climatic conditions are not suitable, women have to shift to traditional method.

Some women shared that plantation time is a busy time and it becomes hard to find labor for planting, which needs to be done in time, otherwise the seedlings outgrow. In this season labor is in demand. They are used to doing plantation using the traditional method and are reluctant to do spaced-out planting with rope measurements. Besides, women on their own, can plant only a small plot, since it is time-consuming to do it with rope measurements. More labor is needed, as two persons need to be engaged for holding the rope. It is challenging to mobilize skilled labour for SRI plantation.

Getting assured market for organic and hand pounded rice is also a challenge. As there are no takers locally, women have to sell it at a subsidized rate. A proper marketing system would help them get appropriate rates for their produce.

7. Way Ahead

Considering the problems faced by women cultivators MAVIM has chalked out a plan of action.

MAVIM will develop a Micro Livelihood Plan around SRI cultivation, which will take care of post harvesting needs. Support systems and market avenues will be strengthened. Establishing storages, rice mills in the local area will provide employment opportunities and needed support services for rice producers.

MAVIM will also team up the cultivators at village and CMRC level so that they are able to plan some of the activities collectively. For instance, some groups can prepare the bio- fertilizer collectively saving time and developing a sense of support from group members. This can also be extended to other areas, like the plantation, which is a skilled and time-consuming work in SRI method. When there is a collective process, more market avenues also can be tapped, beyond the exhibitions and other platforms used at present.

The SRI initiative in Chandrapur shows the willingness of rural women to learn and adopt new agricultural techniques that will benefit them. However, it also brings forth the need for other support required in order to sustain and expand the practice. Training and learning inputs should be followed up with hand-holding. There should be encouragement and motivation till the technique is fully adopted. Also the market linkages need to be strengthened, so that cultivators are able to get the real value for their produce. As MAVIM's plan suggests, it is taking steps in the right direction.

Sustainable Agriculture – A New Partnership Paradigm in Dantewada

Harsh Jaiswal, TERI University

1. Heralding Green Revolution in Independent India

Upon breaking the shackles of colonisation in 1947, India was plagued with starvation and famine in several parts of the country. As a young independent nation, agricultural production wasn't sufficient for the growing population. Several causes have been attributed to this glaring gap between supply and demand. Lack of modernisation in the agriculture sector and the prevalence of primitive methods of farming were attributed as the major cause.

In the early 1960s, the Green Revolution (henceforth, GR) was pedestaled as the saviour of India's farmers and food deficient people. This involved the use of chemical fertilizers, irrigation infrastructure, and high yielding variety (HYVs). GR promised to tackle chronic food deficit by increasing yield and making the country self-sufficient in food grain production. These developments were supported with institutional interventions like Minimum Support Price (MSP) protocol, subsidies on chemical fertilizers, improvement in rural infrastructure, and so on.

1.1 Contestations on Green Revolution

However, the critical appraisal on GR highlights some of the major problems in the technical interventions with serious environmental and economic consequences.

“However the assumption of nature as a source of scarcity, and technology as a source of abundance, leads to the creation of technologies which create new scarcities in nature through ecological destruction. The reduction in the availability of fertile land and genetic diversity of crops as a result of the Green Revolution practices indicates that at the ecological level, the Green Revolution produced scarcity, not abundance” (Shiva, 1991)

Evidence suggests that the Indian states of Punjab, Haryana, Tamil Nadu, Maharashtra, and Andhra Pradesh are currently reaping the repercussions of GR. These implications are environmental, social and economic in nature. Farmer suicides, reduced ground water tables, pollution of land, rivers and decrease in soil fertility have arrived as a package to the doorstep of the India's agriculture sector.

As agriculture expert Mr. V. S. Arunachalam quotes, “Monoculture is not suitable for the culture of [Indian] farming and science can be applied in the market and not in [farming] culture” (V. S. Arunachalam, 2016, personal communication, 9th June).

While the success of GR has raised questions at the global level, many countries have discouraged non-organic farming; smaller states like Sikkim and Bhutan have taken bold steps towards organic agriculture.

Amidst these contestations on the nature of chemical farming, District South Bastar Dantewada (henceforth, Dantewada) has started a movement towards sustainable agriculture led by the strong vision of the District Administration (henceforth, DA).

2. Dantewada at a Glance

District Dantewada was created out of the old Bastar district after its division into Kanker, Bastar, and Dantewada districts in 1998. It derives its name from its presiding deity, Devi Danteshwari, the goddess worshiped as an incarnation of Shakti (Strength). Dantewada is marked by volatile left wing extremism, shrinking natural resources, underdevelopment, and other challenges.

Dantewada is situated in southernmost part of Chhattisgarh with 60% of its land covered by semi-tropical forest. As per Census 2011, Dantewada has a population of 5.3 lakhs with 82% of its population residing in rural areas. More than 75% of the population is tribal with a literacy rate of 42%, far below the national rate of 74%. Considered as one of the most remote districts in India, it is home to the tribal community Madiya Gond. Given the vacuum of livelihoods options, more than 60% of the district population falls below poverty line with Infant Mortality Rate at 54 per 1000 persons, higher than national average of 43.19 per 1000 persons. The people of Dantewada inhabit small scattered hamlets and lack communication facilities like roads and postal services which is unthinkable to many, in modern times. The rule of Tribal Kings in the region continued to exist during British Raj as a princely state. The Bastar dynasty was closely knit with the tribals and their culture. It retained their customs, traditions and therefore, the tribals of Bastar were “free from the harassment and unsympathetic petty officials, and their land was not threatened by the greed of alien immigrants” (Fürer-Haimendorf, 1982). Due to its remoteness, challenging terrain, thinly dispersed population and presence of left wing extremism, it remained relatively untouched by the administration for long.

2.1 Livelihoods in Dantewada

The tribal communities have been dependent on natural resources for their livelihood. This includes forest resources and to a minor extent shifting agriculture. Abundance of forest resources that once existed provided them with wood and other produce crucial to their survival. Agriculture was a subsistence safety net, only practised in the Kharif season (monsoon).

In earlier times, natural resources in Dantewada were abundant and users were limited and dispersed. People were living in harmony with nature and while they had no rights over resources, communities exercised collective ownership. As time passed, several factors led to livelihoods insecurity in the district as discussed below:

2.2 Mining in Chhattisgarh

The state of Chhattisgarh is plentiful in mineral resources. Large deposits of coal, iron ore, limestone, bauxite, and tin ore are located in several parts of the state. These mineral resources, by their very nature have immense potential for attracting large investments in mining and therefore employment generation. Chhattisgarh is extensively mined like other neighbouring mineral rich states of Jharkhand and Odisha. In Dantewada, the Bailadila iron ore mines are excessively mined but the district hasn't been industrialised per se. Similar to the mining sector in other parts of Central India, here too it faces opposition by the tribal groups in the district.

2.3 Loss of Forest Rights

Another important factor is the loss of customary usufruct rights of the local tribal communities due to enactment of state policies such as the Indian Forest Act (henceforth, IFA). IFA, on the premise of ecological protection of forests, banned shifting cultivation, which forced the local communities to practise settled cultivation. The appropriateness and practicability of this step is debatable even today. The tribal groups who were dependent on forest based natural resources for their survival lacked the skills to negotiate with market forces. Moreover, the activities of the left extremist rebel groups in the district at times created a virtual war zone. Therefore, there were a multitude of challenges of insurgency, poverty, underdevelopment, low productivity in agriculture and lack of overall development intervention. The district was caught in a snare of vulnerabilities given the shrinking natural resources due to climate change, increase in population, irreparable damage due to mining, and the lack of intervention for generation of alternate livelihood opportunities. As a result, the tribal communities shifted from forest based livelihoods to practicing settled agriculture, given the pressure to survive. These changes further pushed the people of Dantewada into livelihoods insecurity.

2.4 Settled Agriculture in Dantewada

The tribal communities have historically interacted with those residing in the plains, and therefore, practicing agriculture was not alien to them. But their techniques were primitive. In shifting cultivation they used to incorporate techniques such as seed broadcasting, with no or ineffective use of bullocks.

The communities' farming techniques were not equipped to adapt to intensive cultivation required in settled agriculture. The adaptation on the part of the farmers, hence, was not smooth and gradual but accelerated and forced. The communities have yet not been able to fully adapt to the standard practices of settled agriculture. As per Census 2011, 81% of the total workers are dependent on agriculture either as cultivators or as agricultural labourers.

3. (By) passing the “Green” Revolution

While India was going through agrarian reforms, Dantewada was still trying to grapple with the methods of intensive cultivation practised in settled agriculture. About fifteen years ago, when the practices GR reached Dantewada via the Agriculture Department (henceforth, AD), it called for replacement of traditional seeds with HYV seeds, development of irrigation infrastructure, and use of chemical inputs, etc. However, Dantewada couldn't embrace these developments due to the following reasons:

- Geographical remoteness
- Insufficient staff in AD until 2013
- Lack of adoption of chemical inputs due to incompatibility with technique of seed broadcasting
- By the time these interventions reached Dantewada effectively, the negative impacts of GR were visible in other parts of the country
- Left Wing Extremism and limited accessibility
- Reluctance of farmers due to their own experiences with chemical inputs

One of the farmers, from *Halbaras*, a village in Dantewada quotes (Anonymous, 2016, personal communication, 22nd June)

“At night, staff from the AD used to sneak into our fields and apply chemical fertilizers. When the yield was seemingly more than the previous year, they would tell us that they had applied chemical inputs in our fields.”

A group of farmers of the district speaking about their experience with chemical fertilizers narrate (Halbras and others, 2016, personal communication, 15th July)

“It was difficult to farm using oxen. Species like earthworm, frog, fish and snakes started disappearing from our fields. Women’s use to feel burning sensation in their feet while carrying out transplantation. Our pockets were getting increasingly empty, and so was our health.”

The negative experiences of the farmers discouraged the use of chemical inputs in cultivation. Dantewada failed to adopt practices under GR. As claimed by AD in 2013, the District was consuming only four kilograms of chemical fertilizers per hectare when Chhattisgarh as a whole was consuming around 92 kilograms per hectare.

3.1 The District Administration’s Call

Having almost skipped the GR, the district administration came to a critical decision making juncture. One option was to continue with the agricultural policies of the government that were proving unsustainable given the national experience and another was to design one’s own policy pathway towards sustainable agriculture. The concept of ‘sustainable agriculture’ has varied notions, however there exists a consensus that it primarily denotes being in harmony with ecology, the centre being human and social capital, involving an integration of modern techniques with traditional knowledge that helps additionally enhance financial capital. Organic farming considered as one of the techniques of sustainable agriculture is not an alien concept to the rural population of India.

Considering the fragile tribal socio-cultural fabric of Dantewada, unemployment, volatility of conflict, lack of infrastructure and a developed and diversified market, commercial agriculture through GR did not seem like a viable option. Therefore, a new way forward was contextually significant. The tribal communities are not skilled agriculturists; however, they have a plethora of traditional knowledge.

These communities have historically cultivated several varieties of pulses, small millets like *Koda*, *Kosra*, and rice-black, red, half red which includes varieties like *Sapri*, *Javaphool*, *Dubraj*, *Kalamali*, *Chudi*, *Lokti machi*, etc. These

varieties are grown in different seasons and terrains and many of them have aromatic properties.

A farmer from *Bade Bacheli*, Dantewada shares that some of the varieties grew up to a height of 6 feet while other varieties grew all-round the year, being sown in April and harvested in December. Amongst these climate resilient varieties, there are also those having medicinal properties, used by the tribal communities for gastric and other stomach related problems including the famous *Hardighaati* which can be consumed by diabetics. The traditional species have survived and evolved over centuries, battling extreme climatic conditions.

With increasing potential for organic farming the DA chose the path of sustainable agriculture over blindly following the national policies and decided to promote a practice of organic farming to write a new paradigm in development of agriculture in the district.

3.2 DA in Action

It was well understood that new policy efforts would require a strong institutional and regulatory framework and a multifold of agencies, schemes and other entitlements to help drive the central motive of improving livelihoods through organic farming. The DA has ensured, in parallel with the principles of sustainable agriculture, that ecology and farmer are the centre of benefit and goodwill. This is evident in the measures below:

Chemical Inputs Discouraged

Chemical inputs were being earlier promoted by AD and District Central Cooperative Bank (DCCB). To tackle this, in 2014, DA got the rules of DCCB altered, in consultation with state government. Earlier loans under Kisan Credit Card (KCC) entailed the ratio of cash and chemical inputs as 60:40. This was changed to 100% cash unless a farmer demanded otherwise, thereby leading to reduction in uptake of chemical fertilizers. Change in the rule led to minimal consumption of chemical fertilizers. From distribution of 244.550 tonnes of chemical fertilisers by DCCB in 2014, it became zero in 2015. With the change in rules therefore, the DA was able to curb the passive promotion of chemical inputs by AD.

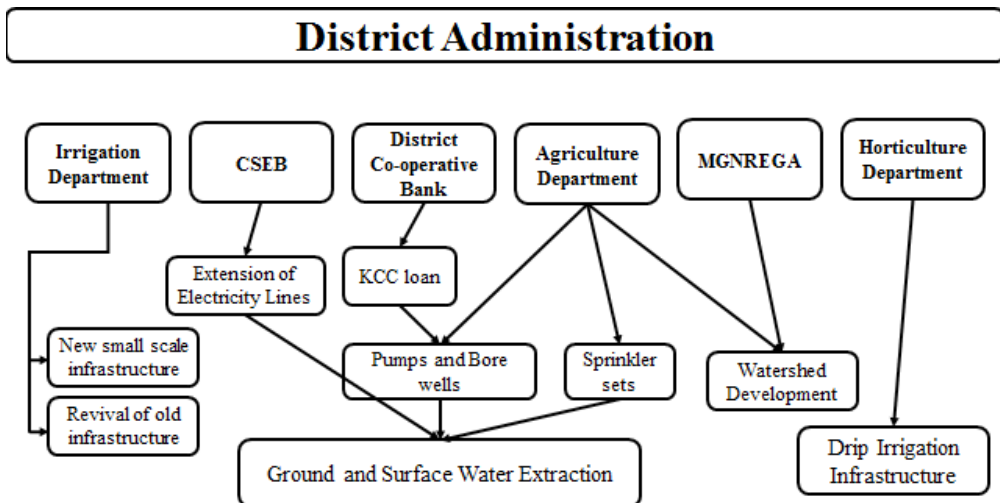
Training of District Staff

DA used training as an effective tool for conscious promotion of organic farming. Provisions under other schemes were modified and the staff was trained by agriculture experts in 2013. The results were visible as the consumption of chemical fertilizers in Dantewada came down to 0.52 kilogram per ha in 2015.

Expanding the Irrigation Infrastructure

Average annual rainfall of the district is 1536.5 mm. The current irrigation infrastructure does not cover even 5% of the total area under cultivation. Agriculture in the area was mostly rainfed, which was one of the main reasons for low productivity combined with the practice of single cropping. 17 out of 27 irrigation systems covered only 635 ha. Irrigation infrastructure covering 50% of the total area being irrigated by the Irrigation Department were revived or repaired and check dams covering 105 ha. were additionally constructed. Under Subsidy Schemes, Chhattisgarh State Electricity Board extended electricity connections for groups of farmers. AD provided financial linkages through KCC and also commenced watershed development activities; subsidised pumps were provided for bore wells. Through some recent efforts, AD has also provided drip irrigation and sprinkler sets to farmers covering approximately 50 ha. The total area covered under irrigation by AD is 1311 ha. Another 100 ha has been covered under the drip irrigation scheme by the Horticulture Department where the cost sharing between state and beneficiary is 60:40. However, the DA sponsored another 80% of the 40% share of beneficiaries for the benefit of farmers.

Figure 1: Irrigation Infrastructure Development by Various Departments



4. Promoting Organic Agriculture - Designing a Comprehensive Model

There was a convergence in efforts of various agencies and actors towards the common goal of converting to organic agriculture and betterment of livelihoods of local population. Such arrangements allowed for cushioning of all kinds of vulnerabilities that the farmers were susceptible to while making the transition. The lack of access to credit, scarcity of water for irrigation and the possibility of being attracted to using chemical inputs were all taken care of by the comprehensive institutional arrangements. This co-ordination and support to the farmers at every stage enabled the DA to move towards designing a comprehensive model right from production to market linkage. The three prongs of the model are as follows:

1. Organic farming infused with SRI (System of Rice Intensification)
2. Provision of Infrastructure Facilities
3. Incubator
 - a. From DA to farm
 - b. From farm to market

4.1 Organic Farming Infused with SRI

The average paddy production in the district was around 11 quintals per ha in the year 2012 as per the AD of Dantewada. Low yield was one of the major concerns to be tackled first. In order to improve the yield, the DA promoted the System of Rice Intensification (SRI) technique commonly known as '*Shree Vidhi*' in Dantewada. It is a set of cultivation practices adopted by farmers according to their local conditions which enhances the activity of root, and increases the number of tillers leading to higher yield. The method is known to be knowledge and skill based rather than input based.

The Rural Extension Officers (REOs) of the AD, encouraged and trained the farmers to prepare organic inputs such as *jeevamrit*, *bijamrit*, *handi dawa*, *panchgavya*, etc. using cow dung, cow urine, and other locally available resources. Farmers were provided with Poly Vinyl Chloride (PVC) drums in order to facilitate production of inputs and deweeder for the weeding process.

Organic farming arrived in Dantewada with improvement in technique leading to increase in output to an average of more than 30 quintals per ha.,

primarily due to adoption of SRI. The benefits of adopting this technique have been two fold. First, the cost of inputs was reduced as they were mostly locally available and second, there was an increase in yield. Practising farmers mobilised more farmers and brought them into the fold of SRI. Even those farmers using chemical fertilizers began adopting SRI based organic farming. As depicted in Table 1, the district experienced more than 200% increase in the area under SRI cultivation in year 2014 and even though 2015 was a drought year, the number of farmers adopting SRI decreased but the area under SRI did not decrease substantially. In 2016, the numbers are expected to increase by more than 100%.

Table 1: Key Impact Figures

Year	No. of Farmers	Area under SRI (in ha)
2013	274	71.10
2014	743	260.55
2015	419	242.3
2016 (Expected)	1000+	600+

Source: Department of Agriculture, Chhattisgarh

4.2 Provision of Infrastructure Facilities

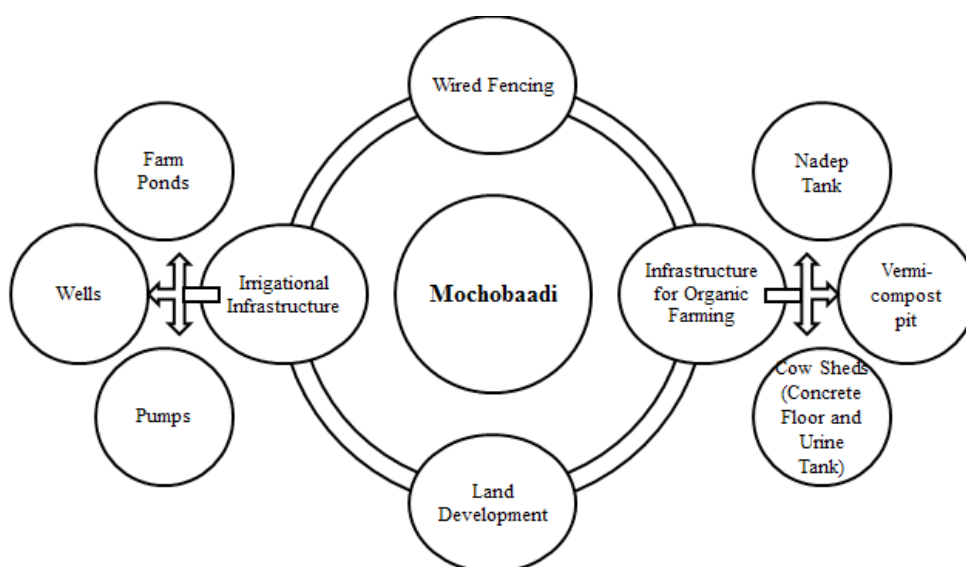
There happens to be a systemic limitation in rural development processes when decision makers are in a particular position for a short term and there is a fear of change in policies by the successors. Former District Collector of Dantewada, Mr. K C Devasenapathi faced the same dilemma and had to make a decision before intervening. The question was whether to lay emphasis on enhancing capacity building among farmers or give priority to providing infrastructural support. With an aim to have the maximum outreach, he chose the policy route of focusing on providing infrastructural support and let capacity building catch up as it is a relatively long term process.

4.3 Launching of Mochobaadi

Mochobaadi, meaning ‘My Farm’, is a programme launched by DA in the year 2013 which encourages farmers to cultivate vegetables, pulses and oilseeds, along with traditional paddy. Farmers were facing two main obstacles i.e. open grazing of cattle and lack of adequate irrigation facilities. This programme came up with a package of interventions including wired fencing of fields, irrigation infrastructure, infrastructure for organic farming, and land development. The programme that was launched in the district is one of its kind. Fencing is helping the farmers save their field from cattle left freely to graze after Kharif season. Irrigation systems promoted under the programme include *Dabri* (farm pond), well, and a pump to enable low cost and effective

irrigation to the farmers. Infrastructure for organic farming include *Nadep* tank, vermi-compost pit, and cattle sheds that include a concrete floor and urine tank. Given that Dantewada has a hilly, undulated terrain, the scheme of Land Development covered the component of marking the land in order to use SRI technique. More than 1200 farmers from more than 100 different villages of the district have benefited from the scheme. These schemes together, in effect, were meant to promote sustainable farming, double cropping and vegetable cultivation. For vegetable cultivation, 10 batches of 50 farmers each were given training on Participatory Guarantee Scheme Organic Council's certification, quality control, and integrated manure management by Horticulture Department in year 2015. Plans are on to increase the numbers. This, one of its kind hybrid scheme required mammoth funds and workforce, therefore, funds were redirected from Mahatma Gandhi National Rural Employment Guarantee Scheme, Integrated Action Plan, Backward Regions Grant Fund, CSR funds of National Mineral Development Corporation and other different schemes of AD.

Figure 2: Arrangements in Mochobaadi



4.4 Incubator

From DA to Farm

DA realized the need for a synchronized effort and intervention at the level of the farmers, beyond policy planning. It therefore created an incubator to promote and sustain organic farming.

Farmers were organized into groups. More than 75 groups with more than 850 members were registered with the AD. About 40 more groups are

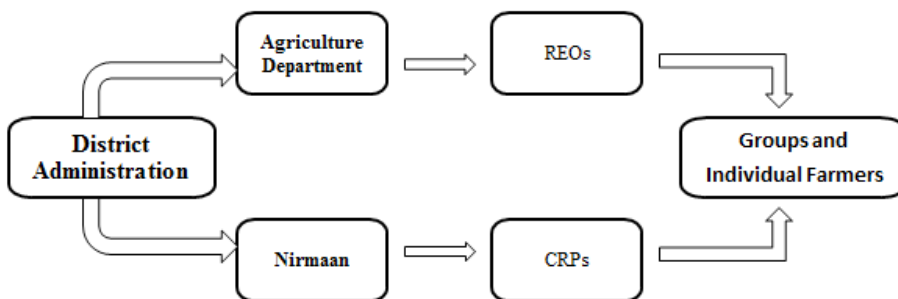
currently seeking registration taking the total number of participants to above 1200. These registered groups hold regular meetings, attend training programmes and strengthen their social capital thereby practicing better farming with each other’s support while reducing the cost of labour as the farmers help each other in fields during sowing, weeding, harvesting, etc. These groups are not only points of contact for the state but also nourish local leadership and empower communities.

The AD holds the responsibility of mobilising farmers, building their capacity and conducting training programmes. For strengthening the outreach and efficiency of the training programmes, DA has involved a Non Government Organization, Nirmaan¹ since December, 2015. Nirmaan has appointed young and educated Community Resource Persons (CRPs) from villages who speak *Hindi* as well as the local languages *Gondi* and *Halbi*. These CRPs are locally known as *Jaivik Karyakarta* who cover two to three villages as assigned and undertake the following tasks:

Figure 3: Framework for Communication, Mobilization, Training and Capacity Building of Farmers

- Community mobilization – Strengthening of existing farmer groups and formation of new groups
- Crop planning and monitoring
- Training and capacity building
- Consultation on demand
- Record keeping

Figure 4: Empowering Community at Grassroots



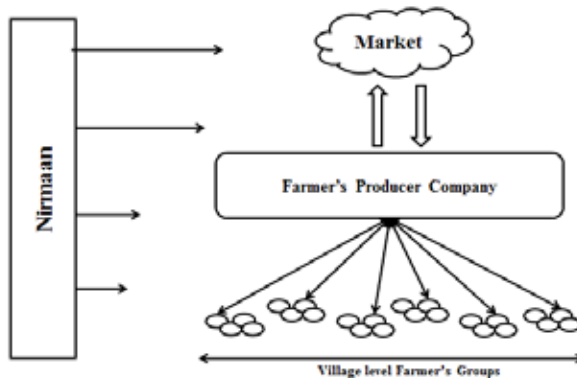
In order to revive the cultivation of traditional varieties of seeds, CRPs are promoting the preservation and cultivation of these varieties. The CRPs are sensitized and trained in their monthly meetings by educating them through visual media. They are shown videos like ‘Toxic food- Poison on our Plate’, Satyameva Jayate, SRI training and talks by experts. Training visit for farmers, AD staff and CRPs are also arranged regularly to Hyderabad, Nagpur, Odisha, Tamil Nadu, etc. where sustainable agriculture practices have been successful.

From Farm to Market- Farmer Producer Company

In today’s time, market has emerged as a site of exploitation of the marginal and small Indian farmer. The market, given its economic importance, has direct relevance on farmers’ livelihood. Earlier, the exposure of tribal farmers was limited to *haat* (local market). In Dantewada a Farmer’s Producer Companies owned by the tribal farmers has been promoted, where the benefits can be reaped by the farmers themselves. At the village level, the famers are organised into village level groups, further federated into Farmer’s Producer Company- *Bhoomgaadi*, named after a festival of tribal farmers. Bhoomgaadi aggregates produces from farmers and stores, processes and sells it under the brand name ‘*Aadim*’.

The role of NGO Nirman is in incubating the FPO and assisting the company in management and operations until the shareholders (farmers) are capable of running it on their own. Having the backing of 44 Participatory Guarantee Scheme Organic Council certificates, an organic store² was opened in district Dantewada in June, 2016. The procurement for the outlet is not limited to the district or the state of Jharkhand. “The organic products are purchased from Jodhpur-based ‘Banyan Group’ to Hyderabad-based ‘Sahajhar Group’ and other parts of the country” (the pioneer, 2016). Further one grain processing unit and an organic store with cafeteria are in the process of being set up.

Figure 5: Building Inclusive Value Chains



5. Way Forward

The use of insecticides and herbicides in the district especially by vegetable cultivators is a major challenge. Vegetables require effective management to be harvested organically and intense capacity building and training will be the key to face this challenge. Workforce in public administration has increased; however, it still does not suffice the requirements of different departments. The reach of interventions has improved now, given that NGO Nirmaan is also performing the functions of outreach, mobilization and capacity building among farmers. In the AD, 27 vacancies existed (as on June, 2016), of which 18 are for REOs who are supposed to be the main promoters of the SRI technique. Out of 64 positions, 24 vacancies exist in the Irrigation Department and 7 field staff vacancies are there in the Horticulture Department.

The organic farming efforts have slowly begun reaching the remote areas. The formation of village level groups ensures strengthening of the backward linkage. A crucial concern is on managing the forward linkage, with the market. Even with support from Nirmaan, it is a challenge to capacitate the tribal forest dwellers to manage their own company. However, looking at the empowered community, one can sense the optimism for bringing about this change.

Policies incline towards the majority. Amidst these challenges, the progress in the last three years had grabbed attention of state government and it has begun supporting the same. In the year 2014, the district was selected under scheme of *Jaiwik Kheti Mission (JKM)* that promotes organic farming. This year the target for the scheme is to cover an area of 2500 acres. JKM provides funding support for trainings, exposure visits, certification, infrastructure development and grants for organizing *Kisan Mela*, so the farmers at district level come together to realize their social capital, feel motivated and empowered. A similar scheme, *Paramparagat Krishi Vikas Yojna* had set a target of 750 acres to be brought under the fold of organic farming, but the overall targets by DA go much beyond these numbers. The efforts have shown their impact and the government of Chhattisgarh has announced for developing Dantewada as organic farming district in 5 years' time.

These efforts call for a new paradigm of democratic governance. It demands a shift towards approaches, policies and programs that are not fragmented, but rather remain holistic, at the level of implementation. Dantewada has tried to imbibe such an approach by incorporating both modern scientific advice and harnessing traditional knowledge. An instance, of this is the previous District

Collector Mr. Devasenapathi, who also showed remarkable openness and willingness to learn and accept suggestions from experts in organic farming such as V. S. Arunachalam.

In view of the comprehensive institutional arrangements, Dantewada stands as a model of new partnership. Literature has long established the relationship between good governance and development. The district has shown an exemplary model of development through effective management of public resources by public institutions and active stakeholder involvement. When good governance exists at the local level, it can effectively engage citizens. This is working effectively in Dantewada with the creation of village level groups.

The creation of local entrepreneurs, innovators and change agents can go a long way in fueling the sustainability of these rapid changes. Handing over the responsibilities to local population gives them a sense of ownership for the change that is being collectively sought.

The nature of governance spurred by the DA has led to multiple actor partnerships, an efficient and effective public sector, legitimacy, access to knowledge and information, equity and sustainability. DA, to a great extent has been able to bridge the gap between citizens and the state as evident from a personal interview with a farmer who stated that the District Collector has come into our life as a blessing (Anonymous, 2016, personal communication, 24th June). This kind of identification with public administration is not commonly heard of, and has taken the earnest efforts of inspired leadership by the DA.

This partnership model is one which involved people who were unequipped with modern day practices and techniques but had an abundance of traditional knowledge and natural resources. The District Administration experimented by deploying an alternative strategy of development in collaboration with people which was close to the tribal ways and means of living. As a result the farmers are learning from experts, scientists and their peers. Capacity building efforts are enabling their interaction with external forces of market. The visionary leadership of DA and local empowerment is showing the promise of a new livelihood paradigm in the resource rich state of Chhattisgarh.

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Pathways to Secure and Resilient Livelihoods

Emily Janoch and Kakuly Tanvin

1. Conditions of the Population Served

Pathways to Secure and Resilient Livelihoods project is working with small holder farmers, especially women, from poor households to reduce their vulnerability and susceptibility to natural disasters and increase their resilience in the face of climate change. 32% of the population in this zone lives below the poverty line. 94% of the population engages in agriculture, and face grave challenges regarding productivity and sustainability in their activities. Recurrent flood, water logging, heavy rainfall, draught and salinity are key climate issues that affect their life and livelihoods every year. Additionally, farmers struggle to access the information and inputs they need to resolve these problems, as 25% have no access to agricultural inputs, and only 46% can access extension information.

Women face even greater barriers. 76% of them have never met with an extension worker, and the lack of mobility makes it hard for them to access inputs, information, or market opportunities. Very few women are involved in decision-making at the household level, and men make between 60 and 88% of household decisions alone. The gender wage gap adds more suffering to women wage earners in agriculture in managing food and other basic needs of the family. In general, women make BDT 85 per day while men make BDT 150, just over half of a man's wage.

2. Nature and Strategy of the Program

The CARE Pathways to Resilient Livelihoods in Bangladesh has been running since 2012, focusing on getting women farmers access to inputs, extension services, and the empowerment they need to adopt sustainable farming practices, especially in the face of changing climate. It works with over 20,000 participants to build community support for women's empowerment and improved agriculture practices. The key strategies include:

Work with women to increase their engagement in agriculture by negotiating for access to equal wages, market opportunities, and information. This includes working with women's groups, landowners, the government, and community leaders to open up spaces for women's participation in decision-making and access to critical resources, like land.

- Improve the knowledge, skills, relationships, and self confidence of women farmers, especially using demonstration plots and community gender dialogues. The projects hosts sessions not only on agricultural techniques that promote improved production, income, and resilience to climate change, but also off-farm training on other key issues around women’s empowerment. More than 7,000 women have participated in sessions on gender, wage rights, nutrition, and disaster risk management.
- Contribute to women’s empowerment and resilience, especially in their influence over household decisions and community activities, by working to improve the enabling environment and support from men, mothers-in-law, and leaders in their communities. The project targets women farmers, but it does not work with only women. Our experience shows us that working with women will only have limited impacts unless other decision-makers support them. The sessions on gender and on wages also included more than 2,000 other community members to build support for women’s activities and women’s rights.
- Improve the yield and income of farmers through adopting climate resilient agriculture practices and connecting farmers to markets and value chains. This includes working to test new climate-smart seed varieties, changing planting and intercropping practices, and focusing on improved soil conditions. It also means connecting women more effectively to markets so that they can negotiate better wages and better prices.

3. Innovation Adopted

The project focuses on building empowerment and women’s ability to implement climate resilient agricultural practices. This leads to more sustainable crop and livestock production, and often includes organic farming as goals of the system. Some key innovations are:

- **Participatory Performance Trackers:** This tool for collective monitoring and action helps groups track their own progress on adopting sustainable behaviors, and overcome barriers to ensure maximum adoption. Farmers meet regularly to go over the list of improved practices, and examine 1) what practices they are successfully adopting, 2) the practices where they are struggling, and 3) barriers to adoption and how to overcome them. From those farmer meetings, the project aggregates data across producer groups. In addition to providing a key source of monitoring and evaluation data, this also allows staff to examine common barriers and how Pathways can help communities resolve them. This may include facilitating access to inputs, helping to negotiate with government

officials, or bringing additional technical assistance around particularly difficult practices. The PPT provides a way for producers groups to hold themselves accountable for behavior change, and help the project make necessary to changes to better achieve the results. The PPT has a web-based component to make data collection, aggregation, and analysis more efficient.

- **Sack planting:** Women are planting vegetables in 50-60kg rice sacks full of soil because it allows them to protect their crops in case of flooding and move them out of harm's way without losing the production of vegetables that they eat and sell. This was especially useful in August 2015, when more than 2,000 households faced flash floods that swamped traditional fields overnight.

Figure 1: Mukta Rai and her Husband Using Bottle Drip Irrigation



This method also protects plants from salinity, as it allows women to have better control over the soil and water conditions.

- **Relay cropping and Bottle Drip Method in home gardening:** Farmers are practicing relay cropping in their home garden that increasing productivity from the home garden in a short period. For example, till June farmers keep harvesting of sweet gourd from home garden pit and they cut off it at the end of June. On early June they plant ridge gourd or snack gourd in the sack bag and place it in the same pit after cutting off

the sweet gourd. In this way they are getting one more month to consume sweet gourd using a pit and keeping a second crop ready to plant in the same pit. This also allows them to protect the sapling of the second crop from the heavy rain as farmers can move it easily. Bottle drip, the adaptive system also protecting plants from drought saves women's time spent watering.

- **Krishi Utsho input shops:** a way for farmers to access inputs such as improved seeds or cattle feed at a lower cost and closer to home. The shops also serve as a hub for sharing information on improved agricultural practices. This is especially important for women farmers, who are often not able to travel long distances to access the tools and information they need. Studies done on the Krishi Utsho model indicate that farmers see at least a 31% increase in their income. Because the shops are closer to home, farmers cut the time they spent going to get inputs in half (a 58% reduction). That makes inputs much more accessible for women, who have a harder time travelling long distances to access inputs. Farmers in Krishi Utsho areas also dropped their cost on items like feed by 92%. So people have more money to spend from income, but also on savings from the goods.
- **Collective bargaining:** Pathways has worked with over 14,000 participants to pressure landlords to provide women with equal wages as men. Working to get mass pressure, and to convince men to support women for equal wages, gives women the confidence and resources they need to implement sustainable agriculture activities.

4. Impact of Initiative

The results so far include increased income, investments in agricultural inputs, and adopting sustainable practices.

- **Better access to inputs:** Communities have raised \$5,703 to invest in agricultural inputs from their fields and in responding to climate-related shocks. By linking farmers to government and research institutions, farmers had access to an additional 500kg of drought-tolerant rice seeds. Nearly 3 times as many farmers are using improved seeds after 1 year of program implementation. This use of inputs has allowed farmers to reduce their production cost by 19% and increase profitability by 24% according to the demonstration do far.
- **Women have better access and equality:** Women have better access to land (215 additional acres so far), because of negotiations with their families, the government, and landowners. Women are also seeing improved

ability to make decisions in the household. In fact, women’s household influence in adopting agriculture technologies went up to 61% that was 36% before the project intervention. Husbands are now much more supportive of their wives as farmers. 78% of male partners of women farmers are supporting their wives in household activities and in child care while women are busy in other activities, whereas before project intervention, only 45% male counterparts were willing to be supportive in household chores. Men are even helping them get access to the inputs they need to be more productive.

“The gendered discussion specially the community gathering on women’s right over asset using paper based visual materials helped my family to be more supportive towards me, immediate after the meeting he (husband) said that he will register some agro-land by my name. As he couldn’t manage enough money to buy land that time, he waited and when became able to manage money, he bought 6.5 decimal of land and registered by my name.” - Salma Begum, Holokhana union of Kurigram District

Women’s wages have also gone up as a result of gender sensitization and negotiations for fair wages. In the communities, where project worked from 2012 to 2014, the wage rate for male agriculture day labor has increased by around 23 percent, while that for female agriculture day labor has gone up by around 46 percent in the program village.

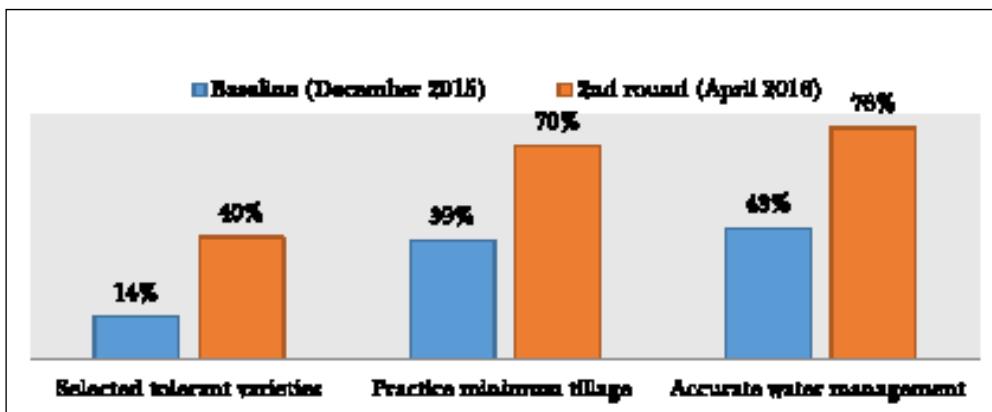
Table 1: Treatment and Control

	Participants	Pre- Intervention Wage in 2011 (BDT)	Post- Intervention Wage in 2014 (BDT)	Difference	% Change
Treatment	Male Ag. Labor	150	184	34	23%
	Female Ag. Labor	85	124	39	46%
Control	Male Ag. Labor	90	127	37	41%
	Female Ag. Labor	42	69	27	64%

Presently, working with 915 landlords, women have been able to raise their wages anywhere from \$0.32 to \$0.64 per day. This is anywhere from a 30-60% improvement in wages for women. 1641 women wage earners increased their income by \$ 631 per day. While this is a substantial improvement, it has not yet closed the gap between men’s and women’s wages. Men’s wages also went up by \$0.26 per day at the same time.

- Increased use of improved practices:** The project has established 346 demonstration farms, where 5573 farmers have learned about sustainable agricultural practices. Farmers have substantially increased their use of adaptive practices. This includes a 31% improvement in farmers practicing minimum tillage, a 33% improvement in those farmers using accurate water management and 26% improvement in selecting tolerant varieties to protect crops from climate adverse. The result from Participatory Performance Tracker tool implementation shows as follow;

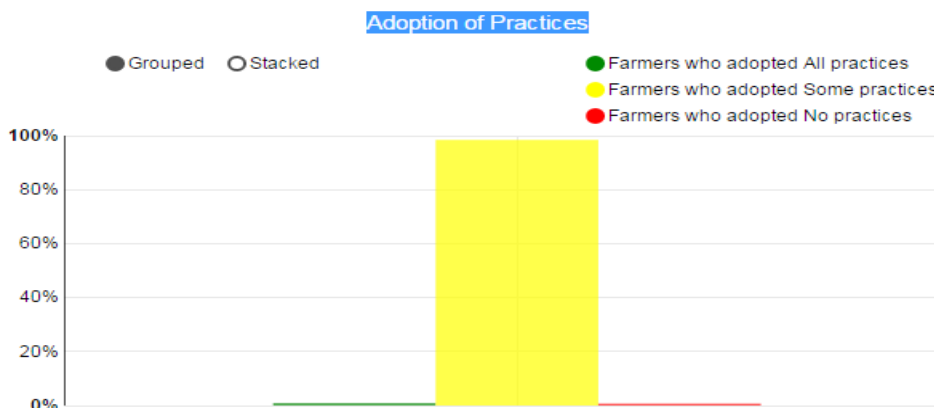
Figure 1: Adoption of resilient variety, minimum tillage and water mgt. techniques



- Better business practices:** Farmers are now better able to calculate the benefits they are gaining from adopting improved practices. This helps them make appropriate choices about which techniques to adopt and how to invest. The project teaches farmers to keep farm records of production cost and benefit from yield sale. Farmers have also learned the key factors to calculate on production cost and how to manage harvest and post-harvest loss. Now, 74% of farmers seek out market information before making decisions, compared to 40% before the project started.
- Higher income and production:** Adoption of better agricultural practices has paid off. More than 2,000 farmers have increased their income by \$2,431, and grew 15.3 more tons of food. These income increases come from increased wages, selling compost, improved rice production, and selling vegetables from homestead gardens.
- Improved Resilience:** A total of 2,575 farmers have been able to save \$5,703 through Village Savings and Loan Associations. They invest 30% of this money (\$1,712) in activities that would help them face climate shocks, such as building improved seed storage, raising houses above flood levels, and buying sanitation supplies after flooding. Farmers invested the remaining 70% of their saving in buying cattle, land, vegetable seed

and other agricultural inputs. They were also able to access \$2,779 in loans that helped them build assets and manage disasters and flooding. The PPT result also shows that 0.88% farmers adopted all climate smart practice whereas 98.4% farmers adopted few or at least one of the climate smart practices as trained by the project. This also indicates that the farmers are more resilient in the face of climate issues.

Figure 2 and 3: Adoption of Practices



Scenario of 19 August, 2015 session facilitated by SAAO at demo plot



The same plot one day later at Suverkhuthi, Holokhana at Kurigram

5. Challenges Faced

Climate shocks are the program’s biggest challenge, as flooding wiped out a number of demonstration plots and farmers’ fields in 2015. 92 groups in 51 communities suffered severe damage to their farms and demonstration plots, as well as their homes. Ultimately, more than 4,400 households and 3,644 acres of land in the project areas were affected by the flash floods. The project quickly mobilized hygiene kits to affected households to ensure that they could have safe drinking water and clean homes. Pathways also facilitated farmers to re-cultivate their lands by alternate cropping through effective

linkages with Bangladesh Rice Research Institute (BARI), Bangladesh Institute of Nuclear Agriculture (BINA) and Department of Agriculture Extension (DAE). The use of planting bags also helped women rescue some of their crops during the floods.

Climate conditions also put potato crops at risk for many of the households. The extreme cold made it much easier for fungi to attack the potato fields. In order to mitigate these threats to potato crops, farmers had to invest heavily in fungicides that made the crop unprofitable for them.

6. Scale and Sustainability of Program

The learning from this program is influencing CARE's work globally in more than 18 programs. The project is helping refine the training modules that projects use to work with communities around issues of resilience to climate change. Reducing gender wage gap and the facilitation of climate smart agriculture practices are also influencing administration and extension workers in the government of Bangladesh to support the program and spread sustainable agricultural practices to women farmers.

Back to Basics

Disha Shah

1. Introduction

Farmers, the backbone of India, are committing suicide in huge numbers. They say that the reason behind this is extremely low output, both quantitatively and qualitatively. So, the government is trying to help them wherever it can. The Green Revolution was started as a result of this. Fertilizers, pesticides, insecticides, water pumps and a lot of other supplementary resources were provided to farmers to make working in farms easy. Subsidies were given at every point so that poor farmers could make use of new technologies in the market. This led to extensive use of chemicals in the soil. The feedback cycle started. Farmers started using chemicals more than ever which ultimately brings us to today, when the quality of soil has deteriorated so drastically, that there is no going back. Or is there?

The Green Revolution increased the production of *wheat* and *paddy* multi-fold. At the same time, the amount of energy and time needed in the farm decreased significantly. This encouraged farmers everywhere to plant wheat and paddy. These crops were produced at comparatively cheaper rates and gave high returns. The consumers had adapted them in their daily diet well. These two crops were easy to grow and it almost turned into a fashion.

However, there are a few things to ponder. What did the farmers grow before this? Producing wheat and paddy without government intervention was quite a difficult task. They did not do it. They produced different types of millets, which were consumed as staple food in all parts of the country since long. This practice started fading with the entry of newer technologies and chemicals. Farming became so convenient that the farmers started forgetting their age-old practices. But, nature hasn't. It is not used to the artificial chemicals being pumped into it. It is dying.

Now that these new methods are not sustaining themselves, why not go back to millets?

2. Why Millets

Millets are small-seeded grasses that are hardy and grow well in dry zones as rain-fed crops, under marginal conditions of soil fertility and moisture. Millets are also unique due to their short growing season. They can develop from planted seeds to mature, ready-to-harvest plants in as little as 65 days. This is important in heavily populated areas. If properly stored, whole millets will keep for two or more years.

Millets are highly nutritious and non-glutinous foods and do not form acid. Hence they are soothing and easy to digest. They are considered to be the least allergenic and most digestible grains available. Compared to paddy rice, especially polished paddy rice, millets release lesser percentage of glucose over a longer period of time. This lowers the risk of diabetes.

Millets are particularly high in minerals like iron, magnesium, phosphorous and potassium. Finger millet (Ragi) is the richest in calcium content, about 10 times that of paddy rice or wheat.

Advantages to consumers

1. **Highly nutritious:** All types of millets are highly nutritious in nature. Different millets specialize in different nutrients. A table of comparison is shown below. The nutrition qualities of paddy and wheat are also shown in end for better comparison.

Table 1: Comparative of Nutritional Content In Different Millets, Paddy & Wheat

	Protein (g)	Carbohydrates (g)	Fat (g)	Minerals (g)	Fiber (g)	Calcium (mg)	Phosphorous (mg)	Iron (mg)	Energy (Kcal)	Thiamin (mg)	Niacin (mg)
Finger	7.3	72	1.3	2.7	3.6	344	283	3.9	336	0.42	1.1
Sorghum	10.4	70.7	3.1	1.2	2.0	25	222	5.4	329	0.38	4.3
Pearl	11.8	67.0	4.8	2.2	2.3	42	-	11.0	363	0.38	2.8
Foxtail	12.3	60.2	4.3	4.0	6.7	31	290	2.8	351	0.59	3.2
Little	7.7	67.0	4.7	1.7	7.6	17	220	9.3	329	0.3	3.2
Kodo	8.3	65.9	1.4	2.6	5.2	35	188	1.7	353	0.15	2.0
Proso	12.5	70.4	1.1	1.9	5.2	8	206	2.9	354	0.41	4.5
Barnyard	6.2	65.5	4.8	3.7	13.6	22	280	18.6	300	0.33	4.2
Paddy Rice	6.8	78.2	0.5	0.6	1.0	33	160	1.8	362	0.41	4.3
Wheat	11.8	71.2	1.5	1.5	2.0	30	306	3.5	348	0.41	5.1

2. **Beta Carotene:** Millets contain Beta Carotene in good amounts. The human body converts beta-carotene into Vitamin A (retinol) - beta-carotene is a precursor of Vitamin A. We need Vitamin A for healthy skin and mucus membranes, our immune system, and eye health and vision.
3. **Gut Bacteria:** It is the bacteria that resides in our intestines. The bacteria helps improve immune health, mood and mental health; boost energy levels; improve cholesterol levels, regulate hormone levels, reduces yeast infection occurrences, supports healthy weight and improves oral health. **Non-glutinous:** People with coeliac disease, gluten intolerance, or the uncommon skin condition- dermatitis herpetiformis, can have nasty reactions if they eat glutinous food. Millets are a good option for them.

Advantages to producers

1. **Rain-fed crop:** It is a rain-fed crop. There is a minimal requirement for irrigation through modern means, which saves farmers from renting out costly irrigation facilities. It does not use up too much water, and ground water can also be retained.
2. **Low inputs:** It requires very low amount of inputs like water, fertilizers, insecticides and pesticides compared to wheat and paddy.
3. **60-75 day cycle:** It has a short cycle of 60-75 days which allows more than one crop a year. Farmers are encouraged to take up as many as three cycles of crops for better utilization of land.
4. **Hardy crop:** These crops are quite rugged. They require very low inputs as mentioned, can sustain in all climates and weather and need little care during production. Also, they are not prone to damage due to insects and pests like other crops.
5. **Export market:** There is a huge export market for these crops. As of now, very few organizations are doing this, but it can be well anticipated that export of millets can be the next uptrend quite soon.

3. Earth 360

Through his years at the University of Mysore as an engineering student, Dinesh had been engaged with the amateur naturalists club and several environmental movements, like “Save the Western Ghats” movement, and regularly conducted environment education camps for students. Soon after completing his degree in 1992, Dinesh moved to live and work at Timbaktu Collective - a community working on farming and environment. Dinesh was one of the first people to join and settle in Timbaktu. Based in Anantapur, an extremely arid district, Dinesh anchored solutions in the conditions of water scarcity, poor access to markets, erosion of soil etc.

Between 1997 and 2002 Anantapur faced severe droughts. The farmer families lost almost half the cattle in this period. Living with the farmer communities during this time and working with them to mitigate the consequences of the droughts had made Dinesh think about long-term solutions for rain-fed agriculture.

This led to Dinesh working on millets, and eventually starting the Millet Network of India, promoted by Deccan Development Society in 2008, along with several like-minded people. The turning point for him came in 2009. Anantapur was again facing a drought with over 85% of the district land

being left barren; farmers were selling their cattle to butchers. Based on his knowledge of millets, Dinesh steered an effort to find and distribute millet seeds to the farmers as a contingency crop. As millet production in the country was nearly non-existent, finding seeds proved to be a challenge. However, Dinesh mobilized funds and a support network to distribute 15 tons of millet seeds to farmers, covering the area of 5000 acres.

It was the first time in 20 years that this crop has been sown in the area. Despite severe shortage of water, 50-60% of fields were harvested to provide food and fodder. Trying to investigate the reasons for which farmers abandoned this seemingly highly beneficial crop, Dinesh realized that the absence of appropriate processing and marketing was the main gap. Determined in his belief that millets were a sustainable solution for rain-fed agriculture, Dinesh set out to fill existing gaps by formally starting Earth 360 in 2010.

Vision

To be a leading organization in millets value chain activities and to create an easily replicable sustainable model for all villages.

To respond to the growing demand for millets and support local farmers, Earth 360 is creating a network of entrepreneurs who can set up local processing units. It is catalyzing ‘small-scale rural millet economies’ that are equipped to produce, process and distribute millets locally.

Earth 360 mainly works in three areas:

1. Production

Network Sanghas of farmers were made stronger. With this, it was easy to disseminate information, have them produce the same kinds of millets, and match their times of harvest. This led to ease in providing inputs with benefits of huge scales and use of the learning curve. They provided training in millet cropping practices to ensure that there is maximum output and no information asymmetry. They encouraged local production of organic inputs to further reduce the costs. Earth 360 also prepares organic inputs from the husk waste it generates during millet processing. Every area, depending upon the climatic and agricultural land, has the best conditions to produce a particular type of millet. Earth 360 encourages farmers to grow those millets and incentivizes farmers for village level seed production and storage.

2. Processing

To sustain millet production, it is necessary to have proper processing units so that the produce can be sold. Earth 360 provides full services for millet

processing, from cleaning to grading to de-husking. The final product it sells to customers is in the forms of millet rice, semolina and flour.

3. Propagation

The last stage is the propagation of millets. This is mainly done by arranging awareness programs with consumer groups. Training sessions are arranged to teach millet cooking and to share recipes. Special diets for chronic diseases are highlighted. A strong network is established and maintained with congruent entities and people.

4. Millet Processing

Earth 360 was one of the pioneers which worked intensively to revive millets. But just encouraging farmers to grow millets would never bring the expected revolution. There should be a robust infrastructure in place that can sustain millets in everyday lives. This situation made Earth360 work on the entire value chain of millets. It starts from the beginning by providing millet grains to farmers, according to their needs of cultivation. The cost of this seed is quite nominal compared to that in the market. This is to ensure that the farmers use only those millets for production. They are of supreme quality and give exceptional returns.

This produce is more often than not bought back either directly from the farmers or through traders. Due to logistical difficulties, buying millets from traders is desirable. They directly deliver the goods in the factory warehouse with less lead time and without letting the quality degrade.

Depending on the demand and supply of different kinds of millets, their processing is queued up. It has been seen that typically, the same kind of millet is processed for 3 to 4 days in a loop. But then again, it primarily depends on the inflow and outflow of different millets.

After the decision is made on which millet should be processed, the millet grains are shifted from the storage area to the plant. The storage area is kept clean and dry to avoid damage of goods. There are 2 to 4 men employed for this task. The storage area is in the factory itself, about 200-300 meters from the plant. Processing starts immediately after this.

The first step is **Grading**. This step separates millets from waste on the basis of size. It is done in a machine called grader. The grader continuously vibrates in an eccentric motion to give the required result. There are 2-3 women with each grader for feeding millets as the input and collecting the output from the machine.

After this, the graded millet goes through a **Destoning** process. Here, millets are differentiated on the basis of their weight. This helps to remove small pebbles which are slightly heavier than millet grains. The machine is called destoner and typically, 2-3 women work with it. It has a sloping plane and moves in a continuous eccentric motion to get the desired result.

Next in line is **Hulling**. This is done to remove husk from the millets. For this, millets are first passed through an **Impeller** which is attached on the top of a machine. It rotates with an extremely high centrifugal speed and so after the millet grain collides with the lining of the machine, the impact removes the husk from the grains. The huller then separates the husk and the millet grains.

Typically, these three steps are repeated several times to get quality output.

The next step is manual verification, which is done by 6-7 women in a traditional way. Then the output goes for packaging.

The output is in three forms. Chiroti Rava is the finest in texture. Less than that is idli rava and then the least is upma rava. All these are packed and sold. Apart from that, the waste byproducts are used as cattle feed and husk is primarily used as a fertilizer. Thus, broadly, we have three outputs - rice, nuka (broken rice) and feed.

Ravindra's Story*

Ravindra was associated with Rural Education and Development (RED) society since his early days. In the year 2008, Timbaktu collective had arranged a seminar to promote the nutritious goodness and benefits among farmers. Dinesh was the main spokesperson of this seminar. Ravindra attended that meeting along with his acquaintances Maula and Devendra. All three of them got so interested in millets that they decided to join Dinesh in the revolution that was about to begin.

These four were the initial leaders in the community who encouraged other farmers to grow millets and spread awareness of its nutritional benefits. In the first year itself, they distributed about 3 tons of millets in 5 villages to the farmers for cultivation. Apart from that, they provided farmers with knowledge and training for millet cultivation using the Nagu method. About 25% of the farmers who were introduced to this new crop and method opted to sow millets in the first year itself. With this, Ravindra started working with Dinesh for Earth 360.

The place of operations was narrowed down. Kadiri was chosen among all the villages because farmers still practiced growing millets here; though the practice hadn't died here, it had slowed down drastically. This gave Earth 360 a platform they could build upon. As they had already worked with the villagers in this area before, it would be easier for the people to encourage millet farming. Taking these things into account a small room was rented in Saidapuram, which would serve all the needs of the project. A month-long discussion for future plans led to the installation of a 100 kg capacity de-stoner. They went to Pulliviadella to check an old de-stoner machine and tried to modify it to suit millet processing. The main problem with these de-stoners was that they were designed to work for grains like paddy and wheat, which are quite big compared to millets. It could not separate them both effectively. Due to this, in later stages, stones got crushed along with the millet grains. This gave a low quality output, making the produce unfit for sale. This was a big problem. All the machinery required for millet processing needed to be modified.

In 2010, Dinesh went to Selum where he carried out research along with Bhavani, a designer, to create a processing machine fit for millet de-stoning. The new machine had a capacity of 500 kg. While they were working on this, the rest of the team was busy encouraging farmers to grow millets and was distributing raw material required for it. Along with that, the main aim was to conduct a market study to check the response of the product in the market, and work towards improving its quality. Finally in 2011, after being satisfied by the output they had obtained with new machines for processing, a step ahead was taken. New value-added products were introduced in the market and the consumer base was increased.

In all this time, the working of Earth 360 had been quite flexible. Though the roles were not well defined at the time, Maula was the factory in-charge, Ravindra kept up with procurement and village interface and Devendra mainly handled administration issues.

All of them continuously tried to decode the market information they collected. At a very early stage they realized that returns are the most important parameter for a farmer to choose what to grow. Returns from millets were quite less compared to that of cash crops. This was the main reason why farmers used to shy away from growing millets. They got about Rs 8 per kg for millets during the early years. So, in total, they just grew 5 to 6 tons. The team then decided to buy back the millets from farmers at Rs 10 per kg to encourage farmers to increase production. During this time, there was a sudden rush of awareness about millets in the market through different means like media, news items, health awareness programs, etc. This made it easier for them to sell millets. This also led to an increase in the price of millets, which reached the peak price of Rs 35 per kg in a short time of 3 to 4 years.

Four years ago, in 2016, about 350 to 400 farmers entered their eco system. This gave them enough raw materials to process. This led to one unavoidable problem. The shelf life of processed millets was only one month. So, the inventory

turnover needed to be high. This meant that they needed a big market for their outputs.

In the year 2014, Ravindra left Earth 360 to work as a trader. He buys from farmers and sells to processing units. He has 8 to 10 clients, Earth 360 being the major one and taking 30% of the share. The other clients have processing plants and the millets are not polished. These clients are mainly from Hyderabad and Tamil Nadu. He works with about 330 farmers from 15 villages and collects their produce. He has appointed an agent to help him with 3-4 villages. He plans to grow organically and wants to make millets the staple food. This is what makes Earth 360 so special. Once you get a glimpse of their ecosystem and know about their values, you just cannot ignore them.

Kaulige*

Narayana and Arun were members of the core team of Earth 360. They loved the idea of bringing millets back to the plate. After working with Dinesh for a few years, they realized that something was missing. They loved Dinesh's intensions. But, they weren't sure if that was enough. Dinesh, having worked in an NGO in his past years, had no business experience. Thus, most of the work done by him revolved around preaching the cause and working towards it. He did little about showcasing the idea.

To bridge this gap, Narayana and Arun started Kaulige for good business. Though an independent entity by itself, they like to think of themselves as the front end of Earth 360. Earth360 and Kaulige Foods is a unique collaborative initiative dedicated towards the revival of millets. They buy almost 10 tons of millets every month. It is based in Bangalore, with a pretty good market, and they don't have any plans of expanding geographically beyond Bangalore in the near future. They

promote a good cause and earn well too. Kaulige Foods works towards reintroducing millets to the mainstream diet of Bengalurians by conducting awareness workshops, offering catering services, tiffin services, supplying millets and millet based bakes. The above collaboration offers a sustainable business ecosystem that promotes the philosophy of “farm-to-table”. In this model, the farmers get the right price for their produce and the consumers get nutritious whole grains grown in a traditional, sustainable way.

Narayana is the program manager, Arun is the operations head and Aditya is the marketing head. The three of them make up the core team. Apart from that they have a trained cook who prepares delicacies from millets, and a delivery manager.

Kaulige has its own strategies to promote millets. The most important of its jobs is to tell people about consumption of millets. They employ various ways to promote them. A large part of Kaulige’s work is conducting workshops in corporate offices and apartment complexes. These workshops demonstrate the use of millets in simple everyday recipes, and show the participants what millet seeds and final products look like. They provide catering services to give a taste of millets. They sell bakery items like cakes and cookies to create liking in youth and children. Every Sunday is celebrated as Millets Sunday, where they teach cooking millets based on different themes. The theme of diabetic friendly recipes is liked the most. As of now, Kaulige has 100 regular customers and 500 listed ones. It has been almost one year since they started in 2015 and are growing organically as planned. One of the highlights of Kaulige is that the millet grains it sells are affordable and they don’t gain much profit from these sales. But, with value added consumables like cakes and cookies, the margins are safe enough to sustain them. This way, millets can be included in everyone’s diet.

Though in its inception phase, people at Kaulige have started anticipating problems. With further increase in sales, there are going to be logistics issues. The supply chain on the customer side still needs to be developed. As food is a perishable item,

inventory handling needs to be done in a proper, scientific method for optimal returns. Good manpower will be needed for that. Getting people who are driven by the same cause as them are very hard to find and retain. This is the major challenge for people at Kaulige which needs to be crossed.

Kalyani Akka*

A loving mother, a perfect wife, a caring human, an awesome cook and a humble being - she is all that and more. Kalayani akka is like a super woman.

She started work as a teacher. She was working with the Timbaktu collective along with Dinesh. When Dinesh got interested in millets, she was the one who played a major role in experimenting with the recipes. She shifted from a town to stay in village Kadiri to help Dinesh in his cause. "I never thought I'll give up teaching to be part of a business!" she recollects. But then, when it came, it was so obvious that the role was meant for her. Apart from Dinesh, she is the only one who has been with Earth 360 since the idea was incepted. While Dinesh is mostly chasing the cause, Kalyani akka works better on managing the cause. Quite sincere herself, she clearly knew what her role needed to be to make this venture more successful.

During the initial stages of Earth 360, while Dinesh was encouraging producers to grow millets, Kalayani akka made it a point to encourage customers to try out the recipes by giving demos wherever possible. A great cook herself, she cooked everything she could think of using millets. She even published her recipes of Andhra-cuisine that had everything made from different types of millets. She used her skills to encourage people to taste millets. She made a point to have the visitors of melas get a taste of millets. She organized workshops

and seminars that gave an encounter to millets as well as its delicacies. Now when Earth 360 is past its initial stage, her role has changed and she is flexible enough to adapt it. Apart from being in the board of directors, she has now taken the responsibility to formalize the way Earth 360 works. She is trying to bring professionalism among all stakeholders of the organization. The major role for her, now, is to coordinate between different teams and bring coherence between them.

Kalyani akka gives you an impression of true women empowerment. She shows us a success story by creating a work-home balance. Cheers to this form of womanhood!

5. Opportunities

The cofounders have already worked in the area before and know the socio economic and political conditions. They have also worked with millets through different agencies and know it well. This gives them an upper hand of established ground work in terms of implementation.

While the environment is degrading at a faster rate than it can be replenished, there are agencies and government organizations that are encouraging alternate cropping methods. Millets are best suited for this scenario. There is a potential for at least one kind of millet in all the regions. They can be grown even in arid regions and are suitable where ground water level is low because of less requirement of water.

Increased health awareness has led to new try outs of healthy food and people are ready to substitute them in their daily diet. It was successful for oats. Millets, on the other hand are locally grown, come in different varieties and are comparatively cheaper. These traits must encourage people to bring millets into their daily diet. This opens up a huge virgin market to cater to with the first mover's advantage.

There is a proposition to include millets in the PDS. There have already been some pilot projects regarding the same by the government before. Dinesh was one of the participants of a pilot project in one of the areas. There is a lot of opportunity for Earth 360 to sell millets through government interventions in such cases. Also, if millets do get included in the PDS, there are high chances

of government schemes for production and processing of the same. This would incentivize farmers more to grow millets.

6. Challenges

The biggest challenge in the process is the unavailability of proper machines. After the Green Revolution, because of exponential increase in production of wheat and paddy, a lot of investment was done in research and development of the processing machines of these two grains. Millets, on the other hand, are quite small and light compared to wheat and rice. It is not feasible to use same machines for millets. This leads to a circular problem - as processing machines are not available, millets are not grown in huge volumes; as production is not in huge volumes, there is no investment to design processing machines for millets. With proper machines, the processing costs will further go down and people will be encouraged to buy more millet.

A paradigm shift has been seen in the food mosaic in the recent years. The staple food of every region has changed and is mostly either wheat or paddy. There is a misconception that millets are heavy to digest. Due to reasons like this, people shy away from consuming millets. One needs to change the core eating habits to include millets in the diet, which is indeed a big challenge in itself.

The problem quite specific to Earth 360 is very low employee retention rate in the upper crust as the returns are not as high as expected and better prospects are easily available. It is also very difficult to find someone who is driven by the same cause and is ready to work with the same enthusiasm and abilities as its co-founders. This mismatch doesn't really work well in the ecosystem where coherence among its employees is very important for survival.

7. Future Plans of Earth 360

The future of Earth 360 depends on how well the model is replicated. As India is a diverse country in terms of climatic conditions, agricultural land, food habits, cultural activities, etc., it is very difficult and not feasible to implement the same model everywhere. So, Earth 360 plans to create a model that is rugged enough for millet production and flexible enough to adapt to different conditions. It wants to create an ecosystem that can bring out professionals who can successfully implement replicable models of the millet value chain across villages.

Diversification and extension in the millet value chain is possible and shows good prospects. This model is easily and effectively replicable for oil and daal. Thus, it is easy to increase the scope. The same established channel of millet chain can be used for both without much disturbance. This will give economies of scale in terms of logistics.

Millet restaurants of different models have failed in previous attempts. Though the idea still remains as fancy as before, it is difficult to have a business plan in place that can be implemented properly and give a successful restaurant.

Annexure

Time-Line*

Pre 2008: Engaged with farmers and studied millets, its market and its nutritional benefits.

2008: A pilot was started to include millets in the PDS

2009:

- Draft business plan was prepared.
- Presentation in XIMB - small grains, big benefits: Jab we Millets
- Ground work was done for the establishments.

2010:

- 1st May - Try to get incubated by XIMB
- 23rd April - Formalization and registration of the organization
- June - Production started
- 30 tons of seeds worth Rs 10 lakh were distributed among farmers of 5 villages
- 4th July - Product co-ordination office was established and de-hulling process was tried
- 14th December - Supported ALC with marketing issues of millets; got first interns from XIMB

2011:

- October - Earth 360 took part in 'Aadhaar', a mela that was put up in Mysore
- Jowar Pops were sold the most
- Took part in one more mela in Bangalore.

2012:

- Ravi got on board as auditor and advisor to formalize the business
- Cooking demonstration was done in Lal Baug mela in Bangalore
- A recipe book in Kannada was prepared
- 13 value added products were introduced

2013:

- Became part of a long-time exhibition at Ongola for the first time. It was 15-days long.
- Millet-based food was prepared for 300 people. Ram babu was one of the guests

- He planned to make an organic food restaurant - Aahaar Kutir
- Earth 360 collaborated with Aahaar Kutir in Hyderabad
- Peter came aboard for improvising processing machinery
- Recipe pamphlets were distributed with 2 kg packets
- More people got engaged with Earth 360
- A local millet based restaurant was started by a couple in Kadiri

2014: December - Got Ashoka fellowship

2015: Got institutional loans of Rs 20 lakh

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*Based on primary data. Interview taken in June 2016 at Kadiri, Anantapur.

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Collective Approach Towards Food Security of Santhal Community

Basil Xess

1. Background

The condition of the environment plays an important role in ensuring sustainable livelihoods to the community. Soil, water and natural vegetation are the main resources for the rural community for their sustenance. If these are degraded continuously, the community would become marginalised in terms of their socio economic development. The extent and quality of soil and land resources is the first consideration in planning for the sustainable management of land resources. The components of land i.e. soils, climate, water, nutrient and bio-organisms are organised into an eco-system which provides a variety of services that are essential to the maintenance of the life support system and the productive capacity of the environment. We cannot increase the area of land, on the other hand population is increasing rapidly; therefore, land resource management is essential for ensuring the livelihood of the rural poor. The productivity and fertility of soil is an aspect of the soil-plant relationship. Soil fertility depends on the presence of natural microorganisms, soil retention, no erosion, crop rotation and usage of organic manure and organic pesticides. The continuous removal of nutrients by soil erosion, mono cropping, chemical fertilisers, and chemical pesticides increases the nutrient problems for crops, leading to lower productivity of available cultivable land. Preservation and conservation of organic matter in the soil is very important for sustainable agriculture practices and ensuring livelihood of the small and marginalised farmers.

Gondwar village, Panchayat Ango, Block Churchu, district Hazaribagh, Jharkhand, is one of the 20 project villages of IGSSS situated around 29 km from the district headquarter. There are a total of 33 households in Bando hamlet of Gondwar village. All families belong to the Santhal tribe. The Santhals are the largest tribal group in Jharkhand among the existing 32 tribal groups.

2. Socio-Economic Condition

The Santhal community of Bando Hamlet Gondwar village are still living a life of simplicity as they did thousands years ago. They are preserving their indigenous life, livelihood and lifestyle. They have unique traditions and customs intertwined with their present, past and future life. Their mother tongue is Santhali but 50% know Hindi and Mundari language also.

The village is home to 172 people, of which 73 are male and 99 are female. Most of the people are illiterate. The primary and secondary schools are 3-5 km away from the village. There is no higher secondary school near the village for the students to continue their education. The nearest higher secondary school is in Hazaribagh, which is 29 km away from the village. However, many from the community are so poor that they are unable to afford the expenses of tuition fees and transportation cost.

The village is connected with the block by a mud road; there is also lack of availability of public transport. They have to travel to the block office on foot or use a bicycle. The communication and transportation is one of the obstacles in their access to basic facilities and also for selling minor forest produce in the nearby markets. Their main occupation is agriculture, followed by gathering of forest produce like mahua, karanj, bamboo, broom sticks, kendu, mango, tamarind, mushroom, etc. They practice traditional methods of cultivation and use conventional machinery and equipment for paddy and vegetable cultivation. The average landholding is 2.5 acres. But there are no irrigation facilities and therefore high dependency on monsoon. These factors result in low yield of crops and thereby food insecurity. Beside agriculture and minor forest produce their livelihoods is dependent on selling of firewood and agriculture labour. 10-15 families sell firewood for supplementary income.

The naturally available food in the area is nutritious, but people are unaware of this fact. In the lack of nutritious food, people suffer from many diseases. The primary health centre is located in Churchu block, which is 5 km from the village. The Balwadi – ICDS (Integrated Child Development) centre is located 3 km from the village. However children are not given supplementary food at the centre.

3. Needs of the Community

The socio-economically marginalised tribal families of the village are unable to meet their minimum basic needs from the income they earn. This problem is aggravated by the climatic fluctuations – low erratic rainfall, temperature rise and degradation of natural resources – land, crop/tree/plant diversity, water, moisture, etc. Rain-fed, plateau, degraded forest regions are among such regions where the livelihood security is, to a large extent, threatened by the large-scale change in the resources that people were using for their livelihoods, and inability of the community to deal with the changes through their traditional practices and knowledge systems.

Despite all these odds, there is wide range of assets such as crops and trees, as well as skills and practices which help them survive despite degradation of

natural resources and climate change. These can be strategized to provide an effective platform for ensuring security of food and income enhancement. Their traditional knowledge can be used for soil and water resource.

The community was far behind the mainstream in terms of socio-economic development. The baseline report and observation highlighted the need of community/groups for the following reasons:

3.1 Poor Management of Natural Resources by the Community

The area abundant natural resources but due to poor management by the community, these local resources were degrading very fast. Secondly, people were unaware of the nutritional value of the locally available minor forest products. There was need to conserve and preserve locally available natural resources.

3.2 No Collective Efforts for Soil and Water Management

There was soil and water management at the individual level but a collective effort was not seen before the project. The poor community was not able to meet the expenses of soil treatment. The topography of the land was uneven; therefore there was continuous soil erosion and degradation of fertile land.

3.3 Low Productivity of Land and Soil

There was poor management of soil with continuous soil erosion, no proper tilling, less porosity and no usage of organic manure, which led to low productivity of land. The soil in this region is mostly nutrient-poor. A combination of undulating and hilly terrain and high runoff of water produces a wide variation in soil, slope, water availability, soil depth etc.

3.4 Poor food basket and unawareness about nutrition value on different crops

The people of the village were ignorant about nutrition from the naturally available plants around them. Therefore, there were health problems, mainly among children and women due to poor food intake.

4. Nature and Strategy of Programme

Indo-Global Social Service Society (IGSSS), a national level organisation, has been working on livelihoods since 1960 for promoting and ensuring livelihood option and opportunities for the disadvantaged community of the society. The organization's interventions span across 22 states and 1 union territory. IGSSS has been working in Bando Hamlet, village – Gondwar, Block

– Churchu, Hazari bag district, Jharkhand since 2014. The nature of the program was community-based soil and water conservation for ensuring the livelihood of marginalised and the disadvantaged community.

As the first step, a participatory rural appraisal (PRA) exercise was conducted at the village level to collect baseline information and take stock of the household income and status of the indigenous agriculture practices, crop varieties and land use pattern. A village level meeting on erosion of the soil, soil health, water availability and use pattern and indigenous agriculture practices like mixed cropping and millet farming were conducted to motivate the villagers to revive their traditional agricultural practices.

The community mobilisation/institutionalization was the first strategy of the program. The identified target households were organised into four groups i.e. three women’s Self-help Groups and one Village Development Committee. The skills and knowledge of the group members were capacitated on the importance of groups, micro planning for village development, sustainable and organic agriculture practices, soil and water conservation techniques, preparation of organic manure and pesticide and convergence and networking.

The group members regularly sat together and reflected on their situation and their own development. They prepared the village micro plan with the help of the PRI (Panchayati Raj Institution) members and IGSSS staff members. They decided on the time frame for achieving results which will also bring about the desired changes.

The community came together for the soil and water conservation and sustainable agriculture practices based on the micro plan. Under soil and water conservation, they have treated 15 acres of uncultivated land for the last 50 years. Contour bunding was done in 15 acres of land and one pond was deepened. Beside this intervention, they approached government department and submitted an application for digging of DOVA¹. Their applications were accepted and two DOVAS were dug in the area of 15 acres treated land. They also got support for contour bunding in 1 acre of land.

The 33 families were supported with paddy and vegetable seeds. The team provided handholding support on field preparation, sowing and management of different crops. They were motivated to cultivate crops by using organic manure and organic pesticide for ensuring production of nutritious food and for healthy consumption. The project team also supported the community level green nursery in which they raised a seedlings of different vegetable crops.

1 Small water conservation structures 30 ft x 30 ft x 8 ft.

The last strategy of the programme was linkages and synergy with the government department. The awareness level on social entitlement was increased among the community through regular discussion, street play and training programme. A total of 12 old men/women got old age pension, 33 families could get BPL revised cards, regular vaccination of children was ensured, support on soil and water conservation as well as agriculture equipments from block office were facilitated. Now they could get support from government departments in a sustained way for their upliftment and legal entitlements.

5. Innovation Adopted

The IGSSS Hazaribagh team organised a planning meeting with the members of the apex body - the Village Development Committee - in November 2014. The team discussed the available waste land and its causes, cropping pattern, agriculture practices, their possible contribution and contribution from other stakeholders.

As a result of this meeting, they arrived at a common consensus for the treatment of wasteland that had not been cultivated for the last 50 years. The waste land belonging to 22 households were covered with wild bushes, and land owners were not planning on cultivating it. These households decided to clear the land through voluntary work. Collective decisions were taken for practicing sustainable and organic agriculture practices for increasing the household income.

Community participation was ensured in the process of reclaiming degraded landscape through contour bunding and deepening of ponds. They were involved in analysing the situation, planning, executing the work, supervising and monitoring the work.

6. Impact of the Initiative

IGSSS' presence and initiative changed the scene of Bando hamlet – Gondwar village in Churchu Block, Hazaribagh district, Jharkhand. At present the following changes have been observed among the community, which are:

6.1 Organised Community

The villagers were organised into 3 women's Self-help groups and 1 Village Development Committee. The women's Self-help groups organised their meeting on a weekly basis. In the meeting they discussed the social, economic and leadership aspects. They distributed role and responsibilities for their socio-economic upliftment. On the other hand, the village development

committee which is an apex body, organised their meeting on a monthly basis. They reflected about their socio-economic issues/problems with an action plan and took steps for the village and community development. The village development committee members had taken the collective efforts to clear all the wild bushes in the areas of contour bunding.

6.2 Increased the Cultivable Land

A total of 15 acres of wasteland was converted into cultivable land. A total of 22 farmers started to cultivate different crops (black gram, yellow gram, millet, tomato, pumpkin, beans, brinjal, chilly, etc.) on their land.

6.3 Reduction in Soil Erosion and Runoff Rainwater

The land was sloping and as a result the rainwater was flowing with high velocity. The high velocity of rainwater increased soil erosion. The soil erosion reduced the productivity of soil due to which the upper layer was washed out. The contour bunding reduced the speed of runoff water during rainy season. This resulted in a decrease in soil erosion. This intervention led to reclamation of wasteland into cultivable land. The productivity of the soil increased gradually.

6.4 Increased Moisture Capacity

The contour bunding helped to stop rainwater in the field. The stored rainwater percolated in the soil and as a result the moisture level of soil increased.

6.5 Increased Water Table

The contour bunding helped to increase the water table of wells in the villages. The villagers could see the changes in water level in their wells. In the rainy season the water volume was 15 feet before intervention, but for first time they could see water upto 22 feet in the well.

6.6 Reduction in Firewood Selling

Earlier a total of 12 households were selling firewood for their survival but now only 2-3 households sell firewood. The community were capacitated on vegetable and paddy cultivation and started to get income from selling vegetables.

6.7 Appreciation by Government Officials

The Block Development Officer and government personnel visited the area and recognised the work of IGSSS. They appreciated the work towards

using local solutions for ensuring livelihood of the marginalised community. Observing and realising the results of farm field bunding, the block level government officials also started to replicate it in other regions of the block.

6.8 Application of Organic Farming

The community knew the importance of organic sustainable agriculture practices. They reduced application of chemical fertiliser in their crops. They used vermicompost and organic manure in their agriculture fields. The practice helped in maintaining the productivity of land and soil.

6.9 Convergence with Government Program

The community were motivated to submit an application for agriculture equipment and small ponds – DOVA. They submitted and two small ponds - DOVAS were approved and constructed in the contour bunding area as well as one acre of land was treated under contour bunding. The interventions added value in soil and water conservation.



Mr. Sonaram Marandi says that “the farm field bunding promoted by IGSSS changed the scenario of our village. Now 22 families have cultivated different crops which was never practiced before. The program has taught us that our own plants and crops are the best. We only need a little support and we can develop our own land ourselves.”



Mrs. Bahmuni Murmu shared that “for the first time I have cultivated maize in my land due to soil & water conservation technique promoted by IGSSS.”



Mr. Binod Marandi and wife are happy that there is moisture in their field and as a result of which they are able to cultivate tomato, that was never cultivated earlier in their field.



The Block Officials of Churchu visited the sites and met Ms. Rita Ekka – Ward panch of Gondwar. They appreciated the work of soil and water conservation through contour bunding initiated by IGSSS which was never done before in Churchu Block. The government approved and constructed two DOVAS in the project site for adding value on soil and water conservation

Table 1: A cost-benefit analysis of mixed crop: Area-15 acres (22 farmers)

A cost-benefit analysis of mixed crop: Area-15 acres (22 farmers)		
INPUT COST		
Own contribution		
Labor cost	Days	Value in Rs.
Land leveling and sowing	2 x 22p x Rs. 300	13200.00
Weeding	1 x 22p x Rs. 150	3300.00
Watering	1 x 22p x Rs. 150	3300.00
Harvesting	1 x 22p x Rs. 150	3300.00
Manure	1 x 22p x Rs. 500	11000.00
TOTAL		34100.00
Project Inputs	Qty. in kg	Cost in Rs.
Tomato	5 gm x Rs. 100 x 22	2200.00
Beans	250 gm x Rs. 60 x 22	1320.00
Pumpkin	5 gm x Rs. 50 x 22	1100.00
Millet	1 kg. x Rs. 80 x 22	1760.00
Black gram	1 kg. x Rs. 120 x 22	2640.00
Maiz	500 gm x Rs. 100 x 22	2200.00
TOTAL		11220.00
PRODUCTION	Qty. in kg	Value in Rs.
Tomato	120 kg x Rs.20 x 22	52800.00
Beans	30 kg x Rs. 60 x 22	39600.00
Pumpkin	65 kg x Rs. 30 x 22	42900.00
Millet	200 kgs. x Rs. 50 x 22	220000.00
Black gram	46 kg x Rs. 100 x 22	101200.00
Maiz	150 kg x Rs. 15 x 22	49500.00
TOTAL		506000.00
<p>The net profit within 3-4 months is around Rs. 460680.00 if own (labor and farm manure) contribution is calculated. But actually those are shadow cost derived during their own leisure time. So actual total profit from intervention area is Rs. 494780.00, per farmer total profit is 22490.00</p>		

X Change of mindset/attitude:

Many farmers had not realised the benefits of contour bunding and were not taking active participation in implementing and monitoring of the work.

7. Challenges Faced

The IGSSS team faced some challenges in the process of reclaiming degraded land and ensuring sustainable agriculture practices in the Bando hamlet of Gondwar village:

7.1 Convincing the Community

The community was not aware of the results of contour bunding as tribal community believes in seeing the results before accepting new intervention or technology. 3 farmers were not allowing farm field bunding on their land. The team made them understand the benefits of farm field bunding and could complete contour bunding in 15 acres of wasteland.

7.2 Unavailability of Local Resilient Seeds

Local seeds were disappearing day by day, due to unawareness among the community and promotion of hybrid seeds by outsider traders. The community were sensitised on the importance of local seeds even in the drought situation. The local seeds also provide adequate nutrition to the community. The farmers were motivated to collect traditional seeds and preserve it for future use.

7.3 Resource Mobilization

Resource mobilization was another challenge in the area because the community was unaware of the process of accessing government schemes. The IGSSS team organised street plays on different government schemes. Beside street plays, the staff regularly motivated villagers to visit government offices and get clarification on the process of application. This helped the community to mobilize government resources for their development. Now they don't hesitate to visit block offices and discuss with the government officers on how to avail different schemes.

7.4 Stall Feeding

Open grazing of cattle was the general practice in the village. This led to destruction of crops. The village development committee took a decision for stall feeding and a fine was imposed if people left cattle their cattle free and it damaged the crops.

8. Sustainability

The project supported the community in getting organised for their planning and development. They organised meetings regularly and discussed major issues and challenges. They divided roles and responsibilities to solve the challenges and problems. The organised community visited block offices for accessing their entitlements. This was a good indicator that they could access government resources after withdrawal of the project.

They shifted their cropping pattern from mono cropping to mixed cropping, and single cropping to double/multiple cropping. This helped to increase their food basket, nutrition and overall income of the households.

The community started to adopt sustainable organic cultivation practices through use of organic manure, organic pesticides and local seeds. This increased soil organisms, and productivity of land.

The contour bunding increased the cultivable land of the marginalised community. The community and individual farmers decided to maintain and repair the structures for long-term benefits. They collected Rs. 40 per month and created a common fund. They utilised the fund towards purchase of seeds, equipment, illness, marriage and other rituals at a nominal 2% interest rate.

Conservation Agriculture – Sustainable Agriculture: A Case from the Tribal Regions of Madhya Pradesh and Gujarat

Gurpreet Singh & Bhaskar Mitra

1. Introduction

It would be a cliché to mention that Indian agriculture is largely characterized by rain dependent farming of subsistence nature. A substantial share of this rain-fed subsistence farming falls in tribal regions spread across central and north-eastern India. The two regions - Dangs of Gujarat and Nimar of Madhya Pradesh (MP) are among the regions inhabited by Warli, Bhil, Barela and Bhilala tribes. The region is synonymous with undulating topography, dependency on forest for non-timber forest produce, high intensity rainfall during the monsoon and dry spells in summers. The two regions are highly vulnerable to the vagaries of climate – torrential rains and extreme temperatures. Harsh summers followed by monsoons with heavy runoff make earning livelihoods difficult for the people. Common crops such as rice, pulses, maize, soybean, groundnut etc. are all cultivated on minimal external inputs like hybrid seeds, fertilizers, and pesticides.

The native tribal population of the region finds it difficult to eke a living out of agriculture. A large population migrates to places such as Surat, Ankleshwar, Indore, Ahmedabad and Saurashtra for seasonal wage employment as the returns from agriculture do not fulfill the consumption needs of the family. In such a scenario, Aga Khan Rural Support Programme - India has been working to enhance the livelihood of the farmers through a combination of approaches that include watershed management, agriculture-based livelihood promotion, microfinance and promotion of social enterprises. Moreover the changes caused due to climate change pose the risk of pushing the community to higher levels of distress if not dealt with holistically. For increasing profitability for farmers, AKRSP-India has been working on promoting methods such as System of Rice Intensification, integrated pest/nutrient management, irrigation support, crop bio-diversification and more recently Conservation Agriculture (CA), along with facilitating market linkages. CA is an innovative sustainable agriculture method that helps the farmers overcome the problems of low production and high costs; besides, it results in amelioration of soil health leading to resilience to climate change anomalies. This case presents the impacts of

conservation agriculture programmes among the farmers of Nimar region of MP and Dangs in Gujarat, which were initiated in 2014 and 2015 respectively. The case tries to look at how the techniques promise sustainable production of crops with a better Cost-Benefit Ratio, along with added advantages of climate change adaptation and sustainable soil, ecosystem services and agro-ecology.

2. Location Of The Case

MP and Gujarat are home to 8.6% and 14.7% of the tribal population of the country respectively, comprising of Bhil, Bhilala and Warli tribes. The Dangs and Nimar region of Gujarat and MP are two such areas where the tribal population is almost 98%.

2.1 The Dangs

The Dangs has hilly and undulating terrain. Fifty five per cent of the region is under forest cover. The climate of the area is characterized by general dryness, except during the southwest monsoon season and hot summers. The average rainfall of this region varies from 400 mm to 1800 mm. The soil of this region is rocky alluvial soil, but black and red soils can also be found at places. Large areas are occupied by rice, pulses and groundnut, followed by finger millet. The Dangs has major challenges such as food insecurity, high distress migration (60-80%), low crop productivity, lack of soil and land management, highly erratic rainfall patterns, lack of irrigation facilities, uncertain income due to dependence on monsoon, price fluctuation in cash crops and no access to institutional credit resulting in very high rates of interest on loans on up to 100% interest rates. The region also lacks infrastructure facilities such as access to potable drinking water and poor road connectivity to many villages, which worsens in the rainy season leading to distress selling of agricultural commodities. It is low on health indicators like high infant mortality rates. Social issues such as rampant liquor consumption leading to domestic violence are also prevalent.

2.2 Nimar Region

The second region Nimar is in south-western Madhya Pradesh in west-central India. The region lies south of the Vindhya Range, and consists of two portions of the Narmada and Tapti river valleys, separated by a section of the Satpura Range, about 24 km in stretch. The region has a subtropical climate, like most of north India. It has hot dry summers (April–June) followed by monsoon (July–September) and a cool and relatively dry winter. The average rainfall is about 1,000 mm (39.4 in) or less. Cotton crop is grown on 30% of the total cultivable area and soybean, which is the second largest crop in terms of area, on 14% of the total cultivable area. The cropping pattern followed by

the farmers in the Nimar region during the Kharif rain-fed season (summer-monsoon season) is: soybean (intercropped with maize in the ratio 1:10) – red gram, cotton (intercropped sorghum) – wheat, cotton – red gram. In the Rabi season (winter season), wheat and gram are cultivated on irrigated land. The area has low agricultural productivity due to soil erosion, low organic content in soil, poor irrigation facilities, erratic rainfall, spurious agriculture inputs, poor knowledge base among farmers particularly for cash crops, inadequate credit facilities, and absence of knowledge extension system. The farmers are forced to rely on market traders for all aspects of agriculture like inputs, knowledge and market for their produce.

3. The Available Alternatives

Aga Khan Rural Support Programme-India has been working towards sustainable livelihood by intensively working on conservation of natural resources – soil, water and forest, providing extension services to the households so as to ensure cushion against external environmental shocks, bolstering food security for the household so as to enhance livelihood opportunities. To overcome the challenges mentioned above the first and foremost intervention which the organization has taken up is to overcome the challenge of production which will lead to not just food security but will also generate surplus food grains to be sold in the market.

4. The Innovation

These two regions had a pertinent need for a suitable method which can keep the soil sustainable and yet productive.

4.1 Conservation Agriculture

The of method Conservation Agriculture (CA) is an innovative solution that serves a resource-saving agricultural production system, presenting better returns from sustained production levels without damaging the environment and adapts to climate change anomalies such as torrential rains, longer gaps in rainfall, high temperatures led evapo-transpiration in drought situation of Dangs and Nimar. CA has three main principles – (i) continuum zero or minimum mechanical soil disturbance (minimum/zero tillage); (ii) permanent organic soil cover – green or dry (surface mulch); and (iii) diversified crop rotations for annual crops or plant associations for perennial crops.

It has been widely adopted by farmers across the world as an alternative to conventional tillage-based agriculture. The technique promises a win-win situation for farmers as it reduces their costs of production (without reducing

their productivity), enhances soil health, safeguards the environment, and adapts the crops for climate change. The seed is sown directly into the soil with the help of special implements – jab planters, no-till implements, happy seeder etc. and year after year the soil is left untilled or minimally disturbed. The biodiversity of the cropping system makes it resilient to the risk factors and also adds to the ecosystem services in the field.

Farmers of Dangs (Gujarat) and Nimar (MP) region were the key decision makers of this initiative. The process followed for the adoption included need analysis, concept seeding through training and exposure, planning and implementation along with periodic monitoring – technical and economic, and feedback process. The intervention was first introduced in MP in June 2014 (Kharif, 2014) and in Dangs in September, 2015 (Rabi, 2015). The proposed timeline was one year duration for each phase namely introduction, uptake pilot scaling, mass scaling and mainstreaming. The ideal method which was followed was first adoption of testing sites on the fields of the farmers where the farmer will learn for one season and test the intervention of zero tillage. The soil was tilled only once before the intervention (later to be left untilled and directly sowing seeds year after after) when the sowing was done and was covered by mulch cover for the first time. The standard operating procedures were developed for the intervention so as to avoid failure in the results.

4.2 The Strategy Adopted in Nimar

4.2.1 Need analysis: Focused Group Discussions were conducted during which farmers' problems were understood, some new options of crop practices were explored like System of Crop Intensification, use of on-farm crop and weed residue for mulching, minimum disturbance of soil and reducing seed quantity etc. The benefits of CA like increased soil retention were also discussed.

4.2.2 Concept briefing to the focus group: Next, the concept of CA was introduced along with its need, process and benefits.

4.2.3 Planning and strategy: Thereafter reliable farmers were identified through an area selection process in all operational areas. Initially demonstration sites were chosen in which four separate plots were taken:

- Conventional Farmer Practice (Conventional Tillage)
- Conventional Farmer Practice + System of Crop/Root Intensification.
- Conservation agriculture with traditional crop spacing.
- Conservation agriculture + System of Crop/Root Intensification.

4.2.4 Implementation and Monitoring: According to the above strategy, the selected plots were monitored as per the crop cycle.

4.2.5 Impact analysis: Impact analysis has been carried out after a year of implementation for getting feedback so that improvements can be carried out.

4.3 The Strategy for Dangs

There were seven farmers who adopted CA testing plots for the Rabi 2015 season for three different crops: chickpea, onion and okra. Out of seven farmers, five farmers had sown chickpea. For chickpea and onion, 25x25 cm spacing was kept while for okra it was 50x50 cm, thus making CA and System of Crop/Root Intensification (SCI /SRI) go hand in hand. The area of test sites for control and CA+SCI was 100 square meter (0.03 acres) as landholdings are small in the region. All the conditions of the two testing sites i.e. control/conventional and CA+SCI, were kept uniform except for the mulching added as a part of the CA methodology and equally-distant sowing. No special treatment was done in any of the two testing sites except for the addition of mulch and raised bed cultivation in CA+SCI. Sowing was done on the raised bed with the help of an iron-frame dibbler, while in traditional cultivation broadcasting was done for chickpea. For onion, transplanting was done in 25x25 cm while with traditional management, random placement was done. In the case of okra, 50x50 cm spacing was kept in CA while in the traditional sites line-to-line spacing was kept at 50 cm, while no row-to-row spacing was maintained for uniformity.

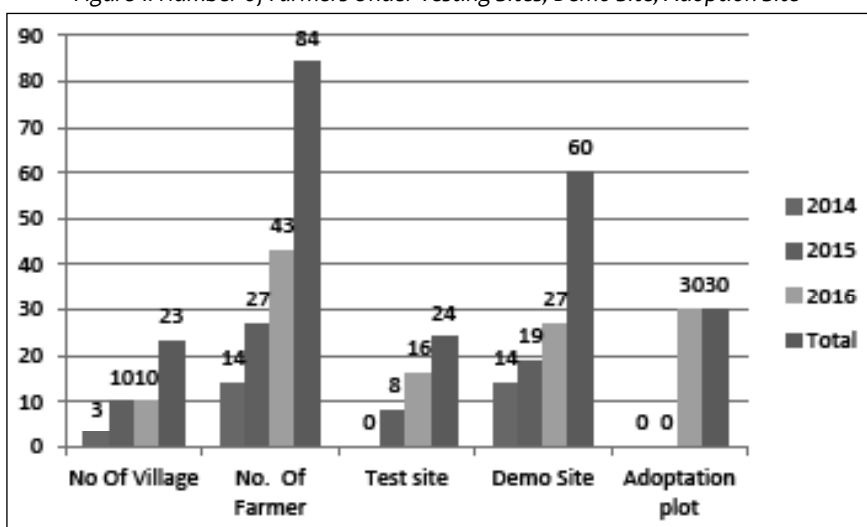
5. Impact Of Intervention

The impact of the adoption of conservation agriculture intervention is different in the regions. The descriptions of the two regions are as follows:

5.1 Nimar Region

Between June 2014 to Kharif 2016 there is a continuous growth in involvement of farmers practicing CA. The following table shows the coverage of farmers under CA practises:

Figure 1: Number of Farmers Under Testing Sites, Demo Site, Adoption Site



Impact has been analyzed after one year in 2015 on two parameters divided broadly in two categories:

1. Assessment of agronomic and economic performance of different crops grown in the pilot areas under Conservation Agriculture and conventional agriculture. The impact of Conservation Agriculture has been analysed on two crops (maize and gram).
2. Assessment of soil health which covers biological, chemical, hydrological and physical properties.

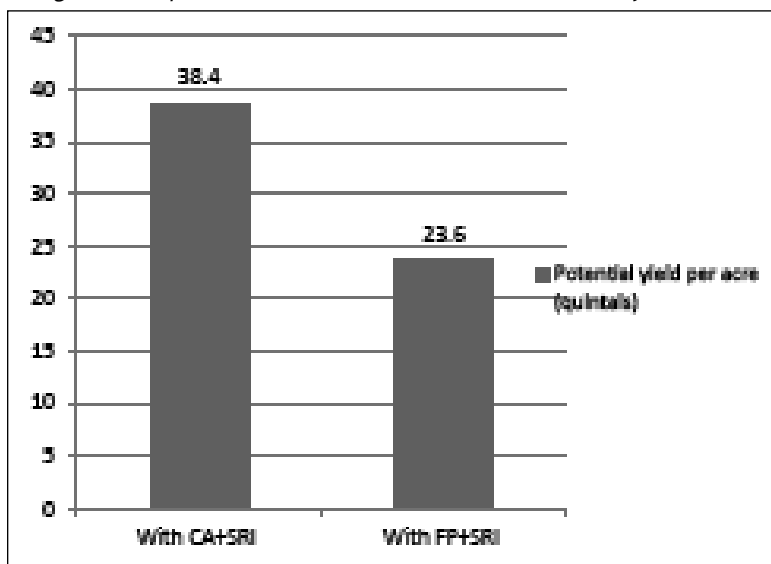
Data was collected and analyzed from seed treatment till harvesting of crops from the two types of fields, those which were under CA, and those which practice maize and gram cultivation in the traditional/conventional way. The results are discussed below with graphical representation, and data is shared in Annexure.

5.2 Comparative Results Between Sample CA and Traditional System for 9 Farmers in Maize Crop

The details of the results seen in the testing plots of the farmers with whom the interventions were done. The results are of the sampled farmers under testing plots of maize.

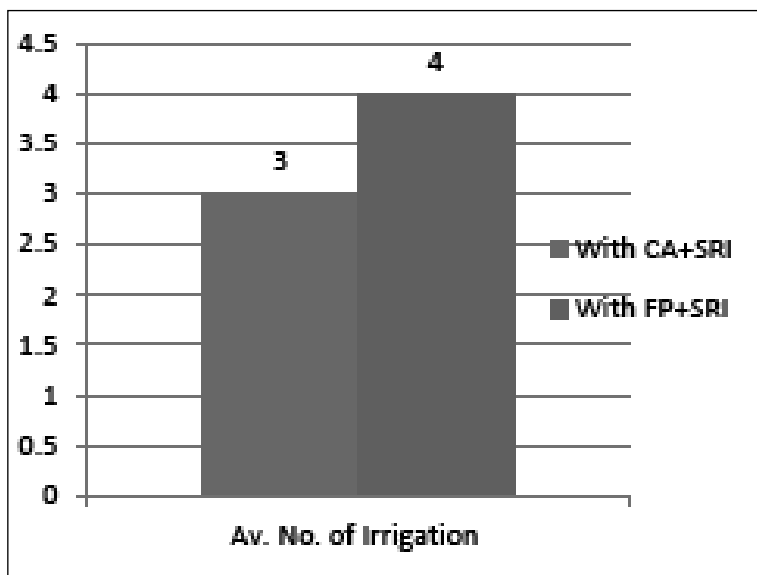
5.2.1 Average potential yield per acre (quintals): The collected data shows that potential yield per acre in CA recorded 38.4 qt, and in conventional plot 23.6 qt. So we can see that the average yield potential per acre was 62.71% higher in the CA+SRI fields than the FP+SRI one

Figure 2: Comparison between Traditional and CA Productivity in Maize



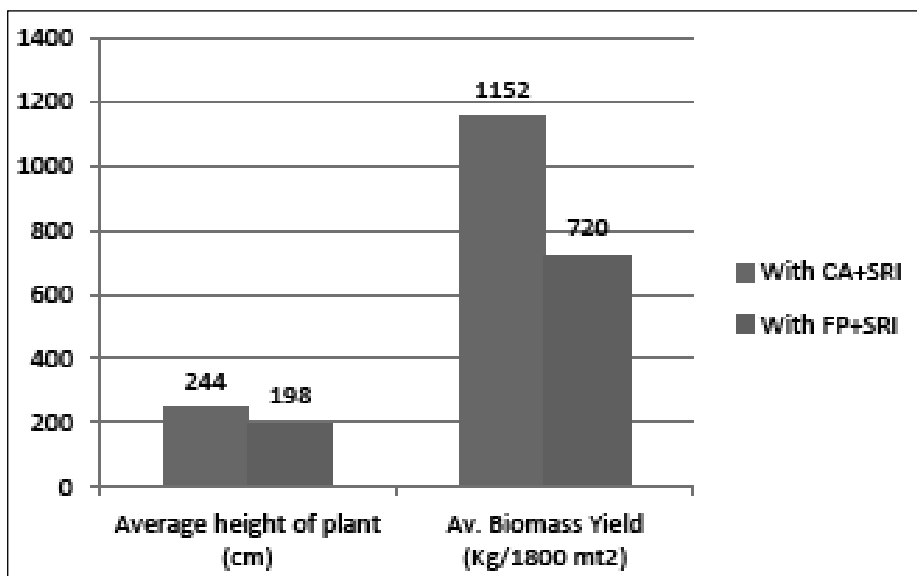
5.2.2 Average Number of Irrigation: The graphical representation shows that average number of irrigation in CA is 3 times and in conventional plot 4 times. This is due to the increase in the soil moisture in CA plot by 9.10% than conventional plot and requirement of water during the critical stages for irrigation for maize crop.

Figure 3: Comparison between Average Number of Irrigation Required for Traditional vs. CA in Maize



5.3.3 Average height of plant & biomass yield: There is an increase in the height of plant by 23.23% in comparison to the conventional plot. On the other hand, increase in the level of biomass yield by 60% in comparison to farmer practice plot were observed.

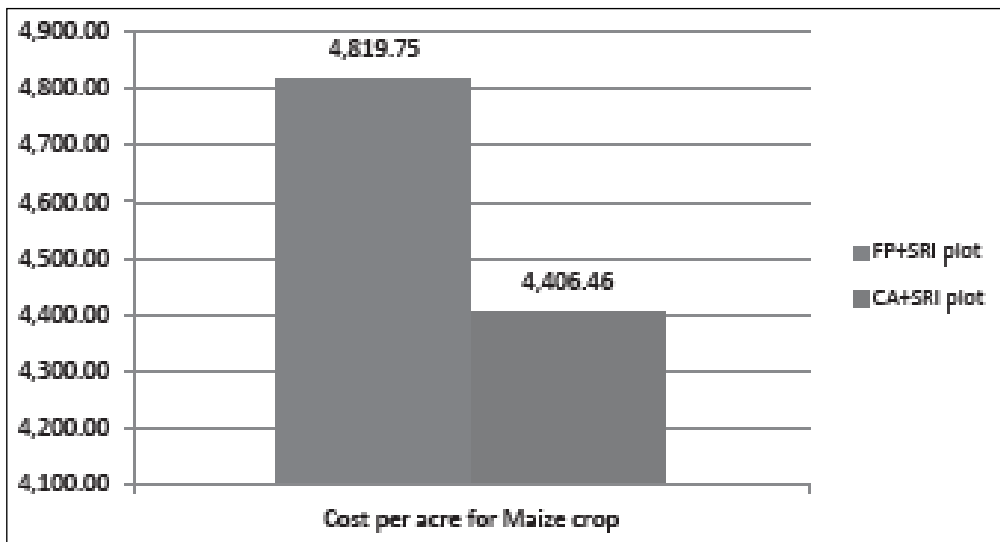
Figure 4: Comparison between Traditional and CA in Maize on Height and Biomass Yield



5.3.4 Cost of production

Apart from the production results of the sampled farmers, the cost benefit ratio of conservation agriculture was also seen to be high (Annexure 5). Differences in cost have been observed for input cost (land preparation and other intercultural operation like weeding, irrigation etc are included), while other activities remain the same for both CA+SRI plot and CT+SRI plots as such seed rate, variety, date of sowing and treatment for plant protection were followed. Different aspects of the costs were calculated including sowing, land preparations, irrigation, intercultural operations. In the comparison it was seen that the total cost is less in the CA+SRI fields. If we compare the total cost per acre, we find that the cost for the CA+SRI plot is 9.38% lower than the CT+SRI one.

Figure 5: Comparison between Cost of Production for CA and Traditional in Maize

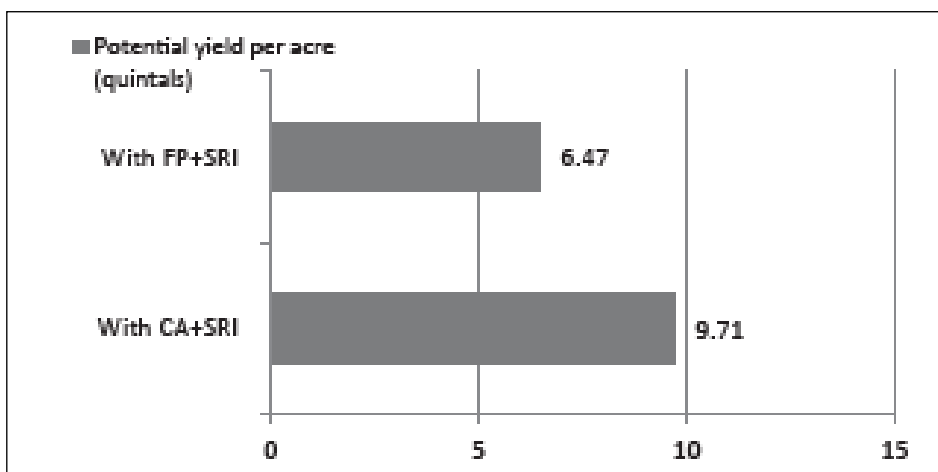


5.3. Results for the Sample Farmers Growing Gram under CA testing plots

5.3.1 Average Potential Yield per Acre (quintals)

The collected data shows that potential yield per acre in CA recorded 9.71 qt, and in conventional plot, 6.47 qt. Therefore, it can be seen that the average yield potential per acre was 50% higher in the CA+SRI fields than the CT+SRI one.

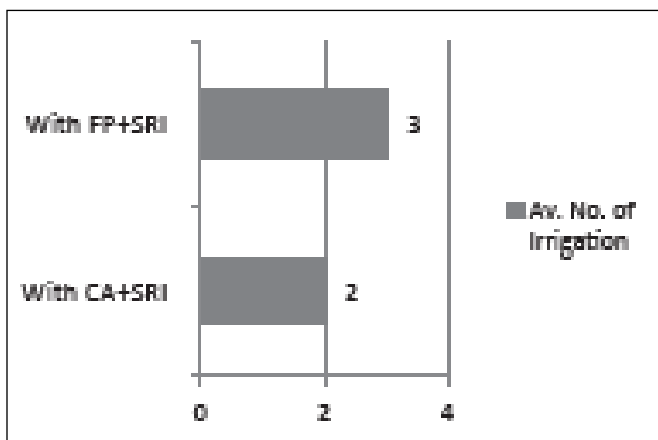
Figure 6: Yield comparison between CA and Traditional in gram



5.3.2 Average Number of Irrigation

The collected data shows that the average number of irrigation in CA is 2 times and in conventional plot 3 times. This is due to the increase in the soil moisture in CA plot by 9.10% than conventional plot and requirement of water during the critical stage of irrigation for Gram crop.

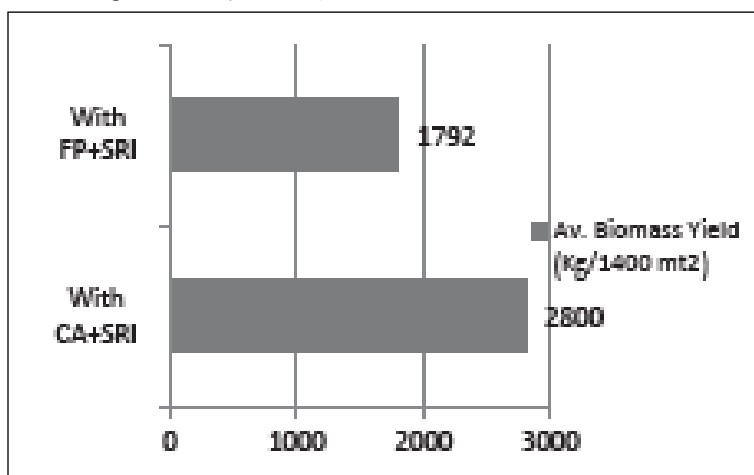
Figure 7: Comparison between Average Number of Irrigations in Traditional vs. CA in Maize



5.3.3 Biomass yield

There is an increase in the level of biomass yield by 56.25% in comparison with farmer practice plot.

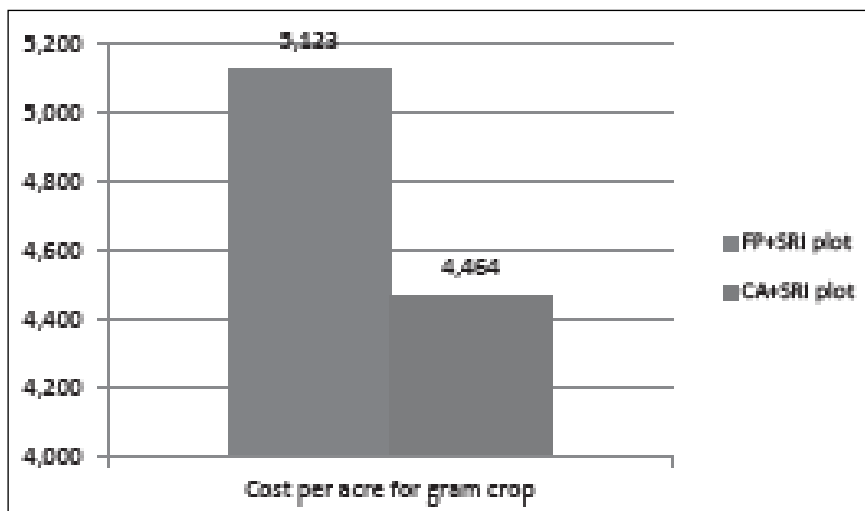
Figure 8: Comparison of Biomass Yields in CA and SRI in Gram



5.3.4 Cost of Production:

The total cost is less in the CA+SRI fields. If we compare the total cost per acre, we find that the cost for the CA+SRI plot is 14.76 % lower than the CT+SRI one (Aee Annexure 6).

Figure 9: Comparison of Cost of Production in Traditional vs. CA in Gram



6. Soil Health Indicators

6.1 Soil Moisture

Soil moisture in CA plots was 19.4%, and in conventional plot it was 17%. So, there is an increase in the level of soil moisture by 9.10% in CA plot in relation to conventional plot in the first year itself.

6.2 Bulk Density

Soil bulk density in CA was recorded as 1.25 g/cm³ and in conventional plot it was 1.28 g/cm³. There is a decrease in the level of soil bulk density by 2% in CA plot in relation to the conventional plot.

6.3 Soil aggregate stability

Soil aggregate stability in CA was recorded as 42.4%, and in conventional plot it was 32.4%. there was an increase in the level of soil aggregate stability by 30.6% in CA plot in relation to conventional plot.

6.4 Water infiltration

Soil water infiltration in CA was recorded as 23.5 litre/h/m² and in conventional plot it was 14.1 litre/h/m². There is an increase in level of soil water infiltration by 66.6% in CA plot in relation to conventional plot of the farmers.

6.5 Soil organic matter content

Soil organic matter content in CA was recorded as 0.55%, and in conventional plot it was 0.39%. There was an increased level of soil organic matter content by 41.2% in CA plot when compared to conventional plot.

6.6 Mineralizable nitrogen

MN content in CA was recorded as 0.014%, and in conventional plot it was 0.012%. There was increase in level of PMN content by 22.6% in CA plot in relation to conventional plot.

6.7 Macro and micro-nutrient level

The collected data shows that the major nutrient levels are higher in the CA plot than in non-CA plot. There is an increase in the level of N by 28.1%, by 12.1% in P and by 19.1% in K.

7. Results From Dangs District

The results from the Dangs were limited to one season of crop so not much technical analysis was done for the soil health and cost of production. As the team is evolving in CA practice, data related to yield was captured from the field and is presented further.

Figure 10: Yield Comparison in CA+SRI vs. Traditional Cultivation in Chickpea (in kgs)

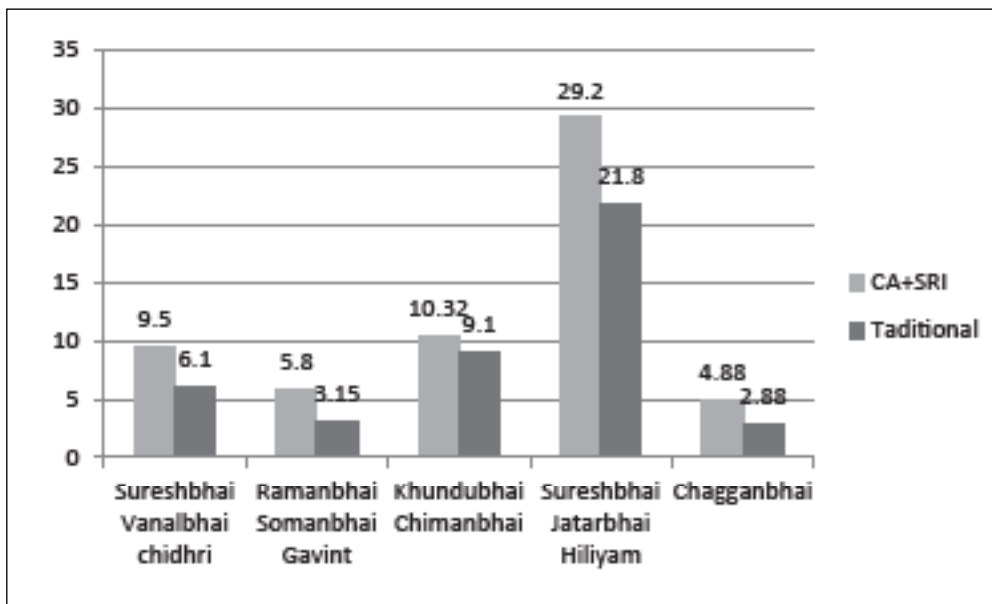
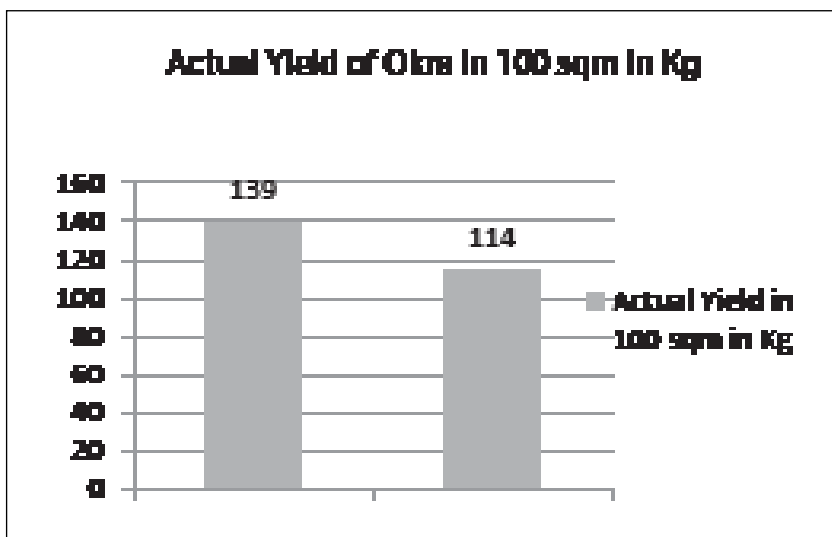


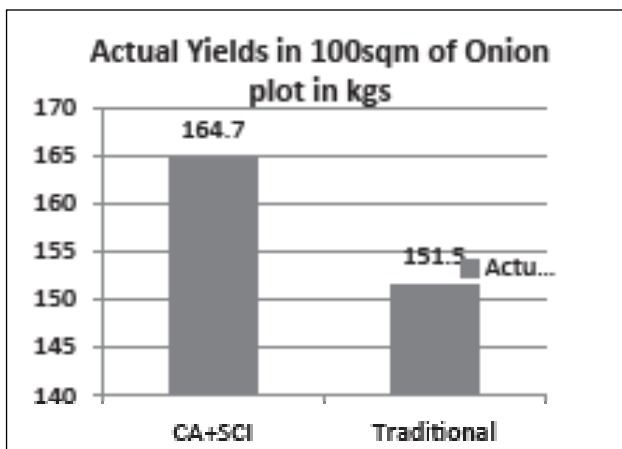
Figure 11: Yield Comparison of Onion production (CA and traditional from left to right)



The test site results have shown (Figure 10) that all the farmers who cultivated chickpea with CA+SCI methods could get higher yield. In all the testing sites, there was an appreciation in yield which went as high as 184% as observed with Ramanbhai of Raochond village, while the minimum increment of the yield was 113%, as seen with Khundubhai in village Godvahal. The average increase in yield was 51.3%. Overall, the adoption of the CA+SCI test sites gave confidence to all the small farmers that the new method can work well from the first year onwards. It was also seen that the seed rate of the CA+SCI testing sites was also less when compared to traditional sites as the seeds were placed in the designated spacing. Farmers believe that there are still chances of reducing the seed rate with this method even more.

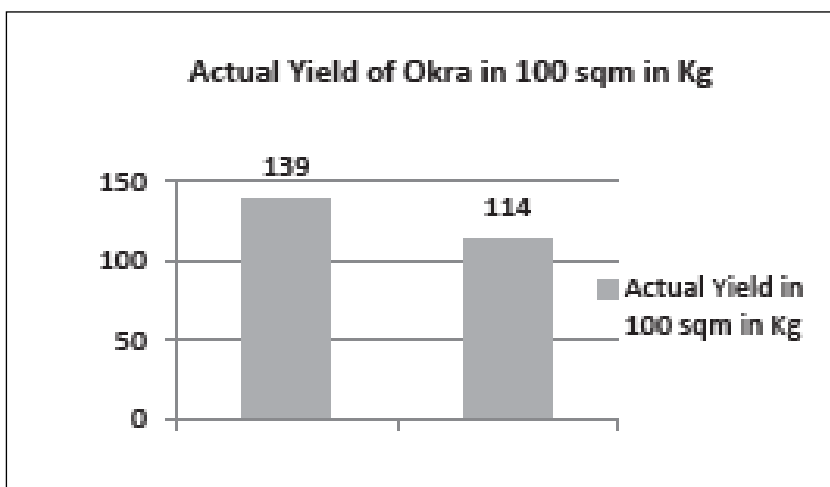
The field results for the onion crop were encouraging too, as the measured yield for CA+SCI testing site was higher when compared with traditional methods. Apart from the good yield of the crop, this farmer was able to apply one less flood irrigation with the CA+SCI crop. The farmer also observed that the color of the onions was redder and they were larger in size when compared to the traditional practice.

Figure 12: Yield Comparison of Onion production



In case of Okra, the production was 21% higher in case of conservation agriculture. The farmer could get an extra 95 kilogram of okra from his field (See Table 3) and being a crop with premium price, he was convinced of the method.

Figure 13: Yield Comparison in OKRA



7.1 Note on Observations from the Farmer's Field

- Yield: In all the cases, the production on the test sites was seen to be higher. This is one of the driving force for farmers to overcome their apprehensions on adoption of new methods.
- Seed rate: Though SCI combined with CA led to lower seed rates, there is scope to reduce the seed rate further and to standardize optimum rates

for a particular crop and variety. This will happen over a period of time, through co-learning with the farmer.

- **Phenotypic observations:** The crops themselves were fairly superior when compared to the traditionally-grown crops as reported by the farmers and the field team. There was profuse flowering in chickpea and okra, while onions had better bulb formation.
- **Weeds:** There was reduced need for efforts by farmers to manage weeds as the soil was covered with mulch.
- **Labor:** There had to be an initial greater investment of labor in the adoption of Conservation Agriculture, but it will only be a challenge in initial years until the system itself generates sufficient mulch or organic matter which is now being brought from outside. The farmers recognized that there is a higher need for labor (although on a one-time basis) for making beds and mulching, but this can be compensated by no-till practice. It is being planned to reduce labor by the introduction of a bullock-driven bed-maker made by a local fabricator and by introducing seed-sowing implements.
- **Irrigation:** As the crops cultivated were done on residual moisture, the factor is irrelevant here.

8. Challenges Faced

- **Traditional paradigm of agriculture:** Years of tillage-based cultivation of crops have fostered the belief that cultivation of crops is not possible without tillage. The idea was therefore rejected by farmers. Only after regular trainings and exposure to other locations, the farmers accepted that they can produce sustainably. It takes sustained effort and time to overcome their behavioral issues.
- **Infestation of rodents in mulch (rats and squirrels):** Rats and squirrel ate up the seeds of Gram planted in the field. *Gliricidia* was recommended to the farmers as a pest repellent in their field, which saved the crop from rodent attacks. It becomes imperative that farmers adopt *Gliricidia*, which can act as a repellent for mice. It is also quality green manure which, when added to the beds, will lead to an increase in soil nitrogen.
- **Lack of implements:** The scale of intervention is largely dependent on the implements – bullock or tractor will help sow the seeds directly in the soil without disturbing it. It was a tedious task for the farmers to adopt the sowing of crops. So, customized zero till implements can slowly be

developed and given to a group of farmers until such time that they are mass produced for adoption and promotion with a larger number of farmers.

- **Availability of mulch:** The CA system is such that it generates mulch, which is needed for soil cover. But there is a challenge in introducing mulch in the initial year of introduction of the CA intervention. The farmers find it difficult to mobilize mulch from other sources when fodder is not easily available. It also reflects in initial years of cost of production. Once the adoption of cover crops or *Gliricida* is done, it will not only add nutrients to the soil in the form of green manure but will also act as soil mulch, thus suppressing weeds of all kinds.
- **An initial higher labor involved:** Mulch collection and spreading is laborious work in initial years as it requires time and energy to set up the testing sites for the farmers. This led to improper mulch cover and later weed infestation in the field.
- **Germination issues:** A few farmers had also seen improper germination in the field due to the mismanagement of soil mulch in the field. The inability of the sunlight to reach the ground and infestation from birds has led to seed germination failure.

9. Scale And Sustainability Of Intervention

The innovation of Conservation Agriculture is currently in a testing stage although some of the farmers have started to adopt it on their own after seeing the results. To help this technique reach more farmers, there is an imminent need of introduction of the CA implements such as Jab Planters, no-till planters mounted on bullock or small tractors seeing the needs of the region. There are some implements such as Happy Seed Planter which can sow seeds directly into the soil without disturbing the soil, but seeing the uneven terrain of Nimar and Dangs that implement is not of much use. Some implements which FAO has also endorsed in Africa and can be introduced if locally fabricated, in order to scale CA adoption by the farmers. Aga Khan Rural Support Programme-India is currently looking towards such alternatives in order to scale the successful intervention in the field. One such intervention can also be seen in the region of *Saguna Baug* in Raigadh district in Maharashtra, where zero tillage has been practiced since four years, albeit with high usage of herbicides rather than engaging cover crops in the field. AKRSP-India is learning along-with the farmers about the scale of the intervention in its three different states i.e. Gujarat, M.P. and Bihar.

10. Conclusion

Conservation agriculture promises to be a win-win situation for a farmer by cutting down cost of production without harming productivity; besides it is good for soil, for the environment, for sustainable production of food, and adaptation to and mitigation of climate change adversities. Looking at them one by one, soil health enhances with increase in SOC, which is on the decline in different soils due to frequent tillage, lower availability of farm yard manure due to mechanization of farming (IARI, 2012) and field crop burning (LW Johannes, 1965). Soil with high organic matter is higher in productivity than the soil where the organic matter is poorly managed (Alan Sundermeier et. al, 2005). The proposed system ensures there is an increase in SOM by addition of residue year after year as also seen in this case study. Carbon sequestration is enhanced by CA as more and more carbon can be restored in the soil while in conventional tillage agriculture, the release of CO₂ is accelerated since release of CO₂ from soil is directly proportional to the volume of the soil which is loosened by activities like tillage and inter-cultivation (T. Bhattacharyya et al., 2010). This makes it suitable for climate change mitigation. As also seen in the case, the production of the farmers has increased to a great extent without harming the environment. Conservation Agriculture not only enhances the organic matter in the soil, make it less vulnerable to soil erosion which is also an imminent problem in the region, and also is cost efficient for farmers who can save their cost of production of tilling the land thus making CA a cost friendly technique (U.K. Behera, 2014). The farmers, especially the small and marginal ones, who are struggling with mounting costs of inputs/production can look forward to this practice to reduce the cost of production and yet increase their productivity in a sustainable manner. The only possible way to scale the innovation will be to overcome the site specificity of the innovation and also introduce implements which are needed for the reduction of drudgery of the farmers in activities such as bed making, seed sowing, and management of weeds that occur in the field.

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Annexure

Annexure 1: List of Farmers under the CA Intervention

Sl. No	Name of Village	Name of farmer	Crops
1	Dawali	Raadhu /Roomalsingh	Maize
2	Dawali	Heera Singh /Sheetaram	Maize
3	Dawali	Bishram /Saanu	Maize
4	Dawali	Chandarsingh /Sukharam	Maize
5	Dawali	Ramkishan / Moutiram	Maize
6	Dawali	Premsingh/Lotiya	Maize
7	Sajni	Ramsingh / Babu	Maize
8	Dawali	Aasharam /Roomalsingh	Maize
9	Dawali	Mangilal /Sekadiya	Maize
10	Dawali	Ramesh /Mugalsingh	Gram
11	Dawali	Amarsingh / Mouti	Gram
12	Dawali	Suneel / Shaimal	Gram
13	Dawali	Shivram /Saanu	Gram
14	Dawali	Munshi /Omkaar	Gram
15	Dawali	Anil / Ramlal	Gram
16	R-Kala	Bashantkumar /Kanhaiyalal	Gram

Annexure 2: No of Farmers under the CA Innovation in Nemar Region of MP

Particulars	2014	2015	2016	Total
No. of Villages	3	10	10	23
No. of Farmers	14	27	43	84
Test site	0	8	16	24
Demo Site	14	19	27	60
Adaptation plot	0	0	30	30

Annexure 3: Different Indicators which were Measured under the CA Intervention

Indicator	Maize	Gram	Wheat
No. of Irrigation			
Seeds rate			
Number of branches per plant	–		–
Number of leaves per plant		–	–
Number of tillers per plant	–	–	
No. of healthy plants per mtsq			
No. of unhealthy plants per mtsq			
Yield (Kg/m ²)			
Height of plant (cm)			
Production per 200 Sq. mt. (Kg)			
Above Ground Biomass (g/plant)			
Av. Biomass Yield (Kg/200 m ²)			
Total cost			
Total income			
Net income			

Annexure 4: Average Cost Incurred in Maize Production by the Farmers

Process	CT+SRI plot	CA+SRI plot
Sowing	960	960
Land preparation	78	50
Irrigation	200	144
Intercultural Operation	667.22	567.22
Harvesting and threshing	238.5	238.5
Total incurred cost (Rs)	2143.72	1959.72
Cost/acre (Rs)	4,819.75	4,406.46
Total selling price @ Rs. 1200/qt (rs)	1428	2304
Cost- Benefit ratio @ selling price of Rs. 1200/qt	1:0.66	1:1.17
Total selling price @ Rs. 1650/qt (rs)	1963.5	3168
Cost- Benefit ratio @ selling price of Rs. 1650/qt	1:0.91	1:1.61

Annexure 5: Cost of Production in Gram

Process	CT+SRI plot	CA+SRI plot
Sowing	802	802
Land preparation	78	0
Irrigation	150	100
Intercultural Operation	583.25	483.25
Harvesting and threshing	159	159
Total incurred cost (Rs)	1772.25	1544.25
Cost/acre (Rs)	5,123	4,464
Total selling price @ Rs. 4000/qt (rs)	1280	1920
Cost- Benefit ratio @ selling price of Rs. 4000/ qt	1:0.72	1:1.24
Total selling price @ Rs. 4600/qt (rs)	1472	2208
Cost- Benefit ratio @ selling price of Rs. 4600/ qt	1:0.83	1:1.42

Annexure 6: Detail of the Okra Vegetable under CA

S. No.	Method	Name of farmer	Village	Variety	Seed rate, in kg	% difference in seed rates	Actual yield of 100 sq. m. in kg	Representative yield (kg/ acre)	% change in yield
1	CA+SCI	Ishwarbhai	Holipada	Samrat	0.50	71.4	139.9	5595.2	122.7
	Control	Babubhai Patel		Samrat	0.70	100.0	114.0	4560.0	100.0

Annexure 7: Details of Onion under CA

S. No.	Method	Name of farmer	Villagew	Variety	Actual yield of 100 sq. m. in kg	Representative yield (kg/acre)	% change in yield
1	CA+SCI	Ramanbhai Ganapthbhai Chidhri	Amsarpada	Traditional	164.7	6588	108.7
	Control			Traditional	151.5	6060	100.0

Annexure 8: Field Results of Gram in Different villages

S. No.	Method	Name of farmer	Village	Variety	Seed rate, in kg	% difference in seed rates	Actual yield of 100 sq.m.	Representative yield (kg/acre)	% change in yield
1	CA+SCI	Sureshbhai Vanalbhai chidhri	Gaurya	GG 1	0.31	45.6	9.50	380.0	155.7
	Control			GG1	0.68	100.0	6.10	244.0	100.0
2	CA+SCI	Ramanbhai Somambhai Gavint	Raochond	GG 1	0.25	66.7	5.80	232.0	184.1
	Control			GG1	0.38	100.0	3.15	126.0	100.0
3	CA+SCI	Khundubhai Chimanbhai	Ghodvahal	GG 3	0.30	85.7	10.32	412.8	113.4
	Control			GG 3	0.35	100.0	9.10	364.0	100.0
4	CA+SCI	Sureshbhai Jatarbhai Hiliyam	Jharan	GG 3	0.30	42.9	29.20	1168.0	133.9
	Control			GG 3	0.70	100.0	21.80	872.0	100.0
5	CA+SCI	Chagganbhai	Machaddi	GG 1	0.25	37.9	4.88	195.2	169.4
	Control			GG1	0.66	100.0	2.88	115.2	100.0

Annexure 9: Details of Intervention in Dangs for Different Crops in Rabi - 2015

Particulars	Traditional	CA+SCI	Traditional	CA+SCI	Traditional	CA+SCI
Crop	Okra		Onion		Chickpea	
Sowing on	Flat bed	Raised bed	Flat bed	Raised bed	Flat bed	Raised bed
Sowing method	Random point placement	Square geometry sowing	Random transplanting	Square geometry transplanting	Broadcasting	Square geometry sowing
Planting/Sowing space	60*5-15 cm	50*50 cm	15-20*7-12cm (no symmetry)	25*25cm	Broadcasting	25*25
Seedling age	NA	NA	30 days	30 days	NA	NA
Seed treatment	Not done	Amrit Pani with 1 % solution	Not done	Seedling root treatment with 1% Amrit Pani	not done	Amrit Pani with 1 % solution
Mulching Material	NA	Dry leaves of local trees	NA	Rice Husk	NA	Rice straw
Nipping*	NA	30 days	NA	NA	Not done	25 and 45 DAS

Note: FP = Farmer's Practice; CA= Conservation Agriculture, SRI= System of Root Intensification

Dedicated to Late Sitaram Rao, mentor and guru of Indian microfinance and livelihoods movement, the Case Study Competition seeks to compile best practices, breakthroughs on the ground, sectoral innovations and efforts that have helped the poor to move from subsistence to sustainable levels of livelihoods. The Compendium is intended to inform and influence practitioners, promoters and policy makers supporting livelihoods promotion.

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