Celebrating 20 years of knowledge exchange on Agroecology
LEISA India is published quarterly by AME Foundation

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LEISA India is a member of the global Agricultures Network. The network organisations provide information on small-scale, sustainable agriculture worldwide, and publish: Farming Matters (in English); LEISA revista de agroecología (Latin America); LEISA India (in English, Kannada, Tamil, Hindi, Telugu, Oriya, Marathi and Punjabi); AGRIDAPE (West Africa, in French); Agriculturas Experiências em Agroecologia (Brazil).

The editors have taken every care to ensure that the contents of this magazine are as accurate as possible. The authors have ultimate responsibility, however, for the content of individual articles. The editors encourage readers to photocopy and circulate magazine articles.

About the special issue

This special issue is brought out to celebrate two decades of knowledge sharing on agroecology. This issue includes some of the best articles published earlier in LEISA India, encompassing various dimensions and perspectives on agroecology.

We are forever grateful to those small farmers who have been relentlessly practising ecological agricultural methods inspiring many to follow and to all those authors without whom sharing such experiences would not have been possible.

LEISA India programme has tried out several other complementary initiatives for better learning and sharing. Brief description on these initiatives is highlighted.

These include: Capacity building programmes on systematic documentation and Knowledge Management, both long term and short term (Page 15); Guiding preparation and consolidation of Special publications (Page 29); LEISA Alliance Meets (Page 55); and, Conducting Impact studies. (Page 73). Also, Feedback (41-42).

Hope you find this special issue interesting.

LEISA is about Low-External-Input and Sustainable Agriculture. It is about the technical and social options open to farmers who seek to improve productivity and income in an ecologically sound way. LEISA is about the optimal use of local resources and natural processes and, if necessary, the safe and efficient use of external inputs. It is about the empowerment of male and female farmers and the communities who seek to build their future on the bases of their own knowledge, skills, values, culture and institutions. LEISA is also about participatory methodologies to strengthen the capacity of farmers and other actors, to improve agriculture and adapt it to changing needs and conditions.

LEISA seeks to combine indigenous and scientific knowledge and to influence policy formulation to create a conducive environment for its further development. LEISA is a concept, an approach and a political message.

www.leisaindia.org
Ecological agriculture or agroecology is a way forward to handle the diverse crises we are facing - be it food, nutritional, climate, social, ecological and economic security. It is a proven pathway to attaining the Sustainable Development Goals (SDGs).

Ecological approaches are context specific, rooted in local responses and adaptations. They reflect a community’s resilience, human ingenuity and innovation.

In India, agriculture still remains the primary livelihood option for the rural majority. Fragile eco-systems constitute a large part of the farming areas. Smallholders and family farmers in these zones constitute the majority. The green revolution technology ushered in during the 1970s was focused on high input agriculture. This was taken up with lot of rigour in irrigated areas, supported by a robust extension system. It was relevant then when we were faced with acute food shortages, but it is now becoming counter productive, seriously threatening the ecological stability and human well-being. The extension set-up too has become either weak or non-existent, failing to meet the requirements of small holders and women farmers.

Civil society organizations have been addressing this gap. They have been promoting and nurturing the alternative agricultural paradigm under various names: Low External Input Sustainable Agriculture (LEISA), Organic Farming, Non-Pesticidal Management (NPM) etc. with small holders and family farming communities. While high input agriculture is cost and risk intensive, carbon emissions intensive, requiring huge investments, the Low External Input Sustainable Agriculture is based on reducing the cost of cultivation, promoting diversity and resilience to meet the market and climate challenges. It is based on promoting simple, low risk, affordable alternatives for building self-reliant farming communities. The focus is on better natural resource management, adopting sustainable farming practices based on diversity, resilience, recycling and reuse while enabling easy access to inputs, markets and knowledge.

Recognising the negative effects of chemical agriculture, the Agriculture Man Ecology (AME) movement was started in 1982 in the Netherlands as an innovative training programme of ecological agriculture. Since 1986 it has operated in India in several phases as a project in the South Indian States. It became an Indian Foundation (AMEF) in 2002. In its vision, the AMEF recognises small holders as its primary constituency. It believes that sustainable livelihoods are attainable through ecological approaches. The AMEF has been promoting ecological agriculture and small holder family farming for more than 30 years in rain-fed areas, supported by national, international and philanthropic groups who recognise its importance.

In its mission, the AMEF recognises the critical role of knowledge in empowering farming communities. The AMEF is well recognised for its flagship LEISA India programme focusing on sharing the practical agro-ecological field experiences through its publication – LEISA India. This is currently published in English and seven local language editions.

Knowledge on LEISA is not easily available, as it is field based, and is seldom written about in comparison to the mainstream research and academic output. In such a challenging scenario, to produce a magazine regularly for over 20 years requires perseverance and commitment. It stands testimony to the collective zeal of the practitioners in sharing experiences, the readers showing deep interest in the content, consistent support of the donors, and the relentless passion and commitment of the editors and LEISA India team. The language editions reflect the strong dedication of the partners belonging to different regions of the country spearheading LEISA movement: GEAG in Eastern UP, Kudumbam in Tamil Nadu, YRA in Maharashtra, ORRISSA in Orissa, Kheti Virasat Mission in Punjab, with the AMEF managing the overall coordination besides anchoring the Kannada and Telugu language editions.

Impact studies show that LEISA magazine is well liked by the farmers, development agencies, NGOs, academics and well wishers in the media. That is heartening. LEISA India programme’s efforts in knowledge sharing through national and international assignments are creditable.

This special issue carries a sample of representative experiences from different regions and diverse themes. I hope it would motivate many more in promoting the ecological approaches as a way forward.

Chiranjiv Singh
(IASt retd.)
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Preface

Celebrating 20 years of LEISA India
the context, the product, the process and the movement

It all started in 1998, when the concept of LEISA (Low External Input Sustainable Agriculture) was new and evolving in India. By distributing ILEIA Newsletter to around 1000 Indian readers, we made a small beginning in sharing experiences on safe and eco-friendly agriculture. After releasing a couple of Indian supplements, in the year 1999, we started publishing a full fledged Indian English edition – LEISA India. Its most satisfying to see that we could continue this service of knowledge exchange for two decades and still continuing….

Small scale farmers are deeply dependent on the environmental context they belong to. Farming is not just business for them. It is ‘a way of living’. Conventional high input agricultural practices are unsuitable, too risky and often out of reach for them. They cannot practice them as they do often impoverish them further by rapidly degrading the very natural resources which are lifelines for them – the soil, water and biodiversity. On the other hand, small farmers comfortably adopt alternatives which are context specific, relatable, simple, less risky, resilient and doable. They generally deal with upgrading the natural resource productivity, ecological balance and use of organic inputs. Practical knowledge on these alternatives is neither widely publicised nor easily accessible. Most often, the co-creation of knowledge is through local adaptations and innovation, and remains unnoticed. LEISA, currently popular as “agroecology” in the global platforms is based on agro-ecological and participatory principles, and contributes towards maintaining biological diversity on which the resilience of agricultural ecosystems depend.

LEISA India is all about celebrating this practical knowledge and benefitting from co-creating it, sharing it and using it for the benefit of all. All along, we believed that it is not just a publication but a knowledge exchange movement. We forged a consortium of like minded partners in 2000, initially consisting of GEAG, Kudumbam and Myrada to explore ways of strengthening knowledge building as well as sharing. The consortium in the later years further expanded to include organisations across India like ORRISSA, Kheti Virasat Mission, Yuva Rural Association and Mitramadhyama.

For more than two decades, LEISA India magazine has been inspiring those in similar contexts and having similar abilities, to emulate. It has been recognised as one of the primary sources of inspiration, a knowledge treasure on ecological agriculture by many individuals and agencies involved in development sector as well as mainstream research and training. Currently, more than 9000 readers receive the English language edition through print copies and electronic copies. These readers include farmers and farmer organisations (11%), NGOs (29%), Academics (22%), Researchers (12%), Government staff (4%), students (5%) and others (17%).

In 2009, we spread out to two local language editions – Hindi and Kannada in collaboration with our consortium partners GEAG and Mitramadhyama. In 2010, we further spread to Telugu and Odiya language editions.
in collaboration with our Odiya partner, ORRISSA. We further spread our outreach in 2014 to Marathi and Punjabi readers with help of Yuva Rural Association and Khethi Virasat Mission. Starting from 3500 readers across all the languages in 2009, currently till end of 2019, more than 13400 readers receive all the language editions. Of the total readers who receive language editions, farmers and Farmer Organisations form the major chunk with 56%, followed by NGOs (23%).

While the English edition reaches the English literate target groups in India and a few south Asian countries, the language editions outreach is limited to the target groups in Karnataka, Andhra Pradesh, Tamil Nadu, Orissa, Uttarakhand and a few Hindi speaking States in the North India, Maharashtra and Punjab. All the editions put together reach more than 22000 readers across the country. Besides the print edition, the digital edition and the social media have helped in reaching out to many more interested in ecological agriculture. On an average, there are more than 2000 visitors to the LEISA India website (www.leisaindia.org), every month.

**Rewarding Processes**

Creating a platform for sharing field experiences and sustaining it for twenty years has never been easy. Themes for each quarter were chosen in collaboration with global network partners, balancing technical and social themes of contemporary importance. Moreover, the effort has been on highlighting multiple perspectives of a theme including the gender dimension. Often, identifying and sourcing articles which are ‘practice based’, that too on a specific theme, has been the biggest challenge. Lot of efforts are made on contacts, networking with those willing to contribute within a specific time limit. Lots of efforts are put in through customary call for articles, web searching, networking for each issue of English edition. Articles had to be sourced from those active in the field, reflecting deep insights and learnings on field realities and alternatives. It has to be written by practitioners who seldom write. Those active in the field, who are invariably busy and working in remote places, seldom had the ability to write. While some write very well, many times, a good experience remains hidden unless provoked to share how and why did it happen, when did it start, who were involved in various stages, the pit falls and challenges faced and how they were overcome etc. Developing the articles through didactic editing process through extensive interaction with authors has been the most challenging as well as a rewarding experience. To get a holistic experience integrating technical community and human dimensions running into 36 pages of English edition on a specific theme is always a precious baby! Recognising systematic documentation as a crucial necessity for sharing field experiences, in early 2000, LEISA India team successfully guided the consortium for two years on systematic documentation and knowledge management.

Working through consortium model of production (English and language editions - 28 issues per year) requires good strategic and effective coordination. With extensive commitment from partners, coordination with seven multilingual partners all over India on selection, production, translation, copy editing, distribution of each translated edition, is done. Partners in each region ensure that translation is well done with peer reviewing by another translator. The overall stylistic consistency is maintained while having the local flavour for each edition. The most satisfying is the consortium model of production which is based on shared ownership, mutual respect and collective pride besides good management practices.

Management of digital editions on the web; sending of e-magazine of English edition, correspondence for all the editions based on common style standards; coordinating Facebook and social media with web consultants; fund raising efforts for co-finances are some of the critical and interesting processes behind the regular production of the magazine. Also, regular maintenance of the diverse databases including subscriber, contributor, survey responses, voluntary contributions database, for timely reporting, analysis sets very good benchmark for timeliness and effectiveness.

**Creating meaningful impact**

As the old adage goes, “The proof of pudding is in the eating”, we have always been keen on knowing the usefulness of the magazine to our readers. The regular surveys done during 2009, 2013, 2016 and 2020 along with impact study done through a combination of strategies like individual interactions, group discussions, field visits, including the analysis done through outcome mapping tool developed by IDRC, revealed very satisfying results.

The responses and feedback was overwhelming. With more than 98% of the readers finding the magazine interesting, it was evident that the magazine remains
the primary and for a vast majority, the only source of practical knowledge on alternative agriculture. Respondents indicated using the magazine for various purposes like field application; training and teaching in agricultural programmes. While farmers used the content for field application; NGOs, for training and guiding eco alternatives; Researchers and Academies for awareness on participatory approaches, practical experiences on ecological alternatives and curriculum development; Mass Media for using and developing AIR and TV programmes on alternative agriculture, Financial institutions for creating awareness among the farmers; Analysts for policy advocacy by citing credible evidences from the field. The magazine became an important torch bearer for alternatives like SRI, IFS, FPOs, traditional ecological and organic alternatives, farmer led institutional models and social processes.

What emerged as a surprise was that majority of the readers did not limit themselves to reading but also shared the content widely with others – farmers with other farmer friends in their own farmer and NGO networks, as well as individual enthusiasts sharing with many more. For instance, one teacher influencing more than 1000 farmers in Orissa! However, one is humbled by the enormity of the task of reaching the still unreached in a country with diverse languages and a huge rural population dependent on farming for livelihoods.

Locally rooted while Globally connected

LEISA India, a member of global Agricultures Network, has been part of international deliberations and exchanges in partnership with partners in Latin America, Brazil, Africa, Asia and Europe in promoting agroecology (See box). These are globally well known partners rooted in agroecological practice, guiding half a million farmers, for more than 3 decades. Together, they have been co-creating and sharing agroecological knowledge through magazines and websites, for more than 2 decades (AME Foundation, India; ASPTA, Brazil; Agridape, West Africa, ETC- Andes in Latin America; ILEIA, Netherlands).

LEISA India has spearheaded significantly several themes and movements like SRI, International Year of Family Farming etc. LEISA India team, besides magazine production has been involved in a number of activities, like LEISA enthusiasts meets, which provided opportunities for face to face interactions with the readers. It has spearheaded long and short duration knowledge management programmes for civil societies in India and South Asia. As coordinating member of the Family Farming movement, facilitated stakeholder workshops and working groups at national and international level. Also, LEISA India team of AME Foundation, on its own and in collaboration with ILEIA, guided several national and international documentation initiatives with international partners like MISEREOR, Caritas, as well as FAO. LEISA India programme has also brought out several products like calendars and posters to popularise LEISA Movement.

A small programme has thus transformed into a movement, ably supported by DGIS (through ILEIA for 2 decades), IDRC for one year, and MISEREOR since 2014. The Voluntary contributions from our readers, though small mean a lot to us in keeping the momentum going. LEISA India is what it is today because of commitment and enthusiasm of all our readers and authors who have been supporting the magazine as well as promoting wider sharing, thus strengthening an alternative paradigm of agroecological movement.

This special issue is brought out to celebrate two decades of knowledge sharing on agroecology. This issue includes some of the best articles published earlier in LEISA India, encompassing various dimensions and perspectives on agroecology. We are forever grateful to those small farmers who have been relentlessly practising ecological agricultural methods inspiring many to follow and to all those authors without whom sharing such experiences would not have been possible. Hope you find this special issue interesting.

KV S Prasad and TM Radha
It is widely agreed that today’s global agriculture system is a social and environmental failure. Business as usual is no longer an option: biodiversity loss and nitrogen pollution are exceeding planetary limits, and catastrophic risks of climate change demand immediate action.

Most concede that there is an urgent need to radically transform our food systems. But the proposed innovations for more sustainable food systems are drastically different. Which we choose will have long-lasting effects on human society and the planet.
Suggested innovations in food systems can be broadly understood as either seeking to conform with – or to transform – the status quo.

**A technological future**

Some want to keep the agriculture industry as close to existing practices as possible. This is true of the increasing number of corporate and financial actors who seek to solve the food crisis by developing new technologies. These technologies are envisaged as being part of what is being called the “fourth industrial revolution” (4IR). The “answer” here is thought to lie in a fusion of technologies that blurs the lines between physical, digital and biological domains.

For example, the World Economic Forum is currently supporting agricultural transitions in 21 countries through its “New Vision for Agriculture” initiative. This initiative supports “innovation ecosystems” to re-engineer food systems based on “12 transforming technologies”. In this imagined future, next generation biotechnologies will re-engineer plants and animals. Precision farming will optimise use of water and pesticides. Global food systems will rely on smart robots, blockchain and the internet of things to manufacture synthetic foods for personalised nutrition.

Like previous green revolution technologies in agriculture, this effort is designed by and for powerful agricultural giants. These technological innovations reinforce the concentration of political and economic power in the hands of a small number of corporations. Indeed, the latter have a growing monopoly control over the “12 transforming technologies” protected by patents.

Most notably, the spread of these technologies will expand the technosphere at the expense of the biosphere. Flying robots will pollinate crops instead of living bees. Automated machines will replace farmers’ work on soil preparation, seeding, weeding, fertility, pest control and harvesting of crops.

These hi-tech innovations radically depart from most farming practices. They are moving us towards an increasingly people-less food system. Yet they show a remarkable continuity with the logic of capitalist accumulation – hence their staying power despite their significant risks.

The spread of automated, de-localised and digitalised production and commercialisation of food is part of the “financialisation” of the global food system. Financial markets play an increasing role in controlling food systems from a distance. This generates huge social and human risks. For example, the significant growth in the sale and purchase of financial products linked to food commodities was one of the determining factors in the 2008 world food crisis.

**Another option**

But there is an alternative to this future. Agroecology involves the application of ecological principles for the design and management of sustainable agroecosystems. Our research on agroecology focuses on how it can contribute to food sovereignty, which emphasises the democratisation of food systems. Agroecology’s contribution to the Sustainable Development Goals is now recognised.

In contrast to the technological vision described above, agroecological innovations promote circular systems that involve recycling, reuse and combining resources to reduce dependency on external inputs, in particular fossil fuels. They mimic natural cycles and the functional diversity of natural ecosystems.

Farming systems are designed in a way that is based on beneficial interactions between plants, animals and environments. Trees and shrubs might be planted amongst or around crops, say. Or two or more crops might be grown in proximity. Agroecology reduces the dependence of food producers on expensive external inputs, distant commodity markets and patented technologies. This is achieved by relying on appropriate biodiversity to ward off pests and increase farm yields.

At broader scales, agroecology involves circular systems that combine food and energy production with water and waste management. Pollution is minimised and synergies achieved by carefully clustering industries into functional wholes. The re-localisation of production and consumption within territories enhances local economic regeneration and sustainability.

Agroecological innovations in transitions to sustainable food systems are being driven largely from the bottom up by civil society, social movements and allied
researchers. In this context, priorities for innovations are ones that increase citizen control for food sovereignty and decentralise power. This is in direct contrast to the monopoly control enabled by 4IR technologies.

**A democratic debate**

Government, civil society and private sector representatives will soon meet in Rome at the United Nations Food and Agriculture Organization to discuss the future of farming. Who controls the global governance of innovation will be a hotly debated topic.

But given these highly contested views on innovations for food and agriculture, it is vital that everyone is able to exercise their right to have a say on the future of their food supply. Deliberative and inclusive processes such as citizens’ juries, peoples’ assemblies and community-led participatory processes are urgently needed to decide priorities for food and agricultural innovations. This is all the more important in today’s context of rapid global change and uncertainty.

So, do you want to live in a world in which artificial food is produced by intelligent robots and corporations that put profits before people? Or one where agroecological innovations ensure we can nourish ourselves and our communities in a fair, ecologically regenerative, and culturally rich way?

*Note: The article was originally published at https://theconversation.com/the-battle-for-the-future-of-farming-what-you-need-to-know-106805*

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Agriculture

A life of inter-connectedness

C F John

Strongly believing in diversity, around 5000 farmers in Kerala have been preserving and nurturing seed diversity, over years. Exchanging and conserving not only seeds but also knowledge associated with it during their annual seed festivals, these 5000 farming families along with their collectives, are making an investment in the sustainability of agriculture and life on this planet.

Seed festivals are instrumental in conserving many varieties which otherwise would have gone extinct.
With the increasing alienation from soil and life processes that we experience today, our thoughts and forms of living have become increasingly abstract, diminishing our capacity to engage with the immediate and physical. It is almost absurd: what is alienated and abstracted have come to feel immediate and real for us, dishonoring the real processes that sustain our life. Only a true engagement with soil and the ones who work with it and help sustain our bodies, can allow all other works that we do today, become whole and complete.

With sustaining efforts of FTAK (Fair Trade Alliance Kerala), about twenty five thousand people from four northern districts of Kerala, (Kozhikode, Kannur, Wayanad, Kasargod) for the last twelve years have been procuring, preserving and exchanging all sorts of seeds, planting material, indigenous livestock, medicinal plants, indigenous and wild trees, and other living things in a focused and sustained manner.

Born at the peak of the agrarian crises in Kerala, FTAK was formed in 2005 by Tomy Mathew of Kerala’s oldest organic store, Elements in Kozhikode. The 300 families from Wayanad who were its first members, initially were looking to increase market access for their farm produce and to negotiate better prices to ensure trade justice. The dignity of farmers was at the center of the collective. Now, under its umbrella over 5000 families, adding up to about 25000 people, have made a mark in the hilly tracts of Malabar, by its pioneering efforts at fair market access for the hill produces of Kerala. The organization has been a trendsetter in procuring agricultural commodities like cashew, coffee, spices, coconut etc., from its members, at prices that match the cost of sustainable production.

The organization initially focused on remunerative prices and fair market access. Today the organization has managed to build on this and become a force in sustainable and organic farming practices, rejecting monocropping for biodiversity. It is thumping a finger at terminator technology. They are recapturing seeds for the public good. At another level, it is bringing the focus back on food sovereignty. The aim is to make each member’s farm a miniature rain forest with a multitude of fauna and flora, typical for the western ghats region, now a declared protected biosphere.

FTAK has become valuable as an institution for its members, not only for marketing their products for fair prices but also providing mid- and long-range proposals on how to improve their livelihoods and lives on a very regional and pragmatic way, with a strong democratic process.

Seed festival – a gathering of custodians of seeds

In this context, FTAK’s seed festival is moving and reassuring. It pulses with hope for the future. It seeks to enliven both the functional and symbolic spirit of the
land and community. Its participants present a vision of life as abundance – an abundance of life. Not a wasteful or accumulative affluence, but satiation and sharing, where we remember and learn again from teachers who have come to us in different forms – soil, rain, trees, plants, birds, animals and elements, and from each other as a community. The farms and the venue of the seed festivals become a place for sharing experience and knowledge related to preservation and propagation of indigenous seeds.

We are living in a time witnessing an increasing aggression in our lives, fueled by obscure and abstract institutionalized forms of faith. Paradoxically, the innate and transcending nature of these faiths are being repressed and predictably producing seeds of threats and hatred. But in the seed festival, along with the preservation of life-sustaining seeds, the important values of caring, nurturing, preserving and sharing are also nurtured. So to my mind, it is not just about preserving seeds, it is about who is preserving them and how. It is often the people at the margins and the vulnerable are the ones who preserve many of the transcending visions, breathing them into the daily life. An observation from a visitor who took many rounds and spoke with each stall said, “What we get to see in the stalls are not just seeds but also the spirit of dedicated collectives. The seeds reflect their labor of love. Hence they spoke from their hearts. It expressed the dignity of their work, the beauty of the togetherness, confidence and contentment. They see the work as their contribution to the coming generation.”

If you went to view the exhibition the way we visit other shows, we would miss the meaning. Around sixty stalls all display seeds with extraordinary diversity, over 6000 of them: ordinary, extraordinary, unique, nearly extinct and common – all are there. Around 200 varieties of rice, one hundred and fifty kinds of beans (payaru), many kinds of brinjal, chilies, pepper, yams, spinach, tubers, fruits, nuts, medicinal plants, engendered livestock, all make a testimony. These are presented by those who have cared to keep them alive. Not just alive, but thriving with health and purity. As faith communities fight over issues of purity, here these humble farmers with urgency and mindfulness, with open eyes and hands, work in the soil to maintain its moisture, micro-organisms, air, warmth and all that is necessary for a seed to sprout, grow, and blossom to give healthy seeds again, year after year. That way they hope that along with all these rich diverse and interdependent forms of vegetation and other forms of life, our life too would regain health and sanity. One visitor said, “Their understanding of the holistic nature of farming was most erudite... I felt that if these were the women farmers, then there was vast wealth of potential trainers and resource persons inside the organization.”

What is important is that most of the people who come to visit the seed festival are also keen to care for life and committed to learn the nurturing of it. So it is the place for the gathering of minds to share their seeds and the knowledge of preservation that to my mind is doing a duty that is sacramental. Because it is the true work for our times, an investment in the continuity of agriculture and the life on this soil.

If one visits any of the farms, half-acre to three-acre plots, one would see multiple crops like coffee, spices, coconuts, fruits and vegetables all on one farm and growing amidst each other. From the tubers underground to the tallest coconut trees, from the soil to the sky, many, many varieties of food and cash crops. A farm looks more like a very large tropical allotment. Here with the involvement of over 5000 farming families, with their collectives, we see the largest indigenous seed preservation effort in the western ghats of India. The focus of the seed fest now is on seed sovereignty, vittu swaraj.
Today each collective has become a seed bank. A seed keeper from a collective says, “Today, I do not even need to buy groceries, except for sugar, salt and tea. Everything is in my farm or the neighbors.” Seeds that were only with one person at the beginning of the seed festivals are now with many. When the farmers speak, we can hear how these seeds are cared for with personal attention. “All is done with our own hand ... this needs to be experienced personally,” they say. If a visitor is not alert enough to the alertness of the seed keeper, he would miss this bodily connection she is whispering, the secret of Life.

Thich Nhat Hanh said once that “if you are a poet you will clearly see that there is cloud floating in this sheet of paper. Without a cloud there will be no rain, without rain, no trees and without trees, no paper.” If we take a moment to see the story in reverse, we will get to see the poems in the clouds and not need to write them on paper. So that the trees, rain and clouds all would return. These seed keepers see the poems in the soil and the seeds. It is the poetry of bodily connection, celebrating life.

The seeds stay together knowing each other

In keeping with the spirit of this mindful preoccupation, the fest itself is different from the exhibitions that we normally get to see. At a time when our tastes, without even our own knowing, are defined by the studio aesthetics of corporate world, the seed fest defies all that smartness. All who come there are part of one caring. The event carries the sensibility of land, done without event managers, PR agencies and media hype. A true farmer knows what is necessary, what is wasteful and how something is made functional. So it is not an exhibition for an alienated consumption, but reminds us of our own simple taste and shows us possibilities of how one can be light. It shows our own forgotten ways of togetherness, and how one can go beyond the financially-driven economy and participate in a social economy.

Conscious consumers

Sections of people today are becoming more sensitive to the effects of their consumer behavior and are increasingly trying to avoid a negative impact in the upstream value chain by making an educated choice. It is time for a conscious consumer to understand the real value of the produce they take away at a bargain.

Fair trade as a concept recognizes the skewed market and tries to appeal to the buyer’s sense of justice. It rests on the principle of consumers supporting producers directly and a willingness to pay more than the conventional market price in exchange for healthier products. As a visitor says, “FTAK’s effort is at the very heart of the struggle between a sustainable food system centered on the work and knowledge of small farmers, and an unsustainable industrialized food system dominated by a handful of multinational corporations.”

In a social as against a financially-driven economy, new ideas spread not by creating large corporations, but by the rich examples of forms that are smaller and in human scale. They inspire others and spread like seeds from a pod. FTAK in its short life has been just such an inspiration.

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In the Deccan region of India, over 60,000 women peasants are feeding their families, their culture and their pride with biodiverse farming practices. Their knowledge and successes have reached across national and institutional borders, giving them world wide recognition.

It is the year 2003 in Andhra Pradesh, India. A group of more than 50 peasant women gathered in a thatched-roofed hall in Didgi village, engaged in a video interface with a group of senior agricultural scientists. Sammamma, who owns three acres of rainfed farmland and grows more than 18 varieties of crops, stands up and starts explaining why she values biodiversity in her farming practices. Quickly a scientist on the other side of the video camera stops her and says “No, no, please do not worry about biodiversity. It is we, the scientists, who should think of biodiversity, and we will recommend a seed for you to use.”

Still, too often scientists believe that agricultural science and knowledge are exclusively their domain while peasant farmers, especially the women among them, are not to be included at all when discussing farming approaches. However, the women in the Deccan region proved them wrong in many ways.

**Biodiverse farming systems**

The peasant women in Didgi village have developed highly biodiverse farming systems with common characteristics: they all farm on non-irrigated, not very...
fertile fields of less than two acres; they are all non-chemical farmers; all of them grow 12-23 varieties of crops on their small plot; and none of them need to purchase any of their food from markets. The women of the Deccan region are the seed keepers. They not only conserve seeds, but also decide on the mix and quantity of seeds to be planted at planting time. This is a win-win system: the women’s way of farming supports biodiversity, and biodiversity supports their way of farming.

Why is biodiversity so important for these women? Why are they not content with growing just one or two commercial crops as advised by the Department of Agriculture? They have a clear preference for food crops such as Yellow Sorghum, which are totally discarded and discouraged by agricultural scientists for its low price in the market. But for the dalit women Yellow Sorghum means nutritious food, good fodder, crop which grows in dry soil, can be used in fencing and thatching, and many other qualities. All these factors, in addition, can be completely controlled by the women in spite of their low income levels. The reverence that peasant women show for such “orphaned crops” illustrates their special vision on food and farming.

More than food

Especially for women from vulnerable communities, sticking to peasant values and biodiversity in farming has made all the difference between death and life. Whereas famer suicides have been prevalent among Indian farmers who suffered from debts as a result of their expensive and risky commodity- and chemicals based farming systems, peasant women farmers who continued to use low cost biodiverse farming principles have not seen a single suicide among them.

Agro biodiversity is a strong part of these communities’ traditions, but it is also the only logical way for them to farm. They clearly understand that a bio diverse system is the best security they have against climate vagaries. Moreover, the crops they grow are indicative of their food culture, and the relationships between foods in the kitchen reflect relationships in the field. For instance, food made from sorghum is accompanied by food made from pigeon peas, and in the field sorghum and pigeon pea grow as companion crops. This unique “farm-to-kitchen” model is what has kept agro biodiversity alive on their farms for centuries. Since women are the most important torchbearers of this food tradition, they are also the carriers of the agro biodiversity tradition.

Biodiverse farms not only nurture physical life, but also moral, ecological and spiritual life.

People in this region celebrate biodiversity through several religious festivals where heroes symbolise and bless biodiversity. Englagatte Punnam, for instance, is celebrated when the winter crops mature, by tying diverse crops on the door of every home – as if they declare, “look at the diversity in my field!” Women treasure these crops more than monetary wealth. Consequently, seeds are neither bought nor sold, but always exchanged.

Reshaping food policy

In India, a select few species are promoted and supported as food crops by governmental institutions. A wide range of millet varieties, which traditionally have nutritionally fed many rural communities, are not among them. In 2013, for the first time in our history the government recognised millets as food security grains of the country by including them in the brand new National Food Security Act. After a decade long struggle by dalit peasant women, the Deccan Development Society and the Millet Network of India, millets are now put firmly in India’s public food system. Not only for us, but also for the women this was a great moment to rejoice. They used radio and made short films to share their toils and successes. With grit and determination they overcame their social, economic and gender marginalisation and reshaped a national policy. Also, in 2013 we as milleteers were able to take the message of millets back to their African birthplace by initiating the Africa-India Millet Network and creating a new solidarity between two continents.
Proud to share

The Deccan Development Society (DDS), a grassroots NGO working with peasant women from socially and economically marginalised dalit communities, has facilitated the sharing of farmer knowledge for 25 years. The women from this region, especially those from lower socio-economic classes, have travelled at least 100 times – from Peru to Cambodia – to share their experience and their perspectives on farming with farmers, scientists and policy makers. They have met receptive audiences, among male and female peasants and in international conference rooms alike. In 2003 they addressed the World Organic Congress in Victoria, Canada, where various people in the audience said they felt humbled by the women’s experiences.

Brimming with confidence, these women have started celebrating the Mobile Biodiversity Festival. Every year since 1998, they travel to over 50 villages during one month, discussing and celebrating ecological agriculture, control over seeds and organic markets in a way that expresses the deep relationships between the farmer and soil, agriculture and environment. They reached over 150,000 farmers in the region, showing them the richness of the traditional seeds and crops from the area. The Indian government has recognised these Biodiversity Festivals as the most important community cultural campaign on the issue.

Worldwide recognition

The Deccan peasant women, who were so easily dismissed by the scientists in 2003, are now receiving national and international recognition for their work on biodiversity. Anjamma for instance, a 55 year old peasant woman who has never gone to a school and cannot read and write, is now a member of the expert panel on agro biodiversity in the state of Andhra Pradesh. Government officers, scientists, civil society activists and media come to the region regularly to look at the women’s farms and seeds. Their stories regularly appear in newspapers and on television channels.

Today, the region comprising of about 50,000 hectares of land is about to be recognised as an Agricultural Biodiversity Heritage Site by the Indian National Biodiversity Board – the first in the country. The international Convention on Biological Diversity (CBD) developed the concept to honour the sites where biodiversity is practiced. The Heritage label would place the area and its biodiversity at the same level of protection as national parks and offers special status, privileges and incentives to the farmers and communities.

The label would convey a strong message that the Indian government supports marginalised family farmers and recognises their contribution to protecting biodiversity. When asked what the Heritage label means to them, the peasant woman Mahbatpur Swaroopa answers, “We are totally disinterested in any monetary benefits. It is the recognition that we cherish.”

The power of women

The attention for their farms and perspectives has added tremendously to the women’s self esteem. Paramma, a farmer seed keeper in Khasimput village, once demonstrated this confidence as she confronted the government officials who came to visit her: “Every month you get your salaries and fill your pockets with currency notes. But come to my home. I have filled it with seeds. Can you match me?”

Given their marginalisation in other spheres of life, the women feel that their practice and conservation of agro biodiversity has bestowed them with a new stature in the country, in their communities and in their homes. Most of the peasant women in this area say that more often than not, they are consulted and play a key role in making choices for their family farm. Cheelemamidi Laxmamma cultivates her three-acre farm with dozens of food crops along with her husband. When her husband was counselled that he should become progressive and plant some hybrid crops on the land, he – completely against the grain of his social milieu – first wanted to consult his wife. When he did, she burst out: “Have you gone mad? Why do we need hybrid seeds and a monoculture? Are we not happy with what we are growing?” And he gave in. Sharp and alert women such as Laxmamma enjoy far more respect from their husbands for the recognition they have gained in the community and beyond.

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Insect behavior is largely decided by farming practices. Both plants and insects are mutually dependant. While plants provide food to insects, insects provide the necessary ecological services to the plant. Farmers therefore need to manage cropping as a part of a larger ecosystem management. This requires deeper understanding of the relationships of various living forms in an ecosystem.

Biodiversity is important in any ecosystem as it increases the productivity of an ecosystem and forms an integral part of food chain and natural cycles of that particular ecosystem. In an ecosystem, each species, no matter how small, all have an important role to play. Crop ecosystem is also one such ecosystem which survives on biodiversity of biotic species on the farm, like, earthworms, amphibians, reptiles, insects, birds, etc. Being interwoven and interdependent in the food web, understanding their roles and using them to our advantage to get the best crop output, is what is needed.

Owing to lack of understanding of the role of insects in a crop ecosystem, we see them transform into pests, all the time, driving all our resources in eliminating them, most of the times in a manner detrimental to other forms of life. Many times, we have managed to transform an insect which occasionally attacked plants into a major pest. For instance, the cotton mealy bug since 2007 is considered as a severe pest attacking not only cotton but many other crops like tapioca, papaya, ornamentals etc., in south India. The question here is, how did this insect suddenly turn into a serious pest which was not reported during earlier years. It was never considered a serious
pest on cotton. Our faulty cropping practices must have been the reason.

Most often, insect attacks are not the ‘problem’ but a ‘symptom’ indicating a deeper problem, like nutritional deficiency. When both soils and plants are weak in nutrition, they invite pest attack.

Similarly, the climatic variation also influences the occurrence of insects and their function. It is important to look at crop health holistically rather than try to address the issue of pest attack separately.

Behavioral roles of insects are largely decided by farming practices. Quite evidently, we find more pest attacks on farms using high external inputs compared to those which follow sustainable agriculture practices. Farmers therefore need to manage cropping as a part of a larger ecosystem management. This requires deeper understanding of the relationships of various living forms in an ecosystem.

**Learning to farm**

Increasingly farming households in Pennagram taluk of Dharmapuri are being headed by women, owing to men migrating in search of alternative livelihoods. Lacking access to resources and knowledge on farming, left on their own, women are managing their farms based on what they know and what they have seen and learnt from their elders. At this juncture, AME Foundation tried to address this issue by increasing women’s access to knowledge on farming and their ecosystems, thereby making them more capable of taking decisions on farm for harvesting better yields.

*The leaf cutting experiment*
Around 25 young farm women from 5 villages of B.Agraharam, Gowrisettipatty, Germalampatti, Rangapuram, Kattunayakanahalli in Pennagram block were trained on understanding farm ecosystem through Farmers Field School (FFS) methodology. Enhancing analytical and decision making capacity with skill upgradation was the prime focus of FFS. Farmers adopted LEISA alternatives while using lesser external inputs for sustainable production.

Around 25 young women from 10 villages of Pennagram block volunteered to form a group for learning purpose. They were trained for a period of 15 days on ecological management of crops and also the facilitation methods for organising farm schools in their villages. These trained women in turn conducted FFS in 5 villages involving 100 women farmers. Earlier, the women who were members of self help groups were only involved in saving and lending activity. The idea of FFS was accepted with great enthusiasm as the women were eager to learn about better farming methods.

FFS provided a good platform for these women to share and discuss about their problems in high input agriculture on a weekly basis. The women decided to meet during 8-10 in the morning, keeping in view the other household responsibilities. The FFS was carried out over a 6-month period during July 2011 to January 2012 during which the members learnt a number of aspects related to ecological crop management, starting from land preparation to crop harvest. Of the five FFSs, two were focused on groundnut crop and the remaining three on cotton with overall dry land production system approach in focus. In all the FFS, simulation studies like insect zoo, short and long term on-farm experiments with non-chemical methods to control pest, bio-fertilizers application, cropping systems, soil and water conservation practices etc., were covered. There was a high level of participation by women in all the FFS.

**Understanding insects**

The FFS sessions promoted durable group learning process. The young women learnt about many aspects related to pest management, like the functional role of insects, their behavioral patterns and services to ecosystem for the crop output. Innovative experimental studies like ‘insect zoo’ were created. For observation purposes, one square meter of the field was marked with erected mesh. For close and continuous observation, potted groundnut plants were also maintained.

<table>
<thead>
<tr>
<th>Village</th>
<th>Pheramone traps (15 nos.)</th>
<th>Yellow sticky traps (50 nos.)</th>
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<tbody>
<tr>
<td></td>
<td>Spodoptera adult trapped</td>
<td>Heliothes adult trapped</td>
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<tr>
<td></td>
<td>Jassids</td>
<td>White fly</td>
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<td>B.Agraharam</td>
<td>843</td>
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<td>Gowrisettipatty</td>
<td>220</td>
<td>9</td>
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<td>Kattunayakanahalli</td>
<td>360</td>
<td>17</td>
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<td>Rangapuram</td>
<td>362</td>
<td>4</td>
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<tr>
<td>Germalampatti</td>
<td>228</td>
<td>11</td>
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<td><strong>Total insects</strong></td>
<td><strong>2013</strong></td>
<td><strong>56</strong></td>
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LEISA is recognized as agriculture based on agro ecological principles worldwide. Ecological agriculture which is gaining increased attention worldwide is primarily based on holistic principles, caring and nurturing the components of nature, their relationships and healthy balances. This means **better management of natural resources and cropping systems** through eco-friendly options while being environmentally safe, enabling better plant growth, resulting in better yields and net incomes. Moreover, often, eco-friendly alternatives evolve from local adaptations (eg. Local plant extract serving the purpose of a harmful chemical pesticide) through the ingenuity of the farmers themselves.
Members observed that in the one-square meter earmarked area of groundnut crop, the sucking pests ‘Aphids’ appeared more under irrigated conditions. They understood that as the nitrogen application was more under irrigated conditions, the plant sap was high, inviting aphids, the sap sucking insects. On the other hand, in case of dry land condition there was no application of fertilizer and as such the number of aphids found was very few.

The beneficial insects are many in cotton based farming system. Generally cotton is grown with commercial motive with higher external inputs therefore the insect’s occurrence and their attack are also high. But, equally important to note here is there are many insects that play predatory role on insects of those pesterin on cotton crop. Insects like Syrphid fly, Green lace wing, lady bird beetles play a very effective beneficial role in cotton production environment. They prey on sucking pests like aphids, white fly, jassids, mealy bugs etc. and protect the crop. Generally, these beneficial insects are more virulent, having good flying capacity, ability to move faster and predate on sucking pests which are less mobile like in case of aphids and jassids or immobile like in case of mealy bug.

One of the experiments in the FFS helped women understand the interactions between pest and predator. The potted plants in which groundnut crop was raised were covered with a mesh. Aphids and Lady Bird Beetles (LBB) were released inside the mesh. Participants observed that LBB started piercing into the stomach of aphids to suck the juicy content and gradually consumed the whole body of aphids.

To educate the women as to how every insect attack is not harmful to crop growth, an experiment was laid out on leaf cutting in cotton field. The leaves of cotton plants in selected rows were removed by 50%, 75%, 100% and 0% of leaf area during vegetative stage. Members were asked to observe and record the growth till the harvest. Participants observed that all those plants with their leaves cut to different extent were compensated with new leaf growth. There was no difference observed on the yield parameters like number of flowers and bolls per plant, between leaf cut plant and control plants. They learnt that the plants had inherent capacity to withstand leaf loss through compensatory ability. Members concluded that there was no need to take up pesticide sprays the moment they see a pest, as they have always been doing.

They learnt about the concept of Economic Threshold Levels (ETL). In context of ETL, they also realized that insects being part of food web have to get their food from plants only. If the production practices are eco-friendly and optimum, then the insects also lead their life drawing nutrients from plants causing no damage while providing the ecosystem services like pollination.

Members also learnt the non-chemical methods to manage pests in case they crossed a level where they could cause damage to crops. They prepared locally innovated yellow sticky traps, pheromone traps and created a conducive micro climate conditions at the farm level. While trying out different coloured sticky traps, they observed that the yellow colour attracted the maximum number of sucking pests like aphids, jassids, white flies etc.

Looking ahead

Agriculture practices mostly decide the role of insects. Both plants and insects are mutually dependant. While plants provide food to insects, insects provide the necessary ecological services to the plant. With a strong belief that “only insects are born and not pests”, these young women are moving ahead confidently by adopting sustainable agriculture practices on their farms. Also, they are taking others along, in their ecological journey.

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Guiding Systematic Documentation and Knowledge Management

Alternative and sustainable agricultural practices are being followed in many regions, practiced by many farmers and promoted by a number of organizations. However, these are not being disseminated far and wide, as they are not being noted or documented. One of the major reasons for not documenting is the lack of skills to document apart from time and resources.

LEISA India team has been guiding organizations in documenting their field experiences. We strongly believe that a long term support is crucial in helping organizations pick up the skills and nuances of documentation. One off training events are just not an answer to this issue.

Therefore LEISA India team has been supporting field level organizations, both in India as well as in other countries by providing long term hand holding support. We have guided organizations in LEISA India Consortium partners through a long term programme; did specific assignment with several Civil Society Organisations.
Pollinators

Key for agro biodiversity conservation

Robert Leo and Mathew John

Initiatives and innovations promoted by Keystone Foundation have helped promote bee keeping amongst farmers and tribal communities around the Nilgiri Biosphere Reserve. The impacts are visible in terms of better yields in coffee, mango and vegetable crops.

The Nilgiris, forming a part of the Nilgiris Biosphere Reserve in the Western Ghats is home to moist, dry, evergreen and mountain tropical forests. The Western Ghats, and the Nilgiris in particular, harbour a wealth of flora and fauna; much of which is restricted to the region. e.g. the endangered lion tailed macaque. The Nilgiri forest ecosystem is, however, under pressure e.g. from tea and coffee plantations, illegal, logging and commercial tree plantations with exotics initiated by the Forest Department. It also has a significant tribal population, dependent on natural resources for their livelihood; including the only surviving hunter-gatherers of the Indian sub-continent – the Cholanaikans in the New Amarambalam area (See page 15). Apart from the Todas – a well known pastoral group in the upper Nilgiris, other groups include the Paniyas, Irulas, Kurumbas, Kuruchiyans, Mullukurumbas, Adiyans and Alyars.

Eco-development initiatives

Keystone started its journey with bees and honey, in 1993. Team members travelled to all hill areas of Tamil Nadu meeting different indigenous communities. This journey was made, to not only get an insight into the traditional activity of honey gathering from the wild Giant Rock Bee (Apis dorsata) but also to identify pockets of beekeeping with the Indian Hive Bee (Apis cerana). The team visited 16 different hill regions, meeting 11 different communities, each unique in their...
Bee pollination

There are four major honey bee species found in the Indian subcontinent. Migratory bee species like the Apis dorsata (Rock Bee) and the Apis florea (Little Bee) bee populations are major pollinating agents across migratory landscapes. The permanent cavity nesting bees like the Apis cerana indica and the Dammar bees (Trigona; stingless bees) are important pollinating agents for local agro biodiversity. These honey bees play a crucial role in maintaining agro bio-diversity which includes cultivated crops and forest regeneration. Cross pollination is essentially important for seed quality, grain quality and crop evolution. Apiculture is also practiced as a part time/fulltime income generating livelihood activity by many rural communities. These bee species forage on and pollinate all plants and year round. Apis cerana and dammar bees find appropriate tree cavities and wall crevices in farmlands. These colonies will stay for years together if external disturbances do not force them to desert. Also, every year, few swarms (natural division of colonies) from the original colony, develop and settle nearby. A farmer can protect such nesting sites and colonies for his/her crop pollination and as well as for honey production. Innovative farmers make such structures on farmlands to attract bees to nest and enjoy pollination benefits. Tribal farmers in the Nilgiri Biosphere Reserve practice such bee keeping for honey and crop pollination.

There are more than 2000 species of solitary bees estimated in our country which have a symmetrical and asymmetrical relationship with endemic plant species. This behaviour by solitary bees is seasonal. This relationship is essential for the existence of plants as well as the pollinators. Common solitary bee spp. like Xylocopa spp., Amegilla spp., Ceratina spp., Blister beetle, Leaf cutter bee and Hawk moths can be observed normally in farms. These bee species are essentially dependent on old logs, rotten wood, hollow wood, reeds and sand heaps to nest and breed. Hence, farmers are encouraged to conserve such habitats in their farms and make others aware of benefit of cross pollination.

At present, all four species of honey bees as well as solitary bees are in a tremendously vulnerable situation due to loss of habitats, extensive use of chemical pesticides, chemical applications, deforestation and changed land use due to urban development. All these are affecting their population density, which in turn may have an impact on species survival and associated flora of the region.

own way. The details of honey hunting techniques, forest vines used, associated traditions and rituals, social systems and economic dependence on such an activity, were a fascinating eye-opener. The experience and learnings from the year long survey were immense – issues of resource alienations, conservation, land use change, use of chemical inputs, etc. had affected bee populations and threatened a traditional livelihood.

Previous work in honey gathering with the Paliyan adivasi community in the Palani Hills during 1990-1993, indicated that this traditional activity could be an effective entry point to work with indigenous communities centered on natural resources and livelihoods. The survey brought the team to the lower Nilgiris, where a number of hunter-gatherer communities practised honey hunting and subsistence agriculture. Beekeeping is not a traditional activity and the communities usually collect honey from the wild. A potential area for future work and learning materialised and Nilgiris, as a region, was chosen to begin work.

Beehive monitoring is crucial for its survival
Traditionally tribal communities have been collecting honey from the wild.

We started working with the Kurumba and Irula communities. We documented their practices, provided training in better extraction methods, mapped the resources (bee populations), provided parameters for quality of honey and bees wax and also marketing support for the produce. All these resulted in an informal network of 200 honey gatherers and a successful micro enterprise.

Over the years, many activities were undertaken for promoting and strengthening bee pollination. These include capacity building, floral mapping to document nectar and pollen sources, research on Apis cerana ecology and behaviour, disease monitoring studies, setting up of an information base and a resource centre in Kotagiri, called ‘Jenugoodu’ (Nest of Honey). The work has faced several set backs during the last fifteen years, due to disease attacks. However, consistent experimentation, innovation and efforts to keep colonies alive has kept the activity afloat.

Specific interventions made are:

- Apiaries have been established across the Nilgiri Biosphere Reserve (NBR), at different elevations, for easy access and benefits of local farmers. These apiaries also serve as training centres. To multiply bee colonies to cater to local farmers’ bee colony requirements, different kinds of bee hives and beekeeping equipment have been designed to adapt...
Making homes for bees

Forest and rocks are sacred to the Cholanaicken people as they believe that the Maladeivam (God of hills) lives in the forest. The Cholanaicken do not harvest honey from sacred rocks. The Thali varai is one such rock, acting like a gene pool for the bees. Honey is widely consumed in this region and it is important to understand the honey hunting process. Elderly people are skilled in attracting honey bees to the bee-nesting trees. They look for trees on hill slopes, where the wind is not strong. The people endeavor to make these trees visible to the bees by clearing plants around the trees, making way for the bees to land.

* Tetrameles nudiflora* (cheeni), *Wrightia tinctoria* (pala), *Lagerstroemia microcarpa* (venteak) and *Stereospermum colais* (poopathiri) are some of the trees used by *Apis dorsata* honey bees for nesting. These trees are well branched, and usually the bees nest midway along these branches. The honey hunter stands on these branches during honey harvesting (April-June), and collects the honey combs.

Acquiring the skills

The Cholanaickens learn honey hunting skills from their parents. At an early age, children accompany the hunters when honey harvesting, and also during collection of non timber forest products (NTFPs). The children learn the skills during the process through watching carefully.

A honey hunting group consists of 7-8 men, although the number varies depending upon the number of colonies to be harvested. The senior members of the honey hunting team tie the bamboo ladders (poles) to the honey tree and the youngsters climb them. By about the age of 20, a young man is skilled to climb any tree and safely harvest honey from an *Apis dorsata* colony.

Ownership of trees

There are two kinds of ownership of honey trees:

**Temporary ownership.** When the Cholanaicken go for NTFPs collection in the forest, they may find honey bee colonies in tree cavities or in termite mounds. Whoever spots the comb puts a mark on the tree with a bunch of fresh leaves of *Strobilanthes ciliatus* (kurinji), *Wrightia sp* (pala), *Xyilia xylocarpa* (irul) and *Helicteres isora* (edampiri valam piri).

The person who finds the honey tree makes an incision in the bark at a height of about 130 cm or where it is visible to others. Then the person places fresh leaves in a vertical position on the bark. They make the mark on the bark of the tree in case they do not find fresh leaves of shrubs. When the honey is mature they will harvest it. Because they respect their traditions and rituals, no one would dare to collect honey belonging to another person. There have been cases of deaths caused by the violation of this traditional law.

**Hereditary ownership.** This gives ancestral right to collect honey from a particular tree. *Tetrameles nudiflora* (cheeni), *Wrightia tinctoria* (pala), *Lagerstroemia microcarpa* (venteak) and *Stereospermum colais* (poopathiri) are trees where *Apis dorsata* often build nests. Hereditary ownership applies to most of these trees with a clear understanding within the community as to which family each tree belongs.

Usually, as the tree has ownership of the bees, the whole family takes part in honey collection. Women do not climb trees, but can be seen lighting the smokers, preparing the pots, squeezing the honey combs and filtering honey into the traditional containers made from large bamboo poles. Children often wait below, watching their fathers climb to bring the harvest down. According to the Cholanaickens, there are different types of *Apis dorsata* bees – some make nests on bushes and fallen trees, about 2 m above the ground. These are called *pontha thenu* and they are usually eaten by bears, before the people can get them. Other nesting sites and bee types are described by local people.

This documentation of indigenous knowledge clearly explains the link between people, forests and especially with bees. The faith, belief and imagination of these people are summed up in the following account, told to us by a senior Cholanaicken:

“We believe that the bees kick on the branch to see the strength of their nesting places. The honey bee asks the tree - can you bear our whole family of bees, our wax, our property (honey and pollen), one pooni kayar (rope used to bring down the honey), kotta (basket), knife and a man? If the tree agrees, they settle on the tree”

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Saneesh C S
Keystone Foundation, Tamil Nadu, India

*Source: Bees for Development Journal, Issue 87, June 2008*
to local conditions. Many simple experiments have been carried out in colony selection and queen rearing practices.

• Community carpentry unit is created in Kotagiri for fabrication of bee tools and bee hives and tribal youth are engaged in making such tools.

• Trainings are organised for forest dwelling communities in this area as well as throughout India to promote sustainable honey gathering techniques for conservation of bees, hygienic honey handling, packaging and better marketing practices.

• Posters and booklets are prepared to disseminate information on indigenous pollinator diversity to understand the role of pollination and its benefits which would in turn help farmers to conserve diversity and habitats.

• School children are encouraged for nature walk with tribal village elders to learn about biodiversity, food chain, insects, bees, animals etc.

• A Bee Museum has been set up in Ooty town for the school children, tourists and the general public to create an awareness about honey bee science, bee ecology, role of bees in pollination and linkages with the indigenous communities.

• Interpretation centres have been established in 5 places in the Nilgiri Biosphere Reserve to disseminate information on Bee ecology.

• A Bee Nature Reserve has been established with the support of local government and forest departments, in a Toda tribal region of Nilgiris to protect *Apis cerana* bee cavities and habitats.

• Organic and fair trade principles are being practised for honey collected at project sites, supporting market development of different types of honey – 4 Green Shops and 3 Honey Huts have been established.

**Some gains**

Innovations in beekeeping (movable frame hives, top bar hives and clay hives) have helped promote beekeeping amongst farmers and tribal communities around the Nilgiri Biosphere Reserve. Crop pollination and honey harvest is achieved in different ecological zones in different seasons. Bee pollination has helped increase coffee yield by up to 69% and soap nut by up to 36%.

Pollen grains of tamarind have also been observed in honey analysis (Keystone Foundation, 2009, unpublished data). Cultivated and agro-forestry plant spp. in the Sigur plateau (rain shadow and dry zone) enjoy the benefits of bee pollination. *Apis cerana* and *Apis florea* bee foraging is observed on vegetable crops like coriander, brinjal, lady’s finger, tomato and tree crops like silk cotton, coconut, lime and papaya.

**Pollination to production**

Efforts were made to combine ecologically sensitive development with rural enterprise by upgrading their skills and income through training at the village level. Village units have been established for the members to add value to the bee products, reduce exploitation in the informal market, gain additional income, and more importantly to work towards self reliance. Today, the tribal communities have formed their own groups and are managing their operation successfully with technical and supervisory role by Keystone. Each of these small units is running with some element of independence. The process of building a micro enterprise which is village owned, able to run and negotiate with Keystone on prices and orders, is the key element to growth.

◆

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This is the story of how the people of Kaluchi Thakarwadi changed their destiny: a story of transformation from desert to replenished watershed. Kaluchi Thakarwadi is no longer a tragedy of inhospitable climate and unfortunate circumstances. By rejuvenating their landscape, people have rejuvenated their lives.

A small, remote settlement, Kaluchi Thakarwadi is located in Parner block of Ahmednagar district in Maharashtra. The village lies in the semi-arid zone in the rain shadow region of the Sahyadri mountains. With unreliable rainfall, the village is known for acute water scarcity leading to recurrent food and fodder shortage. Climate change has further aggravated the situation.

The main livelihood of the village comes from agriculture. But only 2 of the 7 hamlets are close enough to the river to be able to use its water for drinking and irrigation. Agriculture in all other hamlets is completely rainfed. Not being able to earn enough from agriculture, farmers migrate for work to sugarcane factories, brick kilns or as agricultural labour on other farms. This unsettled lifestyle has adversely impacted families, especially the education and health of children.

Needless to say, neither government officials nor development schemes have reached this village. The village didn’t even have a connecting road till 2009.

The community comprising of 98 households scattered in 7 hamlets, lacked the resources, access as well as collective power to tackle the problem of water scarcity.

Then, reports of impactful watershed projects came in from neighbouring villages. People of Kaluchi Thakarwadi decided to bring this solution to their village. The Gram Panchayat contacted Shree Hanuman Watershed Vikas Sanstha (SHWVAS), a small NGO working in the area, who in turn contacted Watershed Organisation Trust (WOTR). WOTR provided financial and technical help to SHWVAS and watershed development came to Kaluchi Thakarwadi’s parched land.

Some conditions

WOTR’s Wasundhara Watershed Development Program is designed around the belief that the success of any project is dependent on the motivation of the community, its willingness to take ownership and participate in the program.
Watershed development is also considered as a means for socio-economic unity and community development. Hence, WOTR has certain pre-requisites for a programme like this one to work in any village.

The first is voluntary shramdaan, or the labour contribution from every family. This is expected to bring in cohesiveness and commitment among the villagers. As elsewhere, it was initially difficult to convince the people in Kaluchi Thakarwadi of this. Their financial condition being critical, it was natural for them to think only in terms of their own household and in terms of immediate incomes. In addition, the high levels of migration had created a scattered, disjointed community, and efforts were needed to get them think of themselves as one cohesive unit. In cases of extreme financial crises, shramdaan is often combined with paid labour in order to ensure that the people’s daily needs are met.

A second pre-requisite is the involvement of all the groups within a community. People here live in remote, dispersed hamlets. Insisting that people from all sections of the village, irrespective of their class, caste or gender, come together and participate, was not accepted easily. It meant breaking years of socio-economic barriers. Also, initially, women did not come to meetings at all. A number of meetings between the organisation and the villagers were needed to gain their trust. Women slowly started attending meetings and getting actively involved in the program.

The third condition is that the communities had to agree to Kurhad-bandi (ban on tree felling) and Charai-band (ban on open grazing in treated areas), which was necessary to protect the ecosystem of the watershed treatment area.

The programme

The programme started as soon as there was consensus around these pre-requisites. Work began in January 2006.

SHWVAS held various meetings with different sections of the village and with the Gram Sabha. People were made aware of the basic concept of watershed development - the importance, implications and the activities related to it, through training events and meetings. The culture of participatory development in the village was also demonstrated. Seeing is believing - what finally convinced the villagers to participate in the project was exposure visits to other villages where watershed development had been a success.

A group meeting in progress
Community Based Organizations (CBOs) are a crucial link between the people and the organisation. A Village Development Committee (VDC) and women’s Self-Help Groups (SHGs) as well as an apex body of SHGs - the Sanyukta Mahila Samiti were formed and trained to address the needs and the interventions of this project.

Jagrut Shetakari Mandal started as an informal group in 2008 with 13 members. All members are from one kin, having close relations with each other. Around 11 members own 18 acres of land all adjacent to one another. The members got together with an idea of pursuing some agriculture related activities for increasing crop production. The group started with monthly savings of Rs.50 and increased to Rs.100. The group was formally registered at the end of 2008 in the Godavari Gramin Bank as ‘Jagrut Shetakari Purush Bachat Gat’.

For the first time, the group received a bank loan of Rs. 13000 (a thousand for each member) and after repaying it within six months, they received a fresh loan of Rs. 26000. The total amount they had at the end of 2010 including interest earned was Rs.82000 saved in their bank account. The group started to plan few income generation activities. In group meetings they discussed various possible activities. During an informal discussion, an elderly member shared that cotton crop in his farm has not yielded well due to lack of water at the required time. He suggested that the group could plan for a dugwell for irrigation. This was the major turning point in the group.

So with the total saving of Rs.82000 at the end of 2010, the group took a loan of Rs. 39000 (Rs.3000 per member) from the Godavari Gramin Bank. Using this amount they increased the depth of old well from 25 feet to 42 feet, and also widened the diameter of well from 12 to 20 feet. The group purchased a new electric motor for pumping water. With increased irrigation, the entire 18 acre land has now access to water in kharif (rainy) season. On rotation and shared basis, these farmers share the water. Presently, water is being diverted for long distance by open flows. Therefore, the members are planning to install a pipeline, drips and sprinklers in the fields to use the water for irrigation efficiently. Most of members expressed their willingness to financially contribute for the pipeline for drinking water in the village. The group is planning to adopt organic farming methods. Jagrut Shetakari Purush Gat has shown how close relatives can come together for a development purpose.

Working together for development
Jagrut Shetkari Purush Bachat Gat (SHG of male members) in village Kachner Tanda-2 proved a path breaking initiative. The men’s SHG has tried beyond the conventional ways of income generation activities to enhance the livelihoods of members.

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The Kaluchi Thakarwadi VDC has 15 members, roughly 2 from each of the 7 hamlets. The VDC consisted of members representing all wealth classes. Both men and women were selected from landed as well as from landless families. The members regularly meet to plan, implement and monitor all project activities. Funds are released directly into the VDC’s bank account who implement all the activities. For example, for construction of the check dam, the VDC identified a local mason, purchased the material themselves and also mobilised local labour for construction. WOTR has only a supervisory role.

Organising women into SHGs was necessary. The VDC not an easy task in a remote, tribal hamlet like Kaluchi Thakarwadi. But three SHGs have been operating well here. Going beyond merely savings, they have also taken up group vermi composting, setting up hot water chullahs and a flour mill.

The VDC has been empowered enough to directly approach government for access to what is rightly theirs. It successfully identifies the current needs of the community and taps government and other agencies for assistance. The VDC made sure that government subsidies reached the village and installed 15 drip and sprinkler irrigation sets in the village. Manai hamlet
even got electricity as a result of consistent efforts by the VDC. The collective empowerment of the community was reflected in the local governance mechanisms as well. Zambharbai Ware, the chairperson of the SMS at Kaluchi Thakarwadi, was elected Sarpanch of the Gram Panchayat.

Benefits from soil and water conservation

Watershed treatments are instrumental in containing desertification and replenishing degraded lands. Through various types of treatments, depending on the layout of the land, water is made to percolate into the ground, thus raising groundwater levels. Some of the treatments used are: Continuous Contour Trenches (CCT), Farm bunds, Check dams etc. Around 275 hectares of land have been treated with soil and water conservation measures. The whole village makes voluntary efforts to maintain these treatments.

Farmers have benefitted greatly with the increased level of the groundwater table in the existing wells. Wells that barely filled up in the rainy season now have water throughout the year. Now, a second crop is possible, while earlier, barely one was possible in a year. The check dam has become a sustaining source of drinking water as well as irrigation. This has been most helpful in reducing women’s drudgery in fetching water from far off places.

The most evident result of this program is its positive impact on agriculture and livestock. With improved water conservation, the area under irrigation increased from 2 hectares to 38 hectares. Earlier, while only 6 families had access to irrigation, now around 55 families have this access. Besides bajra, bengal gram, green gram and other pulses, the crop basket expanded to include crops like wheat, onions, tomatoes and other vegetables. Access to irrigation has enabled farmers to raise kitchen gardens. The production of crops has significantly improved (See Table 1). Use of organic manures has significantly improved to 60%.

Families have been able to raise more livestock, adding to their income. On an average, around 40-45 litres of milk is being produced in the village. The communities do not depend on the forests for forage but produce them on their lands, thus protecting the forest resources.

Migration has reduced. Now only 20% of the population migrate, that too for a period of 3-4 months, while it was 70% before.

Conclusion

WOTR’s Watershed Development Project designed to rejuvenate parched lands has yielded much more than what was envisaged. There is obvious economic prosperity which can be observed. Majority of the population which was migrating earlier has settled down, with better access to income. People are now able to invest on their homes, their children and their lifestyles. This is visibly evident with the television and telephone reaching Kaluchi Thakarwadi. Now, the people in Kaluchi Thakarwadi, are no more isolated from the larger world.

Table 1: Project Impact on Yields

<table>
<thead>
<tr>
<th>Crop</th>
<th>Before the project</th>
<th>After the project (August 2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bajra (per ha)</td>
<td>4-5 quintals</td>
<td>10-12 quintals</td>
</tr>
<tr>
<td>Tomatoes (per ha)</td>
<td>12-15 tons</td>
<td>20 tons</td>
</tr>
<tr>
<td>Onions (per ha)</td>
<td>15-20 tons</td>
<td>20-25 tons</td>
</tr>
<tr>
<td>Kitchen gardens</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>

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Farming without pumps

Shree Padre

Many farmers in the regions adjoining Karnataka and Kerala are relying on Surangas, the traditional water harvesting structures, for meeting water requirements of their crops. Surangas are man made caves of water which work on gravitational forces requiring no external power to operate.

“If we have to resort to pump based lift-irrigation like most of the arecanut farmers of our area”, says this Karnataka farmer, “we might have to say good bye to farming.”

Govinda Bhat Manimoole, 55, owns a farm in Buntwal taluk of Dakshina Kannada district that according to his own words, “is luckily hundred percent water secure.” Karnataka’s never ending ‘power cut’ doesn’t worry him. He has no dependence on electricity or diesel for irrigation. Though painstakingly, the family has been successful in providing gravity irrigation for his 2.5 hectare farm. Areca nut and coconut are his main crops. Pepper, banana and cocoa as intercrop provide additional income.

Batteries of 22 surangas spread across his hills provide required water for 1200 arecanut and 300 coconut trees. Each suranga gives a small amount of water. For appearance, it is of a thumb finger thickness. If measured, this will be in a range of 200 to 600 liters per hour. Water from these surangas is collected in a decentralized way in five earthen tanks. One such tank on the topmost arecanut plot gets water from a total of nine surangas. The collected water is carefully fed to the trees through micro irrigation.

Govind Bhat uses three types of water emitters – the dripper, foggers for arecanut and bubbler for coconut. Dipper oozes water drop by drop at the rate of eight liters per hour. Each arecanut tree is given two dippers. Fogger, on the other hand, sprays water like a tiny fountain and has sixteen liters per hour output. Only one fogger serves a tree. The last, bubbler has still larger ‘fountain’ and feeds 20 liter per hour.

Bhats manage the whole irrigation schedule at the turn of a gate valve. Everyday, about a couple of
hour’s irrigation is given. Luckily for them, though the discharge from surangas gets reduced by summer, the reduction is marginal. It was only recently, in 2007, Govinda Bhat introduced micro irrigation. Till then they were managing with hose irrigation. Even before that, till nineties, manual splashing of water was in vogue.

**Manual splashing**

Manual splashing was really cumbersome and back-breaking. A rectangular bowl shaped container was made from arecanut leaf sheath. Water was transported in the garden site through long earthen channels that required laborious maintenance every year. One has to bend down in ‘U’ shape and splash water to each tree bottoms several times. Subsequently, a wooden implement that permitted the workers to splash water in a vertical standing pose was introduced. But Bhats were managing with their traditional areca sheath container till they switched over to hose irrigation.

Lands in this area are quite sloping. As such, only terraced farming was possible. Breadth of each terraced plot is very less. Wherever the breadth is very less coconut is planted. A few rows of arecanut can not be raised here due to the very narrow strips.

Extension of the farm was step by step. Using the savings, the family has gone on extending by leveling a small strip once in a decade or so. More interestingly, for each plot, the family had done a ‘water availability’ test in advance.

Around forty feet height from the proposed leveling of a new plot, a suranga is dug. Only if enough water is available, terracing is done below. But, luckily, all the 25 surangas dug by this family haven’t totally failed them. Three are abandoned because their output is very low. Water from each suranga is collected in a earthen tank constructed below. To prevent crab menace and to avoid evaporation, water is transported through PVC pipes. There are five such tanks at different heights. By just opening the gate valve fixed to the outlet of the tank, irrigation commences in the plots below.

**Inter-connected tanks**

All the tanks are inter-connected through underground pipe network. So, if there is a tendency in the upper tank to overflow, water is immediately diverted to a lower tank.

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### Suranga

Suranga is a man made cave for water. Kasaragod district in Kerala and adjoining areas of Dakshina Kannada district of Karnataka has thousands of such traditional water harvesting structures. It is generally dug for drinking water. Of late, this skill is dying due to the advent of pump sets and bore wells.

Achyutha Bhat was instrumental in bringing this technology to his village Manila, way back in forties. By the time the skilled workers finished digging the first suranga in his farm, young Achyutha Bhat had picked up the intricacies. Now Manila village has around 300 surangas.

Completion of a suranga takes usually one season. Suranga digging is done only in the summer – say from February to May. Since the soil contains more moisture during monsoon and immediate post monsoon time, there are fears of it collapsing during digging. As such, in this period suranga digging is avoided. Generally surangas here have a minimum length of forty meters. Depending on the soil type, to dig this far, it might take anything from two months to three – four months. Width of the suranga is just enough for an ordinary person to pass through. Even today, the village has hand counts of labourers who know the skill. One ‘kolu’ (two and half feet) of suranga is charged at 150 Rupees. Longer the distance, this charge will go on increasing as it requires more labour once it reaches long distances.

Most important fact about suranga is that it provides crystal clear, non-polluted water round the clock without the requirement of a pump set. Secondly, it is the only water harvesting structure possible for people living on the upper reaches of a laterite hill. Even a poor farm labourer, in his spare time, can dig a suranga inch by inch. He can complete it in 2-3 months – with the help of an assistant, but without spending any cash!

Bayaru – a village of Kasaragod district in Kerala is ‘Mecca of surangas’. That village has an estimated 2,000 surangas.

“At one stage, more than half century ago, we had severe drought in summer. Water from a tank situated in the lowermost plot had to be painstakingly brought up on head load for our domestic purposes too”, recalls Achyutha Bhat, (81), Govinda Bhat’s father, “ Even later, after Shivarathri, - Shivarathri comes in February – we had very little water. So much so that if in a few years we irrigated by providing protective irrigation by physically carrying water in pots, there were years when we didn’t have no water at all to irrigate.”

The water crisis went up to 1987. Though the bore-well technology had by then arrived here, Bhats were least interested. They were fully aware that it is not a sustainable technology and would spell suicidal to their great blessing in farming – the gravity irrigation. Instead, the family decided to try their luck with more surangas.
Almost a suranga a year

In about a decades time therafter, 6-7 surangas are dug. Bhat’s were determined to bid good-bye to the history of drought. Because of this almost non-stop suranga digging (except in off season), the villagers used to say that “Manimoole Achyutha Bhat gets a suranga dug every year.”

One step towards crisis management is the construction of huge storage tank. With an estimated lakh litre water capacity, this stores rain water. In a phased manner, the stored water is used alternatively with the freshly collected water from surangas. This step also helped to bring down the water shortage.

The results were positive. Their water availability increased considerably, though the hose irrigation wasn’t satisfactory. Points out Govinda Bhat, “our soil profile is such that it doesn’t hold water for long. We were able to give only two rounds of hose –irrigation in a week. The leaves used to drupe down a bit and the overall look of the gardens were far from healthy. Yield levels too showed considerable fluctuations.

“There was a time when a gunny bag would accommodate 60-70 of our coconuts. Now, with just 25 coconuts, it is full”, laughs Achyutha Bhat.

Good bye to drought

It was only in 2007, after switching over to micro-irrigation, the farm improved well. Since the requirement of water is less, they could irrigate daily. Crop also increased considerably, bringing down the level of fluctuation to a great deal.

“Now we have sufficient water for these 1500 palms and the intercrop. Though intercrops are there, they aren’t irrigated separately. “Whatever moisture is available in the soil, that takes care of these plants and vines”, explains Govinda Bhat.

What about the costs of these surangas? “We have to spend about the cost of a pumpset for each suranga. A little more on tanks. “But the recurring expenditure is, I would say, negligible. Maintenance of all the five tanks requires about 40 – 50 man days.” Micro-irrigation doesn’t need much labour. Just a round of checking, turning the gate-valve on and off etc would suffice.

Bhats have future plans of extending the cultivation for one or two plots more. But the present price of coconut and arecanut doesn’t give confidence for big investments. As such, Govinda Bhat is studying two diversifications – floriculture that is possible inside the areca garden and educational home stay. A whole household and 2.5 acres of farm totally run by unique suranga water that too without the use of any fuel would attract many researchers, water activists and considerable interested people from outside. “We have plans to construct a couple of rooms, offer our traditional food & facilitate them to see and understand this dying art of strange digging and its sustainable uses”, hoped Govinda Bhat.

Not quite far off, Dandeppady Achyutha Bhat, another old farmer, irrigates his 2 acre areca garden with suranga water. In about two kilometers vicinity of Bhat’s farm, there are 18 families of farmers and farm labourers. All put together, these families will have a total of 50 surangas.

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Biodiverse farms are sustainable farms

I very well remember my father, who could produce food enough to feed his 94 member family from 30 acres of rainfed farm and 5 acre irrigated garden. He used to grow 5 varieties of micro millets, 3 varieties of oil seeds, 12 varieties of vegetables and 6 varieties of fruits. He had a shallow and vast water pond in the garden where we used to get 4 varieties of fish, 2 varieties of crabs and a variety of prawns. Many times we used to catch plenty of fish and also crabs from a perennial stream beside our garden. We had 600 pongamia trees shedding 3 tons pongamia seeds apart from 800 cubic meter of dry leaves and 200 cubic meters of dry flowers. We had 400 animals like bullocks, cows, sheep, goats, buffaloes and even donkeys which provided manure and served other needs. All the above crops were for home use. The only crop for sale was tobacco on 4 acres that was enough to meet the costs of very few needs for the family.

Now after 60 years, we, his 12 sons, 48 grand sons living in 45 families do not have so many animals or crop diversity. We purchase BPL card rice at Rs. 10.00 per kg as beneficiaries of food security act. Most of us are doing agriculture though it is not economically viable as compared to a security man’s job or a real estate agent. However, may be owing to my grandmother’s blessings or her ambitions made me to become a self reliant farmer and lead a comfortable and an honourable life.

At our farm, we grow 3 types of micro millets, 2 types of oil seeds, 10 varieties of vegetables, 8 kinds of fruits, most of the spices, coffee and 60 coconut trees. We have 7 cattle, 8 goats and 10 chicken and 2 kinds of fishes in our water tank apart from 150 green fodder bushes and around 750 trees including 200 silver oaks and 100 teak trees. We grow food for 20 persons, 3 meals a day. From the trees, we sell 6000 to 7500 coconuts, 2 tons of sapota, 600 kgs of banana, 60 kgs papaya, 1000 kg avocado, 2 tons of vegetables each year. At our farm we have 30 different crops, 20 varieties of trees. We produce compost and vermicompost in plenty. Most of the seeds and seedlings are produced in our own garden.

Recently, I had been to several villages in Tiptur taluk, in Tumkur district. Most of the farmers have only coconut cultivation. They have not received even 40% of their usual 500 mm rainfall during the past 14 years. Coconut yields are only 10 to 15% of their potential. More number of bore wells are being drilled which are also drying up due to receding under ground water table level. Farmers are in deep debts.

Similarly, I am familiar with Kustagi taluk in Raichur district. Here, farmers went for Bhaguva variety of pomegranate. They faced worst results in 3 years. Now farmers and even doctors, advocates, IT professionals and real estate people are jumping into pomegranate cultivation as monocrop. I pray for them to be saved from disasters like in Kustagi.

I know an IT engineer from Kolar district who cultivated hybrid tomato. Due to glut in the market, he incurred huge loss and had to auction his ancestral property. I can give you 20 such examples. Let people cultivate many varieties of crops and adopt integrated farming systems with trees, animals and crop cultivation for eco friendly, sustainable and peaceful life.

Late Shri Narayana Reddy was a legendary organic farmer and is one of the most sought after resource persons on ecological agriculture.

L Narayana Reddy
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Guiding Special Publications

LEISA India team has also been supporting in bringing out event specific publications. We have supported donor organizations like MISEREOR, Germany and CARITAS, India in bringing out special publications which involved organisations like ORRISSA, KIRDTI, DULAL in Orissa and Caritas, BARCIK and BIA in Bangladesh.
The System of Rice Intensification and its implications for agriculture

Norman Uphoff

*SRI initially requires more effort while farmers gain knowledge, skill and confidence. Here members of a self-help group exchange ideas.*
The System of Rice Intensification (SRI) reported on by several other contributors to this and previous issues of the LEISA Magazine is casting new light upon both “modern” agriculture and agroecological alternatives. Just because something is widely believed or practised does not necessarily make it true or optimal. Keeping our minds open to new evidence and new ideas is essential for faring well in the contemporary world.

Some old agricultural truths reconsidered

Twenty years ago, either of the following two statements would have elicited derision and dismay: “Farmers do not need to plough their fields to get the best results”, “To get the best yield, farmers growing irrigated rice should not flood their paddies”.

Because ploughing fields and flooding rice have been dominant practices for hundreds of years, both these statements would have appeared ludicrous to most farmers and most experts. “Everybody knew” that the statements were wrong. Conventional wisdom was supported by good logic, even though there were scientific reasons for casting some doubt upon it.

In the case of ploughing, agronomic requirements for crop establishment and weed control appeared to dictate it to be a necessary practice – even though agronomists had identified that ploughing had many harmful effects, especially deep ploughing. These included the loss of nitrogen and organic matter from the soil; loss of soil structure; increased wind and water erosion; and a decline in populations of earthworms and other beneficial soil organisms. The assumption of farmers and researchers that ploughing is essential for successful cropping has been revised in recent decades. No-till cultivation or zero-tillage – or their more robust version, Conservation Agriculture – have been proving beneficial for farmers’ net incomes and for the environment. In the United States, the heartland of large scale mechanised tillage, more than 30 percent of the cropped area is now under some form of reduced-till or no-till, and globally, more than 70 million hectares are cultivated according to Conservation Agriculture.

Rice was considered in the literature, and by farmers, to be a water-loving plant. A leading text on rice states categorically: “A main reason for flooding a rice field is that most rice varieties maintain better growth and produce higher grain yields when grown in a flooded soil than when grown in a non-flooded soil”. This belief has been sustained in the face of growing evidence to the contrary, and knowledge that soils with insufficient oxygen are detrimental to plant roots and most soil organisms. In this context, SRI has provided results that demonstrate that substantially increased yield can be obtained with 25 to 50 percent less water than is commonly used for irrigated production. This is because unflooded soil conditions offer many advantages for the growth of plants and soil fauna.

The lesson to be drawn from both these instances of revised agricultural wisdom is that some long recommended (one might even say, revered) practices can turn out to be constraints if they prevent practitioners and scientists from “thinking outside the box.”

Revising the input-dependence of modern agriculture

By achieving higher yields and greater profitability with fewer purchased inputs, SRI is showing that the input-dependence of modern agricultural practices is not necessarily the most productive or the most economic approach. This alternative system manages plants, soil, water and nutrients differently – in ways that increase the abundance and diversity of the soil biota. Farmers are finding that they can get more output by reducing their external inputs, rather than by increasing them.

SRI initially requires more effort while farmers gain knowledge, skill and confidence. This initial cost (investment) is offset by reduced requirements for seed (by 80-90 percent), water (by 25-50 percent), and costs of production (by 10-30 percent). Results reported from eastern Indonesia, from 1849 on-farm comparison trials over three years on 1363 hectares, are representative of the productivity gains reported elsewhere: an 84 percent increase in yield achieved with a 40 percent reduction in water and a 25 percent reduction in production costs, which resulted in a five-fold increase in net income. Similar results have been documented in India, and in this issue, Uprety gives data on similar benefits achieved by farmers in Nepal.

Reducing water applications can require physical and organisational capabilities for water control, which...
**Advantages and benefits of SRI**

Field experiences from all over the world have shown many wider benefits resulting from SRI management:

- **SRI practices provide immediate benefits.** There is no "transition" period, as necessary with many conversions to a more organic agriculture. After prolonged exposure to synthetic chemicals, soil ecosystems often require some time to become fully restored. SRI yields generally improve over time, but there is no initial period of loss: first-season yields are usually higher than before.
- **Accessibility for the poor.** The lower capital costs of using SRI mean that its economic and other benefits are not limited by access to capital, nor does it require loans and indebtedness. It can thus contribute rapidly to greater food security for the poor. Some initial evidence suggested that labour requirements made SRI less accessible to the poor; but a larger study in Sri Lanka found poorer farmers to be as likely to adopt SRI as richer ones, and less likely to abandon it.
- **Human resource development.** The recommended strategy for dissemination of SRI emphasises farmer experimentation and encourages farmer innovation in ways that conventional agricultural technology development and extension strategies do not. Father de Laulané, who first promoted SRI, intended that it should enhance the human condition, not just meet people's material needs.

While most attention has been focused on increases in yield, this is only one consideration among many when assessing production systems:

- **No need for mineral fertilizers,** which are a major cost in modern agriculture and have adverse environmental impacts. Compost gives better yields.
- **Little or no need for other agrochemicals,** since SRI plants are more resistant to damage by pests and diseases.
- **While more labour is initially required,** current documentation shows that SRI can even become labour-saving once farmers have mastered its methods.
- **Yield increases of 50 -100 percent** are seen, without changing rice varieties. There is no need to buy new seed, since all varieties respond to these methods, although some varieties respond better than others.

- **Greater profitability.** The costs of production with SRI averaged about 20 percent less per hectare, according to seven evaluations from five countries (Bangladesh, Cambodia, China, India and Sri Lanka). This, along with higher yields, means farmers' incomes from rice production increase by more than just their yield increase.
- **Environmental benefits.** Reduction in water requirements and reduced reliance on agrochemicals for high yield takes pressure off water-stressed ecosystems and enhances soil and water quality.

In specific agronomic terms, SRI farmers report the following advantages along with their higher yield and profitability:

- **Drought resistance.** Because SRI rice plants develop larger and healthier root systems, and establish these at an early age, the plants are more resistant to drought and periods of water stress.
- **Resistance to lodging.** With stronger root systems and tillers, in part due to the greater uptake of silicon when soil is not permanently saturated, SRI plants show remarkable resistance to wind, rain and storm damage.
- **Reduced time to maturity.** When SRI methods are used properly the time for maturation can be shortened by as much as 15 days, even while yield is being doubled. This reduces farmers' risk of agronomic or economic losses due to extreme weather events, pests or disease and/or frees up the land for other production.
- **Resistance to pests and diseases.** This has been frequently commented on by farmers and is now being documented by researchers. The China National Rice Research Institute, for example, reported a 70 percent reduction in sheath blight in Zhejiang province.
- **Conservation of rice biodiversity.** While high-yielding varieties and hybrids have given the highest yields with SRI methods (all SRI yields over 15 t/ha have been achieved with improved cultivars), very respectable yields can be obtained with traditional varieties as SRI plants resist lodging despite their larger panicles. In Sri Lanka, farmers using SRI methods have obtained yields of between 6 and 12 t/ha with "old" varieties. These are more profitable to grow because consumers are willing to pay a higher price for them, preferring their taste, texture and aroma.

Adapted from: Uphoff, N. 2005. *Agroecologically-sound agricultural systems: Can they provide for the world’s growing population?* Keynote for the University of Hohenheim’s 2005 Tropentag, Hohenheim, Germany.

are not always available. This can be a constraint to the adoption of SRI, but less than perfect control can still permit improvements from the other technological components of the system. The drastic reduction in plant populations under SRI is the main reason that labour requirements can be decreased over time. This has been documented in evaluations by the International Water Management Institute in India and GTZ in Cambodia, as well as by Cornell University researchers in Madagascar. One Chinese evaluation reported that farmers in Sichuan considered labour saving to be the most important aspect of SRI.

Agroecological practices usually involve some trade-off between more labour input to achieve reductions in other inputs. The net result is an improvement for farmers and the environment. However, SRI can reduce all the inputs.
and increase their productivity because it mobilises productive inputs from soil biota, which are inhibited, suppressed or unbalanced by agrochemical applications or are limited to anaerobic organisms by flooding.

Changing production systems that have heavily utilised chemical inputs to systems that rely primarily on organic fertilisation usually involves a period of adjustment after the inorganic inputs are halted. However, SRI farmers usually achieve year-on-year improvements as soil fertility improves, with no initial penalty for converting to the new practices. However, for long-term sustainability of productivity, continued provision of organic matter to the soil will be necessary. SRI is not unique among more biologically-based production systems in offering substantial productivity gains resulting from a reduction in dependence on external inputs. The SRI experience has prompted more systematic consideration of scientific knowledge about agricultural production systems that are less dependent on chemicals.

**SRI in a broader perspective**

Two factors underlie the concurrent increases that SRI achieves in the productivity of land, labour, water and capital employed in irrigated rice production. These are quite different from the changes that sparked the Green Revolution. The increases in cereal production accomplished under the Green Revolution depended on a) genetic changes in crop potentials to make them more responsive to external inputs, and b) increases in inputs of water, fertilizer and other agrochemicals.

SRI involves neither of these strategies. Instead, it a) enhances the growth and health of plant roots, which are generally given little attention in crop science, and b) mobilises the services of vast numbers of soil organisms, ranging from the microscopic bacteria and fungi up to earthworms and other macro-fauna. SRI is reminding everyone of the importance of symbiotic relationships between plants and soil organisms – relationships that go back more than 400 million years. Studying these relationships is difficult and demanding, but they represent the next major “frontier” for agricultural scientists.

We know that SRI is still a work in progress, with knowledge and understanding accumulating from season to season, and we expect that SRI performance will attract more interest from researchers, extensionists, policy-makers and, of course, farmers. Farmers in a number of countries are already extrapolating SRI concepts and techniques to other crops such as millet, sugar cane, wheat, cotton, even chickens!

Practitioners of agriculture who have paid close attention to the ways in which their crops grow under different conditions often have a good sense of the linkage between soil fertility and the living status of the soil. The very term “soil” does not reflect adequately the extent to which its fertility is a consequence of the life within it – the abundance, diversity and activity of soil organisms. It would be better to talk and think in terms of “soil systems”, as implied by the motto of organic farmers: “Don’t feed the plant – feed the soil, and the soil will feed the plant”.

This may not sound very scientific to some readers, but the scientific basis of such an agroecological conception of farming is growing every year. The foundations of this knowledge are reviewed in Uphoff et al. (2006), and the penultimate chapter suggests that this body of knowledge provides a basis for a “postmodern agriculture”. This is more appropriate to the conditions and realities of the 21st century than many of the technologies currently in use. The emerging paradigm for post-modern agriculture differs from its namesake in the arts and humanities in that it embraces modern science, rather than being hostile to it. Indeed, post-modern agriculture is the most modern agriculture because it builds upon cutting-edge research in microbiology and ecology:

- It is not hostile toward genetic improvement, but it does not regard advances in agriculture as being primarily led by the manipulation or modification of genes. Genetic differences are very important for capitalising on all available inputs, but these differences should be considered in an interactive rather than deterministic fashion.
- There can be a role for soil nutrient amendments to correct deficiencies or imbalances, so it is not “organic” in a doctrinaire way. It does, however, reject efforts to accelerate plant growth by “force feeding” plants, with large amounts of nutrients. This supply-side approach is generally less effective and
less efficient than one which nurtures and supports plants’ demand for nutrients.

A general principle of post-modern agriculture is that plant-soil-water-nutrient management practices should foster synergistic relationships between plants and soil organisms. With SRI, when paddies are not kept flooded, weed control becomes a challenge. But the use of a rotary hoe aerates the soil at the same time as it churns weeds back into the soil, where they decompose and their nutrients are retained within the cropping system. Formal studies remain to be done on the effects of this kind of weeding, but substantial data sets from both Madagascar and Nepal show that additional weedicings, beyond what is needed just to control weeds, can add between one and two tonnes per hectare to yield, without the application of inorganic nutrients.

The building blocks for this extra growth have to come from somewhere, and they are obviously being mobilised from within soil and plant systems, both of which contain tens of billions of micro-organisms. For example, recent research reported from China has documented how soil rhizobial bacteria migrate into the roots and up through the stem, their presence in leaves adding to the production of chlorophyll and photosynthate and consequently to grain yield.

There is still much more to learn about these relationships and their present and potential contributions to agriculture. My conclusion from a decade of working with SRI and being drawn into the larger realm of agroecology is that, as agricultural scientists, we should expand our thinking beyond the primary basis of chemical and physical understanding of soil, to encompass and make central the myriad of biological factors, that are at play both in the soil and above it. To achieve this we need to add also a cognitive dimension, as thinking and knowledge are critical for comprehending and making use of these factors in more productive and more sustainable ways.

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Upscaling SRI
Unpacking innovation, investments and institutions

C Shambu Prasad and B C Barah

SRI performance has been spectacular under diverse conditions. Many small, marginal and tribal farmers, are reaping better harvests with SRI, many a times with indigenous or traditional varieties. Farmers are innovating constantly and have extended SRI principles to crops other than rice. Upscaling such farmer innovations need investments and institutions to take it further.

SRI in India has now had over a decade of experience in the field, and this is a good time to look back and reflect on how has SRI scaled up overall, what specifically in SRI has scaled up and what not, what appears to be preventing further scaling up of SRI, and how can policies be formulated to support greater scaling up. Discussions on SRI, even in the highest policy circles, often start with an assumption that SRI has not scaled up sufficiently, and this perspective is often shared implicitly by many promoters of SRI without any critical scrutiny.

Inherent in this assumption is a view of SRI as a technology that can and should be invariantly applied across all agroecological and socio-economic conditions, or that it is just a fixed set of six principles. This perspective mimics the well-known scaling up of Bt cotton or the expectation that all agricultural innovations could be spread the same way as telecom, even if such questions were not asked about the spread of toilets and the sanitation deficit in India!

To us the upscaling of SRI needs to address three fundamental I’s – the nature of the innovation, the investments that need to back an innovation, and the presence or absence of the right kinds of institutions that can back the innovation. We shall look into each of these in the case of SRI, but we also need to remind ourselves about the larger ‘political economy of uncaring’, following Vasavi’s recent work on the shadow space of agriculture, that characterises agriculture in twenty-first century India that has seen the tragic scaling up of farmer suicides, seldom considered in such terms.

Innovations and enhanced peoples choices

Upscaling strategies and assessments should not be divorced from concerns with the nature of an innovation, asking the fundamental question whether the innovation has enhanced farmers’ options when facing increased input costs, reduced state support, and greater vulnerability due to market, ecological and climate stresses. In an environment where farmers’ choices among technologies can increase their debt and vulnerability, even leading to desperation and suicides, it is important to look for innovations, not always technological, that enable farmers to make safer, more beneficial choices about best use of their natural
resources or improving factor access that could have a favourable impact on their well-being and livelihoods. ‘Miracle seeds’ have been the preferred option for government-promoted technological interventions and yield improvements made under the banner of the (first) Green Revolution (GR1).

The only change in recent thinking has been on who is the key player in a second Green Revolution (GR 2). It was the state research and extension systems that led GR1, whereas it is private actors, of many hues, that are considered at the forefront of GR2. The mode of operation for this GR2 in terms of its geographical focus, its preference for irrigated areas, and the space (or rather its absence) for farmers’ innovation — and an excessive fixation on yield or productivity — remains the same.

SRI, on the other hand, should be seen as a game-changer in terms of how we look at agricultural innovations. If only the contemporary discourses on innovation that are often discussed by management thinkers who project India as an innovation hotspot were to be extended to agriculture, we would be giving more meaning and substance to the adjectives ‘frugal’, ‘Gandhian’, ‘open’, ‘disruptive’, ‘reverse’ that are attached to innovation today. Game-changing innovations, not technologies, cannot and should not be measured merely by our existing dominant yardsticks of yield increase or productivity, but according to a larger set of parameters that help us better understand the innovation.

If yield were the only criterion for success in SRI, then the celebrated story of the SRI farmer Sumant Kumar and others in Darveshpuravillage of Nalanda district in Bihar would suffice to redirect agricultural research and extension. The world-record SRI production significantly did not come from the rice bowls of the GR – Punjab or irrigated delta tracts – but in Bihar that has been traditionally known for its poor, indeed paltry, yield performance.

Dr. Joseph Stiglitz, the celebrated Nobel Prize-winning economist, recently visited the district in Bihar to look at both the innovation and the institutions that enabled innovations such as these. There has been spectacular SRI performance under diverse conditions, not in noted GR areas. There have been successes by small, marginal and tribal farmers, with often better response to SRI principles from indigenous or traditional varieties, not seen in GR 1 or GR2. Extension of SRI principles to crops other than rice is now gaining momentum, for wheat, ragi, sugarcane, and mustard, for example. There has been increased yield difference between SRI and non-SRI crops in seasons with climate stress from drought or floods. These results open up enhanced and positive choices for farmers all across India.

Agricultural policies that are unduly focused on yields or productivity gains alone tend to miss the need to focus critically on making a sustainable transition from the dominant Green Revolution paradigm to a more agro-ecologically-based one. Unfortunately, this need and opportunity for change has been realised more often by farmers than researchers and policy makers. The latter prefer to limit, or rather block, discussions by repeatedly framing their questions within the purview of the innovation as a conventional technology, as a fixed suite of six practices, with dogged resistance to using the name SRI and a predilection to subsume the new ideas under the rubric of BMP or Best Management Practices, thereby redefining and limiting the innovation to make its theoretical and practical contributions meaningless.

No innovation can proceed unless backed by investments in research and other institutions that need to be in place that can enable, refine and accelerate a transition or ‘revolution’. Discussions contrasting SRI spread with GM crops often are mute regarding the scale of investments made in the latter by government and corporate decision-makers in contrast to the miniscule support given thus far to the former.

Two examples from the field will illustrate this point. A recent international multi-institutional initiative to improve productivity and livelihoods in the eastern region of India had invited ideas in their preliminary meeting about ways to improve productivity. In their presentations, research institutions, both central and state, and leading civil society actors clearly pointed out SRI as an important option for food security and productivity enhancement. However, given the contestations that have occurred internationally, the lead institution preferred to ignore local voices and promoted its own package of practices.

In another instance, a senior government official, perhaps enthused by the promotion, and projection of SRI in a southern state, suggested a sequential manner for promoting SRI over four seasons starting just with line sowing, not the complementary set of packages
Resource-poor farmers have been more open to innovations and changes. They are willing to go faster, provided they are backed by institutions that support the transformations over three seasons.

Among the ways in which thinking on SRI has changed the ways that agricultural development is proceeding, mention should be made of the unique position of researchers from India in the furtherance of ideas on SRI and agroecology. Although the numbers of Indian researchers working on SRI and similar agroecological innovations today is small, their research is having visibility and impact. Indian researchers have been at the forefront of most conferences on SRI, and articles by Indians have constituted a significant, if not the highest, number of overall papers on SRI. What this suggests is the merit of making a shift in investments so that the Indian research establishment could become a leader in agroecology rather than a laggard in the kind of technological innovations of a paradigm that has run its course.

We conclude by sharing some insights on the third ‘I’ (institutions) that can enable SRI spread or upscaling. In this we draw upon the recommendations of the sub-group of the Twelfth Five Year plan on ‘upscaling innovative technologies’ whose recommendations were unfortunately not integrated into the final plan document to the extent that the ideas deserved.

A new institutional architecture for SRI upscaling

There are no reliable estimates of the SRI spread in the country or even in a single state due to the large number of actors and current methods of estimation. A guesstimate from various government data and donors across the country would indicate over 1.5 - 3 million farmers have experimented with SRI principles with a spread of over 1 - 3 million hectares. SRI is clearly more than a niche innovation.

This spread has happened due to a diversity of institutional mechanisms that can broadly be grouped in three categories. The largest spread is through Departments of Agriculture (especially in Tamil Nadu, Tripura and Bihar), and there is another set of states where upscaling has been largely or solely through Civil Society Organisations supported by donors such as Sir Dorabji Tata Trust (SDTT), Deshpande Foundation, Aga Khan Rural Support Project, etc. The third is in states where upscaling is happening through one of the following means: NABARD stream (with direct implementation by CSOs or working in a consortium mode like in Andhra Pradesh), Rural Livelihood programmes (Jeevika in Bihar, MPRLS in Madhya Pradesh, Society for Elimination of Rural Poverty (SERP) in Andhra Pradesh and Orissa Livelihood Mission (OLM) in Odisha), or with private sector players such as Basix, AgSRI, Usha Martin, etc.

A review of the spread of SRI in the last decade in India indicates the following:

- While yield increases vary, there is extensive evidence of productivity enhancement without varietal changes through agroecological innovations without a concomitant decline in the first year or season. There is the added advantage of improving soil health and conserving scarce resources such as irrigation water and fossil fuel-based agri-inputs.
- These innovations can go to scale with modest investments, but require different institutional mechanisms that are neither conventionally public...
Fig 1: Framework of National Consortium

extension nor private sector but community-led. This potential of Community Based Organisations (CBOs) organising themselves to transform agricultural practices through their institutions has not met with the recognition or support in agricultural policy that it deserves.

- Upscaling SRI requires innovations in extension methodology. Current extension systems that are focused on technologies and are input-centric, have led to heavy dependence of farmers on outside agencies and on commercial transactions and debt. SRI is based on improved knowledge, skill and management. Farmers are expected to enhance their on-farm management capacities (timing of operations, labour use, water management, etc). Experience indicates that this requires at least 3 seasons/years for internalizing the principles of SRI by the majority of farmers.

- Civil Society Organizations (CSOs) have an important role in enabling this shift to thinking on technological paradigms, regimes and extension systems. State governments that have innovated their extension systems by working closely with Departments of Irrigation, Rural Development, and Panchayati Raj Institutions have taken SRI much further that those that have relied only on conventional extension systems.

- Women farmers have played important roles in enabling this transition through community-based institutions in several states, and women’s roles has conventionally been ignored by the Departments of Agriculture.

- SRI enhances farmer’s capacities to manage changes in the external environment such as drought and has greater potential in both mitigating and adapting to climate change.

- SRI can lead to diversification of farming systems providing greater choice for farmers and enhancing biodiversity. Indigenous varieties have responded well to SRI management, enhancing the scope for
farmers to focus on varieties that improve household nutritional security in many parts of malnourished India.

• SRI is bankable. NABARD has demonstrated that civil society-led SRI can enhance farmer incomes and improve soil health, with definitely positive benefit-cost ratios.

• Finally, India has the potential of being a world leader in agroecological innovations. Not only does India have the widest spread of actors involved in SRI, including a confident and emerging community of practice of researchers who are open to working with farmers and civil society organizations, also showing how SRI can be extended to other crops.

Broadly speaking, intervention strategies need to appreciate the phase in which the innovation is and institutions need to respond or evolve accordingly rather than follow a one size fits all approach. Some of the phases for upscaling based on past evidence can be tried for taking SRI into a new area. It needs to be recognised that the upscaling of knowledge intensive innovations requires greater investment in the initial years and the multiplier effect or tipping point occurs after the right institutional conditions have been created.

A process that focused first on adaptive research at the grassroots through Krishi Vigyan Kendra (KVK), Civil Society Organizations (CSOs), and a pilot in a contiguous area for upscaling (300-600 ha in each district) in collaboration with an experienced NGO as well as sustainable community-based organizations and further upscaling by CBOs is a strategy that has worked quite well with SRI.

The key to upscaling is having a novel institutional architecture that will take up steps to change attitudes of farmers and provide long-term support in the field (Fig 1). The new institutional model envisages a bottom-up approach based on creation of a cadre of Community Resource Persons (CRPs) who are experienced farmers from surrounding areas who have themselves had positive experiences with the technology. This approach seeks to treat farmer groups as co-travellers and envisages operating through farmers’ groups rather than approaching them as individuals to provide them with a mechanism of mutual learning. The extension staff from the implementing agency – the Agriculture Department, ATMA, NGOs or CBOs as relevant – will play the role of Master Trainers (MTs)–and will provide constant support to the CRPs.

Large-scale adoption of an innovation is not expected to happen with one-shot supply of inputs or with support for just one season. The extension mechanism has to engage with the farmers in their habitats and be a co-traveller with them for a period of at least three years so that they can lead the processes by the investment made in creation of local capacity.

A sustainable transition is not possible without leadership and sensitive facilitation that empowers grassroots actors. The institutional design would consist of a State-Level Resource Organization (SRO) spearheaded either by a government agency, NABARD or CSOs. The Department of Agriculture (DOA), Krishi Vigyan Kendra (KVK), Civil Society Organizations (CSOs), Non-Governmental Organizations (NGOs) and Community-based Organizations (CBOs) would be members of the SRO and would be responsible for the implementation of the program. The SRO is expected to play this role by drawing insights from various resource organizations in the State/District, constantly assimilating learnings from the field, upgrading the innovation and feeding it back to the field. It will be a knowledge body and a think tank on food security at the state level. The SRO will pick and choose the subject matter specialists (SMSs) from the research organizations, SAUs, CSOs and other departments.

There would be a pool of master trainers (MTs) who would be the staff of the NGO/CBO/CSO/DOA/KVK, etc. These master trainers would train the Villager Resource Persons (VRPs). VRPs would work with the grassroots farmers’ groups or self-help groups (SHGs) which in turn would be enabled to reach out to individual farmers. The idea of SRO is not new, but the role envisaged is to promote inclusive innovation forums. These inclusive innovation forums have been tried out in several states in the form of learning alliances, consortia, workshops, etc. and have enabled knowledge flows within the existing innovation system.

It is envisaged that the role played by the state-level consortium would be in partnership with a central National Consortium on SRI (NCS). An umbrella body like NCS is important for making sense of the diversity of approaches and setting guidelines and systems for
planning, coordination and effective monitoring and evaluation with respective agencies. NCS would ensure a transition eventually from incubation to upscaling to mainstreaming of the innovation. The second part has to be done by the Agriculture Department, whilst the first one can have a smaller role for the Department of Agriculture with intermediary agencies such as CSOs, NABARD, etc. seeding the innovation. A strong Monitoring, Evaluation and Learning (MEAL) system that can use principles of adaptive management based on continuous and fast learning will make such a system more effective and efficient.

It is important to emphasise that the above institutional architecture is not an ideal type but a synthesis of insights from field-based experiences. With SRI spreading across the country there is an urgent need to also undertake micro-studies to examine current strategies and examine their sustainability. Recent research on SRI from PhD students of Wageningen University indicates significant variations in SRI practices in regions and even among villages. Understanding farmers’ decision making in complex and diverse settings will be a critical factor in taking SRI to larger number of farmers in future. The SRI community needs to engage in several studies to better understand this phenomenon both technically, socially and institutionally. Recent studies by NCS on indigenous varieties and SRI and comparisons of SRI policies have indicated that there are newer dimensions that need to be brought into policy discussions on SRI, questions on the role of civil society government relations and their bearing on attitudes to community based institutions or how could choices be enhanced for farmers by focusing on varieties that can enable nutritional security.

SRI in India has scaled in diverse ways in the last decade moving beyond the scientific controversies of 2004 through more empirical evidence that has in its wake thrown newer light on rice physiology and opened newer scientific challenges. There is indeed a strong case for specific programmes, both technical and socio-economic, that can research these questions. The innovation needs to be backed by sufficient investments and appropriate investments in institutions that can enable a much needed sustainable transition from Green Revolution to agroecology while at the same time enhancing farmers’ incomes and choices.

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I congratulate you and your colleagues on the outstanding get up and contents of this important journal. I wish you great success in making LEISA India an instrument for the promotion of sustainable agriculture in our country.

– Dr. M. S. Swaminathan, MSSRF, Chennai.

I have adopted SRI method of rice cultivation after reading it in the magazine. Other farmers have also shown interest.

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I consider LEISA India as the ‘Readers Digest’ of the farming community and agricultural extension workers of the country.

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Being a regular reader of the magazine, we have introduced organic farming, LEISA, Permaculture and biodynamic farming aspects in the agriculture syllabus of our diploma course.

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I have improved the soil condition in my fields by adapting the techniques described in the LEISA India magazine.

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LEISA India magazine is very useful to the staff, students and scientists of the college and the same is preserved in the Library for their reference use.

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The magazine is well brought out and the contents are interesting and have useful information. I hope it will have a wider circulation in our country.

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About climate, meat and markets

High time to move towards agroecology and food sovereignty

GRAIN

As temperatures rise across the globe, meat and dairy have been found to be a major culprit. Still, the industrial meat industry actively facilitates the growth in consumption rates. We can only solve the climate crisis if we take meaningful steps towards agroecology and food sovereignty.

Our global food system is one of the biggest drivers of climate change. It accounts for over one third of all global greenhouse gas emissions, according to latest estimates from the Meridian Institute. Livestock represent the biggest portion of this. Research done by GRAIN shows that it is the industrial meat and dairy complex that produces this tremendous damage, not traditional livestock reared by smallholders. Deforestation, industrial feed crops, use of chemical fertilizers, manure lagoons, transport and refrigeration, and massive waste are all central elements of the industrial meat and dairy complex responsible for huge amounts of climate gases. The FAO calculated that, today, meat production alone – especially that of the industrial type

Biodiverse small scale livestock production leads to environment and human health benefits
Meat-free Thursdays

The city of Ghent, Belgium, became the first city in the world to officially stimulate its citizens to have a weekly vegetarian day. The structural government support and involvement in this initiative sets it apart from other campaigns promoting reduced meat consumption. In partnership with the NGO, EVA (Ethical Vegetarian Alternative), the city of Ghent launched ‘Thursday Veggie Day’ in 2009. Response among local citizens and local public institutions has generally been very positive. People’s awareness of the issues concerning meat (and especially the global warming impact) is rising. Two years after its launch, 60,000 people indicated that they participate several times a month and, 94% of public school students were choosing the vegetarian meal on Thursdays. Beyond the city, from Cape Town to São Paulo, cities are launching similar campaigns that were inspired by Ghent.


Meat production alone generates more greenhouse gas emissions than all the world’s transport combined

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Yet, meat consumption is soaring in many places of the world. If current trends continue global meat consumption will grow a further 76% from current levels by 2050, according to the latest studies, pushing us deeper into the climate crisis. If, on the other hand, heavy eaters of industrial meat reduced their unhealthy levels of consumption to the World Health Organization’s recommended amounts, the world could eliminate 40% of all current greenhouse gas emissions.

So, why is meat consumption increasing so much beyond sustainable and healthy levels? The most common narrative is that the growing middle class in many newly industrialising countries can now afford to eat more meat, and thus jump on the opportunity. Indeed, the projected growth of meat consumption is especially stark in countries like China, Brazil, India and other countries in their regions. But that is only part of the story.

The other side of the story is that the industrial meat industry actually facilitates the growth in consumption rates. It produces cheap meat surpluses which are traded as global commodities and pushed onto markets everywhere. As a consequence, industrial meat is the most rapidly growing segment of meat and dairy production, accounting for 80% of the global growth in recent years.

Propping up the corporate meat market

So, why can industrial meat be produced so cheaply and expand so fast across the globe? Confinement of animals at a high stocking density is one part of a systematic effort to produce the highest output at the lowest cost. Yet, at least three key structural factors are at play here: corporations are fighting off any regulation of their sector, industrial meat is highly subsidised, and trade deals are signed to get it to expand massively into markets across the globe.

Attempts by governments to regulate meat consumption is met with resistance by the industry. When Germany drafted guidelines to reduce meat consumption, demonstrating that a 50% cut by 2030 would be “crucial to climate protection,” the industry lobbied hard. By the November 2016 launch date, the country’s climate change plan had been stripped of any reference at all to greenhouse gases in the agriculture sector. Similar stories can be told of the meat lobby in the United States (US), Brazil and other countries where industrial meat is strong.

Furthermore, the industry receives subsidies in many countries. For example, in 2013, the European Union paid US$ 731 million to its cattle industry alone. The same year, the US Department of Agriculture paid more than US 300 million US dollars to just six huge meat companies in order to get industrial meat and dairy on school meal trays, compared to just a fraction of that to fruit and vegetable suppliers.

But, the big guns in the industry’s arsenal are ‘free trade’ agreements. These corporate trade deals artificially prop up production and consumption by promoting the dumping of cheap meat and dairy into low income countries. They include clauses that eliminate protection for local farmers from foreign competitors, that make it illegal to grant preference to local suppliers or products, and that allow foreign companies to sue governments
that adopt social or environmental legislation that they think could undermine their profits.

Without permissive regulations, subsidies and ‘free trade’ agreements, industrial meat would simply be too expensive to buy. These structural factors give priority to profits for an elite few and dismiss the massive environmental and social costs incurred by the corporations.

**Support smallholders, agroecology and local markets**

Corporate lobby groups, scientists and development agencies often paint small scale livestock holders in poor countries as the climate culprits because of their animals’ low efficiency in converting calories to meat or milk on a per capita basis. Yet, a narrow focus on efficiency and emissions intensity ignores the multiple benefits of mixed, multi-functional and biodiverse small scale livestock production systems. These include providing local livelihoods, improving soil health, greater climatic resilience and other positive environmental and public health benefits. Small scale meat and dairy production is already well tailored to local food systems that support the moderate meat and dairy consumption levels needed to mitigate climate change (see figure).

We can only solve the climate crisis if we take meaningful steps towards agroecology and food sovereignty. To achieve this, we need bold moves to disincentivise the production and consumption of cheap industrial meat and dairy. We also need to stop trade deals that prop up the massive international trade in meat and dairy products. Instead, small scale, local and agroecological meat and dairy production and marketing should be supported.

In this process, livestock will once again become integrated into diversified farming systems, while meat and dairy regain their proper place in peoples’ diets. This is the approach that is needed to keep the world liveable for future generations. The task is daunting, but the stakes have never been higher.

*Note: This article was originally published in June 2017 Issue of Farming Matters*

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**Shrinking the water and carbon footprint of school food**

Oakland Unified School District (OUSD) in the state of California reduced animal protein on school menus by 30% while increasing fruit, vegetables, and legumes. When kids ate meat, it came from local organic producers. The result: a 14% reduction in the school’s food carbon footprint. This translates into 600,000 kg of CO2-equivalents saved per year – the same as driving 2.4 million kilometres less per year or covering all of OUSD’s roofs with solar panels with no additional cost. They also reduced their water footprint by 6%, from 428 to 401 litres per meal served, saving a total of 159 million litres of water per school year and US$ 42,000 in the cost of the meals. Perhaps most remarkable: the children reported increased satisfaction with the healthy, regionally sourced meals.


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**Small scale meat and dairy production is well tailored to local food systems that support the moderate meat and dairy consumption levels needed to mitigate climate change**

GRAIN is an international non-profit organisation that works to support small farmers and social movements in their struggles for community-controlled and biodiversity-based food systems. This article is based on a series of publications produced by GRAIN. Full references and sources for the figures quoted in this article can be found at www.grain.org
Building climate resilience

Seema Ravandale, Vinod Niranjan and Debashish Sen

In distressed situations of drought and floods, tribal farmers of southern Bundelkhand region illustrated that System of Crop Intensification, an agro ecological method, helps build climate resilience. The socio-technical approach based on building upon the traditional knowledge and innovative capacities of farmers, proved to be effective in building climate resilient cropping systems.

The Bundelkhand region of central India has become synonymous with drought, distress and poverty. It repeatedly hit the media as it experienced severe water stress in 2014 and 2015. In the past, drought was experienced around once in every 16 years. But, of late, it has become a regular phenomenon. The region also witnessed erratic, high intensity rainfall, particularly in 2011 and 2016. Even in an year of average rainfall, the region faces acute scarcity of water for irrigation as well as for domestic use.

Lack of drought proofing measures, appropriate farming practices coupled with highly variable annual
rainfall makes the poor of the region, vulnerable. Absence of mechanisms for compensating crop losses leads to increasing indebtedness, unemployment and land transfers to big farmers or non-agriculturists, thus trapping people in a “vicious cycle of poverty”. The region has witnessed large-scale migration by the landless and also marginal farmers over the last decade.

In December 2013, People’s Science Institute (PSI), initiated a long-term action programme in 10 villages of Panna district. PSI is a non-profit public interest research and development support organisation based in Dehradun. The programme included 850 farm families having 1442 ha of agricultural land. The goal was to demonstrate and extend a model of climate smart self-reliant development by promoting drought combatting measures and innovative agronomic practices that would improve water, food, nutrition and livelihood security among vulnerable sections of the society, in a socially-just manner. The crop management strategy was developed based on PSI’s experience with System of Crop Intensification (SCI) in the States of Uttarakhand and Himachal Pradesh for more than ten years. This innovative strategy was identified as a method with a potential to improve livelihoods, if not fully achieve local food and livelihood security.

**Farm trials**

Farm level trials were initiated in Kharif season of 2014 with 25 farmers, mainly cultivating paddy on plots averaging 100-200 m2. Farmers adopted or adapted the principles of seed selection. Seeds were treated with different materials like cow-urine, jaggery, ash, organic compost, soil from termite colonies, based on their availability, locally. Using soil from a termite colony was a suggestion made by a farmer to repel termites, which is a major problem in the area.

Direct sowing with grid spacing was taken up which is the usual practice in the rainfed areas. Weeding was done twice or thrice depending upon the availability of irrigation water. “*Mataka Khad*” (see Box 2) was applied. As this is primarily a rainfed region and rainfall is uncertain, farmers were reluctant to practice alternate wetting and drying (AWD) method for paddy.

The year 2014 was a serious rainfall deficit year and most rice plots (conventional as well as SRI) did not survive due to long dry spells of 25-30 days in September and October. Only eight plots of SRI could be harvested at the end of the season. Yet, the villagers observed that the SRI crops were healthier, had more tillers, and survived for a longer duration than the conventional crops. Crop cutting done in six of the SRI plots showed a 38% increment in the yield, when compared with some of the surviving conventional crop plots. While the average paddy grain yield in the SRI plots was 2.53 tons/ha, it was only 1.83 tons/ha in conventional plots.

**Scaling up**

In 2015 and 2016, the System of Crop Intensification (SCI) was promoted with various crops: wheat, maize, black gram, chick pea, and mustard. Scaling up was accomplished by training local youth and/or progressive farmers as village level resource persons (VLRPs). These persons provided timely support to farmers and monitored the SCI fields. Dialogues with farmers to address doubts, exposure visits to successful demonstration fields, inter village farmers’ interactions, and post-harvest felicitation of progressive farmers were some of the tools used for mobilizing farmers and stimulating their curiosity about SCI. Learning and modifying the application of SCI in the context of farm conditions, rainfall pattern, and labour availability was a two-way process in which farmers participated, raised

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**Box 1: What is SCI?**

Application of principles and practices of System of Rice Intensification (SRI) to a range of other crops is being referred as System of Crop Intensification (SCI). SCI is an agro ecological innovation for improving agricultural production, food security, and resilience to climate change. It aims to achieve higher output with less use of or less expenditure on land, labour, capital, and water – all by making modifications in crop management practices (FAO, 2014).

**Box 2: Mataka Khad**

A preparation of cow dung (5kg), cow urine (5litre), and jaggery (250gm) added to 10 litres of water. One such mix Mataka Khad is sufficient for half acre (2000 m2). This preparation is kept for three days for composting, and should later be used within 4-5 days along with the application of irrigation water or during rainfall. One litre of Mataka Khad is to be mixed in 10 litres of water before applying to the field.
Bhaddi Ahirwar, a hard-working farmer of Sonmau Kalan village in Panna district of Madhya Pradesh, owns 2 acres, mainly rain-fed land with average fertility. He grows paddy, maize, and pigeon pea during *Kharif* season and wheat, mustard, and chick pea in *Rabi* season.

In *Kharif* 2015, when other farmers were still experimenting with the System of Rice Intensification (SRI) on just small fractions of land, i.e., up to 100-200 m², Bhaddi took the risk of experimenting on 1500 m², despite being ridiculed by elders. He reasons out that “I was convinced that this technique strengthens the roots and hence a single plant is strong enough to tolerate a dry spell, heavy rainfall, and diseases. Despite the low rainfall in 2015, I got 2 quintals of extra paddy from the SRI plot. In 2016, I doubled the area under SRI paddy and got 4 quintals of extra paddy despite floods.” After obtaining yield increases of 56% (2.6 tons/ha to 4.05 tons/ha) and 49% (2.8 tons/ha to 4.17 tons/ha) in 2015 and 2016, respectively, Bhaddi subsequently started applying SRI principles in other crops too. In *Rabi* 2016, he practiced SCI for wheat and chickpea on more than half of his land.

He observes that “farmers need some time to realize that SRI is not labour intensive and time consuming. Rather it is a matter of their getting accustomed to the idea that their old practices can be changed for the better.” Bhaddi has invited other farmers to his SCI fields. He believes that “indebtedness is the main reason of farmers’ poverty in this region. SRI needs less seeds, less investment, no market dependency and brings higher output. Hence it freed me from the clutches of the landlords.”

A steady growth in the number of SCI farmers, from 125 to 573, has been observed from 2014 to 2016. An exponential growth in the area, from 3.7 ha to 224.4 ha., was observed during the same period.

**Farmers adapt practices to suit climatic conditions**

Farmers experimented in different ways to accommodate the principles of SCI to suit their farm conditions, crops and rainfall pattern as explained below.

For farmers in rainfed areas, timely sowing during the *Kharif* season and tapping moisture at the appropriate moments in the *Rabi* season are critical steps for successfully sowing and establishing the crop. Farmers choose their cropping pattern for both seasons based on rainfall patterns and in-situ soil moisture content. Over the three years, farmers experimented and modified their practices for operations like seed treatment, seed rate and spacing - both under grid pattern as well as line sowing. The choice, preparation and application of organic manure, soaking of seeds for quick germination, procuring an appropriate weeder based on soil type, and many more specific details were worked out with farmers. For example, in the event of low soil moisture during the *Rabi* season, farmers soaked the seeds of wheat and chick pea for quick germination and early establishment of the crop. In case of availability of partial irrigation, farmers preferred not to soak the seeds.

In paddy, most farmers shifted to transplanting from direct sowing in 2015. Due to long dry spells and inadequate rainfall, however, farmers could not transplant their seedlings early. Based on seedling age, farmers adjusted their line-to-line distance: the older the seedlings, the closer the line spacing of rows. Based on 2015 experiences, some of the farmers set up community based cascading nurseries. Cascading nurseries are nurseries that are grown in sequence at an interval of 7 days, to ensure availability of appropriately aged young seedlings for transplantation with the onset of rainfall.

*Photo: PSI*
Table 1: Performance of SCI and conventional crops in seasons of droughts and excess rain

<table>
<thead>
<tr>
<th>Crops</th>
<th>2014 (drought year)</th>
<th>2015 (drought year)</th>
<th>2014 (excess rains)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. grain yield t/ha</td>
<td>% Increase</td>
<td>Avg. grain yield t/ha</td>
</tr>
<tr>
<td></td>
<td>Conventional SCI</td>
<td>Conventional SCI</td>
<td>Conventional SCI</td>
</tr>
<tr>
<td>Paddy</td>
<td>1.83 2.53 38%</td>
<td>2.53 3.7 46%</td>
<td>2.83 4.27 51%</td>
</tr>
<tr>
<td>Maize</td>
<td>- - -</td>
<td>2.2 3.4 55%</td>
<td>- - -</td>
</tr>
<tr>
<td>Black Gram</td>
<td>- - -</td>
<td>0.72 1.08 50%</td>
<td>1.14 1.55 36%</td>
</tr>
<tr>
<td>Wheat</td>
<td>2.2 2.9 32%</td>
<td>2.75 3.72 35%</td>
<td>2.5 3.4 36%</td>
</tr>
<tr>
<td>Chick Pea</td>
<td>1.46 2.14 47%</td>
<td>0.64 0.8 25%</td>
<td>0.77 0.96 25%</td>
</tr>
<tr>
<td>Mustard</td>
<td>- - -</td>
<td>0.72 0.92 28%</td>
<td>0.74 0.92 24%</td>
</tr>
<tr>
<td>Average</td>
<td>1.83 2.52 38%</td>
<td>1.59 2.27 43%</td>
<td>1.59 2.22 40%</td>
</tr>
</tbody>
</table>

Farmers who continued with direct seeding, revived the traditional practice of *machau*, where the field is ploughed when the crops reach 20-25 days growth. While the stronger plants survive, weaker plants and weeds are uprooted. In drought years, farmers had the option of using a dry soil weeder to uproot excessive plants and weeds, and maintain uniform distance between lines.

For wheat, mustard and chick pea, farmers preferred line sowing as grid spacing was considered as labour intensive. In the absence of a proper seed drill, sowing one or two seeds per hill by hand is a tedious task. The practice of line sowing has been enhanced by the introduction of the *Tifan*, a three-pronged multiple type seeder designed and fabricated by farmers. It can be used with the traditional ox-and-plough system, and the line spacing can be adjusted according to crop and soil moisture conditions.

SCI trials conducted with transplanting of mustard crop (PBold variety) in the Rabi 2015 were not so successful. Next year, a young farmer, Mahapat Singh from Ghutehi village used *Tifan* for line sowing of the PBold variety of mustard on half of his land (2000 m2), while broadcasting in the conventional way on the other half. He got an additional 40 kgs of mustard (25% productivity enhancement) from the plot where line sowing was done.

Singh asserts that “line sowing is as good as SRI, as in principle, many fewer plants should be maintained in the...”

Any agricultural intervention needs to factor farmers’ existing practices and build upon their knowledge, experience and skills. It needs to strive towards minimization of risks, stabilize and even enhance the yields in a given context.
field no matter which way you sow them. I have been asked to use ¼th seed rate as compared to what I would have used in broadcasting. Mustard seeds are too tiny for seed drills. Hence to maintain the lower seed rate, I have mixed the seeds with cow dung compost. Next time, I will try to reduce the seed rate further as it should give more productivity.” When asked what he will do in a low rainfall year, Singh said that “success in sowing of mustard depends on the soil moisture. In a drought year, I will either reduce the seed density by increasing line spacing using Tifan or I will shift to chick pea.” He was sceptical about increasing line spacing as that might enhance the loss of soil moisture. However, Krupal Singh, the VLRP with more experience, suggested to cover the open spaces with mulch.

Outcomes

Panna district received 60% and 65% of its average annual rainfall in 2014 and 2015 respectively. The farmers recalled that dry spells in 2014 varied between 15-20 days, and exceeded up to 25-30 days between the last September rains and the first October rains. In 2015, although the early monsoon helped in timely sowing, the subsequent dry spells varied between 15-20 days, while the rains tapered off in September. In 2016, the area received heavy rainfall of high intensity, particularly in July and August causing flooding in some parts.

The high variability of rainfall, seriously affected agricultural production across 2014-16. Initially, it was difficult to convince farmers about the merits of SCI as their major concern was with the stability of their crop production rather than increasing it. PSI’s initial efforts therefore focussed on establishing successful demonstrations with the aid of progressive farmers. This was followed by frequent dialogues with the communities and exposure visits to demonstration plots at various growth stages of the SCI crops.

Despite the extreme climatic conditions, SCI with its variations has proved to be a promising climate smart technique that can help farmers to not only minimize their risks but also to enhance their yields (Table 1). It was observed that as farmers gained experience and skills, they were able to improvise, by manipulating the practices for different crops according to their farm and climatic conditions. This was most evident for paddy and wheat production. For wheat, farmers have adapted to line sowing as grid sowing has not made significant difference in the enhancement of productivity. Maize was sown only in 2015, because it needs favourable conditions of an early monsoon and low rainfall in the later months. It was not taken up in 2016 because of excessive rainfall. Other crops like black gram, chick pea and mustard have shown further scope for improvement. Farmers are now looking forward for conducting more trials to check out possibilities for enhancing grain production by further reducing the plant density and using less seed rate.

This experience from Panna, a rainfed region prone to serious and frequent weather uncertainties, highlights encouraging innovative capacities of farmers to enhance grain yields under their respective conditions and to build up crop resilience. Various experiments conducted by farmers illustrate that the introduction of SCI involves many technical as well as social adaptation processes that are highly location and farmer specific. SCI has brought in new concepts and new options for farmers, helping them to extend and diversify their practices for coping with the growing weather and climate vagaries.

Acknowledgement

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A self reliance path towards food sovereignty

Kulaswami Jagannath Jena

The tribal farmers of Rayagada and Kalahandi districts in Odisha have promoted biodiversity on their farms and on their plates by adopting agroecological models of food production. They are on the path of self reliance by defining their own food system.
The tribal farmers of Rayagada and Kalahandi districts in Odisha face a number of issues like hunger, starvation deaths, drought, bonded labour, distress migration and so on. Most of these farmers have never been able to cultivate their small patches of land that was given to them by the government, as part of land reforms programme. Since there is very little employment in the region, these farmers migrate elsewhere and work as labour on farms and perform other odd jobs. To help these communities to get back to farming and achieve food security, Agragamee, a local NGO, has been promoting family and community based agro-ecological models of food production.

**Alternative local food production initiative**

Millets and pulses are core to dryland farming and consumption in Odisha. The public distribution system (PDS) in India, which is based on the wheat and rice model, has never benefited the tribal farmers. With Agragamee’s support, a group of tribal women farmers (115 women groups) in Rayagada and Kalahandi districts came together, to experiment with an Alternative Food Production and Storage System (AFPSS). They decided that any alternative would have to be significantly different, and based on different ideas about food security and sovereignty, than those adopted by the PDS.

Agragamee’s effort over the past three decades has shown that, bio-diverse, organic, natural farming produces more nutrition per acre food, meaning more health per unit of land. Our recent grassroot level assessment shows that small farmers who have their own seed, practice chemical free, ecological agriculture and share fair trade markets earn 5 times more than their counterparts who are dependent on costly corporate seeds, chemicals from the same companies and depend on exploitative commodity markets. These small farmers have promoted local food product circles for direct consumer – producer links through farmers’ producers organisation, bypassing the exploitative ‘middlemen’. These circles have promoted biodiversity on their farms and biodiversity on their plates, which is not only vital for nutrition but also food sovereignty.

In the AFPSS model, the first step is to work on the patches of degraded lands through efforts like bunding, trenching, top-soil addition etc. A seed loan from community seed cum grain bank, established by Agragamee, is given to the farmers, which they would need to repay in the form of grain. The next step is to cultivate this land with traditional and bio-diverse agriculture using indigenous seeds. Once the crop is harvested, the loan is repaid as grain and stored in the community grain fund. This not only ensures food security of the tribal community during the times of food scarcity but also promotes the traditional diverse agro-ecological practices to attain food sovereignty.

*A mix of millets are cultivated on small farms*
Food is a basic human right. This right can only be realized in a system where food sovereignty is guaranteed.

Indeed, every tenet of the AFPSS model is the pillar of food sovereignty: reclamation of fallow land, increased productivity of existing cultivated lands, biodiverse agriculture, market-focused and climate-driven planting, and emphasis on ‘local’ roles. The work is carried out through women’s collectives, and emphasizes ‘local’ at every stage - production, storage and distribution.

**Reclaiming diverse food system**

Over the years, the work of the Mahila Mandals (women groups) in 65 villages has resulted in reclamation of 2275 acres of fallow land and production of one million kilograms of extra food every season. Around 2000 employment days have been generated per village with 40 person days employment generated per acre. Alongside, the extra fodder generated is equivalent to 6,000 cattle feed. Every family has now 1000 extra meals. Overall this implies increased fodder, increased livelihoods and increased wage income. The Mahila Mandals continue their effort towards ascertaining food sovereignty in their villages and also convince neighbouring villages for the same.

**Sani Majhi: an exemplary role model**

Sani Majhi, a 34 year old farmer of Maligaon village of Kashipur block in Rayagada district, was determined to overcome nature’s unending challenge and achieved a sustainable source of livelihood. She worked almost single-handedly for five years on her 1.2 acre farm to ensure the right mix of crops, poultry, goatery and cattle.

In 2012, Sani Majhi opted for integrated farming system on her one acre family farm under Eco-Village Development – a sustainable model initiative of Agragamee. She was motivated to change the shape of the land, which could be developed into an integrated farming system by setting up a network of nutrient flow. She realized that to get a productive farm she needs to strengthen biodiversity on her farm, which would be self-supportive.

About 25% of her land was kept for growing cereals, millets, pulses and vegetables, 55% for fruit orchard.
development, 15% for rearing of cattle, goatery and poultry and the remaining 5% for border plantation of trees like neem, subabul (Leucaena leucocephala), pongamea, bael, amla, lemon, pineapple, ber etc. These perennial trees have planted for enriching the soil and for supplying fodder and fuel. She started mixed cropping, crop rotation, crop combination and inter-cropping regularly in order to increase the farm diversity. Gradually, Sani Majhi shifted to ecological farming which helped her attain food sovereignty. She has also saved varieties of seeds (vegetables, lentils, millets, cereals) in the community seed cum grain bank. These seeds are being used by the villagers every year. “Now I have become the earning member of my family,” she says. She is using part of her earnings for children’s education and a small amount is being saved. She participates in family decision-making process. Sani majhi feels that now she has an identity of her own.

**Conclusion**

The tribal communities in south-western districts of Odisha have developed their livelihood systems which includes cultivation of a wide range of crops like cereals, millets, pulses, oil seeds, tubers and fruits. Their practice of diverse crops under integrated farming system on one acre of family farm has not only helped them to ensure food security but has also helped them to move a step ahead to attain food sovereignty. Moreover, it has provided a sustainable path of livelihood and food security even in the times of droughts. The practice of shifting cultivation, which was once a form of cultivation, has now harmonized with the ecosystems in its steady rhythm of mixed-cropping. The Kondhs, Jhodias and Parajas of these regions have become self reliant and independent.

The tribal farmers proved that food security cannot be achieved without taking full account of those who produce food. Any discussion that ignores their contribution will fail to eradicate poverty and hunger. Food is a basic human right. This right can only be realized in a system where food sovereignty is guaranteed.

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LEISA Alliance Meets

To strengthen the LEISA knowledge use and sharing, unstructured alliances of LEISA enthusiasts were formed. It was thought that if LEISA India has to become a movement it has to be built in small ‘steps’. These steps need to be rooted in democratic principles and a spirit of volunteerism.

Two LEISA Alliance meets were organized, one in the North and one in the South bringing together LEISA enthusiasts, which facilitated knowledge sharing. Such alliances in various parts of the country, facilitated by the consortium partners, are expected to strengthen the LEISA knowledge use and sharing.
Farmer Field School

Building knowledge on the farm

Abhijit Mohanty and Ranjit Sahu

Farmer Field Schools serve as a platform for mutual learning among farmers and resource persons. Interactions, discussions and hands on training provides an opportunity to revive and sustain traditional knowledge while making improvements through modern science.

Southern districts of Odisha State in India are mostly hilly rainfed uplands with an average annual rainfall of 1200-1400 mm. Tribal communities in these regions practice a combination of forest based livelihoods and shifting cultivation for subsistence food crops which includes traditional millets, pulses, cereals, grams and oilseeds. But, in the last two decades, rampant destruction of forests for various commercial purposes has severely affected the livelihood of these communities. The changing pattern of rainfall combined with persistence of shifting cultivation has triggered extensive soil erosion and siltation in the low lands.
Excessive application of synthetic fertilizers, pesticides and insecticides has reduced the natural fertility of the soil and increased the cost of cultivation. Farmers are in a vicious circle of indebtedness, especially when their crop fails. To make the situation worse, most agricultural development projects launched by the Government in these regions encourage cash crops over subsistence crops – ignoring that the latter is critical to reinforce local economy and ensure food as well as nutritional security of the communities. Indigenous knowledge (IK) of farming and seed resources are now on the verge of extinction due to large scale use of hybrid seed and mono-cropping.

The journey

Aragamee, a grassroot organisation committed for the development of tribal and other marginalised communities of Odisha, has been promoting agroecological models ensuring livelihood, food and nutritional security of the communities and conserving bio-diversity. It has been working with the local communities in two blocks of Kashipur and Thuamulrampur through a knowledge empowering process like Farmer Field School (FFS).

Through a series of interactive meetings with farmers the critical issues of farming were identified and discussed. Several documentary films based on successful agroecology models and the “exposure visits” provided first hand field experience, fostered close interactions and stimulated cross-cultural learning among farmers. These events led to increasing exchange of information and debates on traditional seeds, farming systems, diverse food and their cultural practices.

Co-creating knowledge in farm schools

Farmer’s Field Schools (FFSs) established at the village level provided a platform for knowledge building and sharing on agroecology where farmers of 4-7 neighbouring villages meet, interact and find solutions locally. They learn through hands-on training on various topics like indigenous method of soil, water and nutrient management, seeds varieties, crop cultivation, pest control, pasture and fodder management while conserving biodiversity.

By interacting with farmers, many indigenous practices were documented. These were validated through a series of field trials carried out by farmers during the FFSs. Farmers observed the results and are convinced to practice the indigenous practices with some modifications on their fields. For example, traditional practice of mixing neem leaves to stored grains has been modified in FFS to include leaves of karaj and amari to protect it from fungus and ants resulting in better and longer storage. The entire complex web of information flow is depicted in figure 1 where learning is a multi-directional flow of information and knowledge.

Realizing the pressing need to revive these age-old varieties, field trials on selected crops like paddy, millets, pulses, and a host of vegetables were undertaken by farmers. Farmers were involved in seed multiplication of many varieties which are close to extinction, through selection of ideal location for trials, using ecological mapping, and selecting advanced lines.

The exchange of knowledge on agro-ecological experiences during ‘Farmers Fairs’ brought out systematic analysis of various problems that bother certain classes of farmers. This knowledge exchange
helped scientists to understand the factors for success and failure. In turn, they modified the field trials, which is now based on the availability of local resources, farmer’s ability and his economic status.

Of the 150 field trials taken up with different highland indigenous paddy varieties like Matidhan, Bodhidhan, Pradhan and Tippadhan, Matidhan was found to be superior to others in terms of high yield, short duration, pests and disease resistance. Also, its combination with Arhar is superior to other combinations. Farmers also found that in vegetable mixed cropping, solanaceous vegetables mixed with leguminaceae is superior. Among crop combination of maize and pulses, a second crop of mustard with the residual moisture was successful. Scientists too learnt that involving farmers in field trials helped to convince farmers in adopting superior varieties and follow successful crop combinations.

As women have a sound knowledge of seed preservation, they were involved in setting up Grain-cum-Seed Banks (GCSBs) in 15 villages. Women manage the GCSBs, deciding the amount of seed and selecting the varieties to be stored, resulting in preservation of varieties of paddy, pulses, millets, tubers, and vegetables. Efforts for linking these GCSBs with plant breeding research institutes are on-going.

New learning for farmers

Farmers learnt that pests and diseases thrive in monocultures because of abundance of food and few or no natural enemies. They learnt about crop diversification and the importance of including some specific crops to avoid pest occurrence. According to Dr. Debesh Prasad Padhi, a horticulturist associated with Agragamee, “domestic and wild grasses help significantly to protect the crops by attracting and trapping the stem borers. By including plants like Desmodium in between the rows of maize/sorghum, stem borers will be repelled owing to the chemical emitted by Desmodium”. Scientists realized that a scientific explanation convinced farmers to adopt suitable practices. Farmers are trained and sensitised on various beneficial insects, their role in food production by way of pollination and controlling pest attacks. For example, farmers are happy to see Ladybird beetles (Coleoptera) which feed on soft-bodied pests like aphids, whiteflies, mites and scale insects, and prevent crop damage.

Similarly, farmers who grew a second crop of mustard with the residual moisture following maize and pulses crop found it rewarding. On the other hand, scientists learnt the decision making process of farmers which is based on need and existing marketing demands.

Farmers are now growing live fencing with plants like Simarouba glauca, Pinnata and Cassia tora, thus enhancing biodiversity and access to fodder and fuel. They are glad that these border plants serve as wind breaks, thus conserving soil moisture.

Need for working together

Agroecological systems are knowledge intensive. They call for in-depth understanding of local conditions for building on the indigenous knowledge already existing with the communities. The concept of land-to-lab-to-land approach can be possible only when farmers and scientists work together, building sustainable linkages. Involvement of farmers in the research process is vital which helps the scientists acquire knowledge about traditional practices and redesign their strategies. The outcome of such a process is not only relevant to farmers but is also sustainable in the long run.

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Power of collectives

Jasbir Sandhu and Rajesh Sharma

With an inclusive, sustainable and scalable model of value chain, farmers in Gujarat have come a long way in realising the power of collectives. Through direct engagement in the market space, farmers gained a competitive edge by exercising their power of negotiation.

Kansloliya, a panchayat village of Jasdan taluk, is located in Rajkot district of Gujarat. Inhabited largely by Koli Patel community, it is home to 372 families who rely on agriculture for their living. Being a dry land, water stress caused due to erratic rainfall or drought, greatly impacts agricultural production. In addition, dilapidated condition of water harvesting structures further exacerbates the situation, eroding the top soil without replenishing the ground water table. The only source of relief to the village is the pipeline water from Narmada, which is insufficient in meeting the needs of people. Lower agriculture productivity has also impacted animal husbandry, leaving no option for the villagers except to seasonally migrate in search of wage labour.

Reliance Foundation (RF) which strongly believes in achieving inclusive and sustainable development through the strength of Farmer Collectives, entered the village in 2013. Initially, efforts were made to understand
Knowledge on commodity future trading has helped farmers use new age market platforms for better price realisation.

Yard Manure (FYM) were adopted by the community. Gradually there was a shift from monocropping of cotton to multiple cropping patterns. Compared to previous years, 2013 saw a jump in groundnut production to 30% and cotton crop production dropped by 5%. Groundnut crops additionally improved the fodder availability for cattle that boosted the dairy business. The quality and number of milch animals saw a big jump, generating extra income from sale of milk, thereby changing the social fabric of village. Ensured irrigation in Rabi season enabled farmers to grow two crops, thereby reducing migration.

Around 1600 more farmers from Kansloliya and 16 more neighbouring villages are now exploring avenues to sell some of the produce in the market for better price. All shared the same heart-warming story of turn-around in agriculture with bumper groundnut production. However, they also had a common challenge of getting

Success of Jivanbhai – a farmer from Kansloliya

Ageing Jivanbhai – a small cotton farmer from Kasloliya had never imagined that he would ever take second crop in his farm. He had spent his entire life growing single low produce of cotton crop on 20 bigha that fetched 7 quintals of cotton giving a gross income of Rs. 45,000. He used to migrate for 4-6 months along with his two sons in search of wage labour. Construction of earthen dam gave a new life to his farm. Supported by VA, activities like farm bunding and deep ploughing were carried out on his 15 bigha farmland. He also learnt and adopted sustainable agricultural practices and switched from applying fertilisers brought from market to farm yard manure and vermi compost generated on his farm. Simultaneously he adopted drip irrigation and animal husbandry. He started practicing intercropping, integrated pest management practices, thereby reducing the dependency on external inputs and coping with climate change. Ensured irrigation and good soil health enabled him to replace cotton cultivation with groundnut. Crop diversity increased with the inclusion of mung and urad crops in Kharif and wheat, chana and cumin for the first time in Rabi season. Groundnut production came as a surprise, with a production of 25 quintals.

The enriched platter

With the critical input water getting stabilized, all efforts were made towards improving the basic productivity of the lands. Sustainable agriculture practices like farm bunds, mixed cropping, use of tank silt and Farm Yard Manure (FYM) were adopted by the community. Gradually there was a shift from monocropping of cotton to multiple cropping patterns. Compared to previous years, 2013 saw a jump in groundnut production to 30% and cotton crop production dropped by 5%. Groundnut crops additionally improved the fodder availability for cattle that boosted the dairy business. The quality and number of milch animals saw a big jump, generating extra income from sale of milk, thereby changing the social fabric of village. Ensured irrigation in Rabi season enabled farmers to grow two crops, thereby reducing migration.

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remunerative price for their produce. They were selling the produce to the middle men, who grossly reduced the value of the produce, citing it as poor quality. Farmers were left with the option of either compromising for the lower price being offered or bear the exorbitant transportation cost to market the produce at APMC, where small quantities limited his power of price negotiation. Thus emerged the need for a Farmer Producer Company.

**Evolution of Saurashtra Swanirbhar Farmers Producers Company**

Collective need for getting the right value for their produce brought the farmers together. After the initial concept seeding on FPC, a small group of 12 farmers travelled across the country visiting different farmers’ collective initiatives to understand the dynamics of market negotiations. Post visit, this group rallied across villages to raise awareness of farmers. This resulted in raising a share capital of Rs. 11.28 lakhs by 991 farmers to form an FPC in 2016. To gain first-hand experience, farmers collectively marketed cluster bean, which served as a learning ground on how to plan, aggregate, analyse business potentials and market as an FPC.

Based on the experience and the role of initial promoters, five members - 2 women and 3 men were selected as Board of Directors (BoDs). They finalised constitution and operational framework of FPC which later got materialised with incorporation of Saurashtra Swanirbhar Farmers Producers Company Limited (SSFPCL) on 1 August 2016. BoDs came up with business plan of the company that mainly focused on collective aggregation of groundnut and input supply at farmer door steps as primary focus. Series of meetings were organized in VAs to raise awareness among members on business plan and its governance structure. Meanwhile, SSFPCL acquired trading licence and hired a shop for sale of inputs. In collaboration with Gujarat Narmada Valley Fertilizers Company, SSFPCL helped member farmers realise better prices for six metric tonnes of neem seeds. Simultaneously, BoDs also initiated talks for licence with Agricultural Produce Market Committee (APMC), Jasdan. Thus, began the confident journey of FPC with an aim to provide a just and transparent market to the produce grown by the farmers.

**Expanding the horizons**

Having decided to aggregate and sell groundnuts, FPC sought the support of local administration and people’s representatives to establish procurement center of National Agriculture Cooperative Marketing Federation of India Ltd. (NAFED) in their village. Since, NAFED procures produce only from co-operatives, SSFPCL entered into a partnership with Gujarat Agribusiness Consortium Producer Company Limited (GUJPRO) - a nodal agency of NAFED to establish an aggregation and distribution centre. Meanwhile, there was a declaration by Government of Gujarat to purchase groundnut at MSP through Gujarat State Cooperative Cotton Federation Limited (GUJCOT) - a state level cooperative federation. In order to accelerate the scope and depth of engagement with farmers, SSFPCL collaborated with GUJCOT. As a result, FPC became a nodal agency for its 3 groundnut collection centres under state level agencies i.e. GUJCOT & GUJPRO. The operational process implemented is as follows:

SSFPCL served 168 villages reaching 5786 farmers with groundnut transaction worth Rs. 54 crores. In the process, the average price realisation grew from Rs. 3500/quintal (in local market) to Rs. 4500/quintal. Along with price benefit, the farmers were also saved from additional transportation cost with the collection centres being located in their village periphery. Direct online payments into their accounts resulted in hassle free transactions.

What distinguishes SSFPCL from many Producer Companies is its strong community presence in village institutions and collaborative efforts with relevant stakeholders in ensuring MSP to the farmers. One of the members, Chhaganbhai Metaliya of the Saurastra Swanirbhar Farmers Producer Company says, ‘I was hesitant to join Farmer Producer...’
Company, since I wasn’t sure if it would suit my business methods. But I took a leap of faith, and now, when I see farmers from other villages joining the company to sell their produce, I feel reassured. I am happy and proud to be a member of a company that helps farmers sell their produce at better rates – each member farmer has been able to increase his or her profit by at least Rs. 10,000! This is no less than a miracle.’

In just 2 years, SSFPCL has benefited 66 farmers in Kansloliya with over Rs. 2 lakh as additional income due to collective marketing of agricultural produce and availability of farm inputs like – seeds, fertilisers, irrigation equipment, soil testing services etc., at competitive rates. Besides this, 6 farmers earned additional income of Rs. 56,000 in 3 months by working in collection centres. There has been rise in assets like motor pump, electrification, well deepening, drip systems, pipelines, number of pucca houses, cattle etc. Synergising with Gram panchayat, Kansloliya VA is gradually marching towards holistic development.

Like Kansloliya, RF is working in 550 villages across 12 states of India providing direct support to more than 60,000 households. The strategy of localising this large scale intervention has enabled every single farmer household to enjoy the impact. Today, there are 19 FPCs supported by RF, with an equity of Rs. 228 lakhs contributed by marginal farmers in 10 Indian states serving 35,000 rural families in more than 500 villages. Knowledge on commodity future trading have helped farmers use new age market platforms for better price realisation. Besides price negotiations, the FPCs have collaborated with many departments, agencies and NGOs to support farmers on soil health, seeds, seasonal information, price trends, storage etc. This has empowered farmers by bringing out the entrepreneurial abilities, reduced post-harvest losses and securing their income.

**Conclusion**

Empowering farming communities by providing end to end solution i.e., farm to market can change the face of agriculture. Impact created through RF in transforming Kansloliya village or raising hope of Jivanbhai with ensured water and sustainable farming or giving the power of production and market negotiation in the hands of its farmers through Jasdan FPC is a testimony to it. Market linkages through Farmer Producer Companies (FPCs) has provided economic self-reliance to producers by safeguarding them against price fluctuations, ensuring quality of produce, improving their negotiation power and enhancing their skills.

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With access to knowledge and inputs, the goat rearers of Gondia district in Maharashtra are able to make a decent livelihood with goat rearing. A community based alternative extension system which is women centric, has also brought out a positive change in the lives of women and in the communities.

Small livestock, like goat, sheep, pig and poultry is a critical source of livelihoods for rural poor, especially for women, in developing and underdeveloped countries, including India. Small livestock are perceived to have several benefits. According to field studies, small livestock serve as a source of income, as assets which could be encashed in times of emergency, as source of nutrition (milk and meat), as a source of medicine (milk), and as gifts during ceremonies.

One of the many problems that the livestock farmers have been facing is high mortality and morbidity of animals. High mortality and morbidity of goats leads to economic, social and mental stress, making rural households highly vulnerable. Women are the worst sufferers of such tragedies owing to their high involvement with small livestock. Also, they take care of ailing animals, which consumes significant time and energy. Families try to cope with such loss of livestock by selling food grains. In extreme cases, it may lead to even stopping child education and opting for long distance migration. Several other challenges for livestock farmers are genetic degradation of goats, feed scarcity, seasonal stress, absence of transparent system of price estimation of goats, inefficient trading, high costs of aggregation and low adoption of information technology. Besides,
The goat population increased by over 25% in one year, with the mortality rates dropping from 22% to 6%.

Table 1: Activity data sheet - Gondia district

<table>
<thead>
<tr>
<th>Description</th>
<th>Salekasa</th>
<th>Tirola</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of villages</td>
<td>74</td>
<td>70</td>
<td>144</td>
</tr>
<tr>
<td>Number of Pashusakhis</td>
<td>65</td>
<td>70</td>
<td>135</td>
</tr>
<tr>
<td>Number of goat rears</td>
<td>5317</td>
<td>8542</td>
<td>13859</td>
</tr>
<tr>
<td>Number of goats</td>
<td>26039</td>
<td>28230</td>
<td>54269</td>
</tr>
<tr>
<td>No. of goat clubs</td>
<td>168</td>
<td>118</td>
<td>286</td>
</tr>
<tr>
<td>First Aid treatments</td>
<td>20944</td>
<td>3922</td>
<td>24866</td>
</tr>
<tr>
<td>Herbal treatments</td>
<td>13779</td>
<td>2256</td>
<td>16035</td>
</tr>
<tr>
<td>No. of Castretd Goats</td>
<td>2103</td>
<td>205</td>
<td>2308</td>
</tr>
<tr>
<td>Increase in goat numbers</td>
<td>5453</td>
<td>6923</td>
<td>12376</td>
</tr>
<tr>
<td>Reduction In mortality rates</td>
<td>6.50%</td>
<td>8%</td>
<td>0.145</td>
</tr>
</tbody>
</table>

Based on learning from past limited success and some failure, an alternative process was conceptualized and implemented on scale to assess feasibility and impact of Pashu Sakhi model. In this initiative, semi literate women are trained as Pashu Sakhi. Prior to training, the women are selected by the community, their roles and responsibilities are briefed by involving the family heads. The process is followed to enhance community ownership and family support for effective functioning of Pashu Sakhi. Once nominated by local goat farmers, a systematic orientation is organized, followed by 5 day residential training. A participatory training process adjusted with the pace of learner, was evolved to have multiple training methodologies around key knowledge, skills and attitudes required to function as Pashu Sakhi.

Besides treatment, Pashu Sakhi training module focuses on management practices and sharing of best practices. Pashu Sakhis essentially are small livestock farmers and adopters of best practices, rather than just propagators. This enhances knowledge and creditability of Pashu Sakhi as a best practice propagator and local leadership.

Role of Pashu Sakhi

Pashu Sakhi performs three kind of complimentary functions:

- Extension of improved practices and knowledge sharing
- Providing door step first aid and counseling services for disease prevention and management
- Demonstration of best practices and enterprise management in her own house.
Pashu Sakhis also work as monitoring and support service provider for the project. They visit each goat house and assess the condition. A regular monitoring on disease spread and decrease in frequency of morbidity (disease) is kept through data analysis. They provide critical feedback on adoption and suggest appropriate practice, technology or input based on the relevance and feasibility.

Pashu Sakhis through awareness and training motivate farmers to adopt good practices which boosts demand for new inputs. To meet the demand locally, Pashu Sakhis are trained to take up entrepreneurial activities too. In fact, Pashu Sakhis sustain on entrepreneurial initiatives of input supply for goat farming rather than by providing services alone (e.g., providing treatment and first aid).

In a nutshell, Pashu Sakhi works more like an Anganwadi worker and ANM in human health management. The only difference is that here she becomes an input supplier, a self business promoter, and also a service provider, making the system sustainable and more effective over a period of time.

**Major changes**

In about twelve to eighteen months of the programme, positive impacts were observed on two fronts. There has been significant decrease in mortality of goats. Goat mortality dropped from 22% to 6%, which saved nearly 8600 goats every year, thus generating over 51 million rupees. Besides reduced morbidity, reduced kidding interval and better growth of kids have collectively contributed Rs 25 million gain in goat farming. This has been reflected in over 25% growth of goat population in last one year. Further, farmers increased confidence resulted in further investment in goat farming.

Field assessment study in Gondia has provided strong evidences on improved knowledge, services, technology propagation and adoption by goat farming families. There has been enhanced faith of the community in managing risks. This in turn has enabled goat farmers to negotiate enhanced price for their goats and bucks.

Pashu Sakhis earned Rs 800 to Rs 2000 as an additional income by improving their goat rearing practices and by providing services to others. By way of contributing to the family finances, these women gained recognition in the household as well as in the community. They were being recognized in the society as providers of critical services. Attitude of men towards women, especially from the higher castes, has shown dramatic change for good. Pashu Sakhis are now being addressed with greater respect and affection, sometimes being referred to as “doctor didi” by villagers.

**Way forward**

The alternative community based extension model in Gondia district was successful and sustainable. Factors like high density of small livestock and lack of access to knowledge and basic services have played a crucial role in the success of this model. The Goat Trust is now exploring market opportunities, facilitating market linkages and building the capacities of Pashu Sakhis in estimating and assessing live body weight pricing of small livestock. The model of Pashu Sakhi is being extended to other livestock too. It has been tried for poultry, successfully. It is yet to be tested for large ruminants, on a scale.

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Women livestock keepers of South India prefer local to global breeds

Ilse Köhler-Rollefson and Karthikeya Sivasenapathy

For most women in South India, rearing local breeds is hassle free, add-on and a part-time activity that can be combined with other income generating activities. Authors through a number of cases, highlight merits that these women see in local breeds like – low investment in terms of housing and feed, prolificacy and hardyness.

About 400 million, or two thirds, of the estimated 600 million poor livestock keepers in the world are women (Thornton et al, 2002). It is therefore not surprising that there are numerous studies about women and livestock, and that many institutions, such as IFAD and Heifer have a gender approach to livestock development. Curiously, the vast majority of reports about women, livestock and poverty alleviation do not specify the breeds of goats, sheep, cattle and other livestock species that are involved. Certainly, in many cases, so called “improved” (i.e. exotic or crossbred) with their supposed higher output are promoted.

However, in India’s southern states of Tamil Nadu and Kerala, there are many success stories of women livestock keepers raising local breeds.
Making Do with Mecheri Sheep

For widowed Palaniammal (60) in Veerasolapuram village in Tiruppur district, Tamil Nadu, her flock of 13 Mecheri sheep is her sole source of income. The Mecheri is a hair sheep famous for its very high quality skins. It is perfectly adapted to the local pasture system of Korangadu, which is privately owned sylvipasture system enclosed by a live fence. The most important vegetation are *Acacia leucophloea*, *Cenchrus setigerus* and *Cenchrus ciliaris* and wild legumes and grasses. The Mecheri ewe gives birth to about 1.5 lambs per year or one lamb in 8 months. [Mecheri ewes average has three lambings in two years and single lambs are the norm]

Palaniammal embarked on her sheep production venture, some ten years ago, thanks to a government scheme that enabled her to obtain 10 ewes and a ram for Rs. 15,000 on 50% loan and 50% subsidy basis. To feed her flock, she is leasing 7 acres of Korangadu pasture from a Gounder landlady for Rs. 5,000 per year. This nets her an annual profit of about Rs. 5000 from the sale of lambs. Marketing of manure fetches an additional Rs. 1200. With these returns she was able to repay her loan within 7 years.

Palaniammal’s work is hard – she has to walk about 3 km every day bringing water from the pump to the pastureland. And due to the current drought, she has to purchase additional feed – bajra stover– to maintain the sheep. But veterinary inputs are free, enabling her to deworm regularly. Palaniammal is neither complaining about her lot, nor worried about her future. She is proud that she can buy gifts for her two married daughters and grandchildren when they come to visit, and in fact she was able to support one of her daughters with cash by selling a good number of sheep- in between her flock had risen to 40 head- but she sold a large number to provide cash to support one of her daughters. When Palaniammal will be too old to take care of the sheep, she will sell them, give the money to a reliable person and live off the interest.

Keeping Kangayam stud bulls

The Kangayam cattle is a famous draft breed of western Tamil Nadu and forms an integral element of the Korangadu pasture. Earlier this sturdy breed was essential for lifting water, ploughing, hauling the harvest and rural transportation in general. A number of factors, including irrigation, availability of electrical and diesel pumps, as well as a rise in property prices, have resulted in a dramatic reduction of the population. Nevertheless Sundaram Ramaswami and his wife Soundra of Mulanur village have specialized in keeping Kangayam stud bulls for breeding. Their four bulls serve an average of six cows per day for a fee of Rs. 150 per service. Interestingly, the majority of the cows they service are Holstein-Friesian grades that have difficulties in conceiving via artificial insemination.

Mecheri sheep are adaptable to the local pasture systems
Kangayam stud bulls are being used for breeding

Soundra not only had the idea of keeping stud bulls, but is also the one handling the bulls, supplying them with water and keeping records of the services. According to her husband, she is the only one to whom the old bull in the picture listens to. The couple and the bull have a sentimental relationship: he starts shedding tears when he is shouted at and although he is at an age when other bulls are retired, his owners want him to die a natural death and plan to give him a proper burial.

**Binu and her goats**

The Malabari goat is the first breed to be recognized in Kerala and takes its name from the hot and humid Malabari coast that is famous for the cultivation of spices. It is a vigorous and prolific breed that produces both milk and meat. Scientific studies have shown it to be superior to imported Boer animals and Boer crosses; yet the latter continues to be promoted by the Government. Binu, a poor mother from Athirampuzha in Kottayam is benefiting from this breed. She keeps just one Malabari doe, but this animal has produced strong and healthy quadruplets three months ago which will be ready for sale in about one month. Because of the booming demand for meat, a four month old female fetches Rs. 1500, while males are sold for Rs. 2500. Mother and offspring are sustained almost exclusively on free forage that Binu collects from roadsides and plantations. Even the goat shed is constructed completely from throw-aways and without any financial investment. Binu will use the income to build assets for her children by buying gold for them, and undertaking some repairs on her house.

For Binu who covers her daily expenditures by going for casual labour, the Malabari goat is a means of building assets and a pleasant, no-risk means of generating income.

**Shirley and Ankamali pigs**

Although the Kerala government is promoting exotic white pigs, it is the local black Ankamali pig breed that is better suited for income generation for resource poor farmers. Its advantages are its small size (only 20 kg slaughter weight), ability to thrive on local feed, disease resistance, heat tolerance and uncomplicated reproduction.

Shirley is a single mother raising two daughters in Onamthuruthu in Kottayam District of Kerala. She keeps two sows and one boar of the Ankamali pig breed,
sustaining them on kitchen waste, leaf fodder, and weeds. Recently, she sold 27 piglets at the age of 45 days, each for Rs. 1000. She also keeps a few goats and is hoping to add a Vechur cow.

**Vechur cattle**

The Vechur cattle is only about 90cm high and originated in the coco-nut groves of coastal South Kerala. Due to the heavy-handed promotion of cross-breeding, it would have become extinct, but for the efforts of Prof. Sosamma Iype and a few of her students (later transformed as the Vechur Conservation Trust) who scouted out and collected the handful of remaining pure animals and now have brought the population back to about 1500 head. The small cow is now proving extremely attractive for people who are keen on zero-budget or low-input farming, since it can be kept in a small area and sustained on crop waste and weeds. It is also popular as a companion animal and to provide milk for households with small children. There is now a long waiting-list for this animal at the Vechur farm in Moozhikulangara, near Vechur village in Kottayam District.

**Conclusions**

Local breeds seem to have many advantages over the improved varieties that are generally promoted. Among these are the disease resistance and prolificacy and their error friendliness. These animals require low investment, if any, in terms of housing and purchase of fodder and feed. In fact most inputs are available free. For this reason, raising local breeds for most women is a rather hassle-free add-on and part-time activity that can be combined with other income generating activities, and reliably leads to good economic returns.

By comparison, improved varieties of livestock may have higher outputs (at least in theory), but require housing to protect them from the climate, regular disease prophylaxis, as well as purchased concentrate feed. Often, there are problems with fertility in the long run, and the yields may not be as high as expected. For instance, in Kerala, after half a century of cross-breeding, the average daily milk yield of cross-breeds stands only at about 6.5 kg. The number of these animals is going down and some local dairy farmers have even stopped breeding, preferring to purchase pregnant animals that they sell for slaughter after their lactation period is completed. Generally, nobody stays in dairying for more than 10 years, according to Dr. Sosamma Iype, a retired professor of animal genetics and head of the Vechur Conservation Trust.

Despite the obvious benefits of the local breeds and the drawbacks of the cross-breeds, credit institutions, such as NABARD and others, give loans only for the latter, and cross-breds are relentlessly promoted by the animal husbandry departments. It is time for a paradigm change!

**Acknowledgments**

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The livelihoods of adivasi communities - Koya in Malkangiri and Kondh in Kandhamal districts in Orissa State, are primarily dependant on agriculture. Traditionally, they have been cultivating many species of millets which provided food sufficient for the entire year. The local communities with concern for agricultural sustainability have been growing diverse crops to maintain and conserve the local diversity. Adivasis in this region are also dependant on the forest resources for food and non-timber forest products. Over the years, rapid loss of forest cover has widely affected the adivasi livelihoods. Also, the high cost external input agriculture started to have influence on the adivasi farming systems. The diverse cropping systems were largely replaced by monocropping with paddy and some high value crops. In such a changing situation, its been a challenge for the women in the households to ensure continuous supply of food to their families as rice growing alone cannot meet all their nutrition and household needs.

During the year 2006, a local NGO - Organisation for Rural Reconstruction & Integrated Social Service Activities (ORRISSA) started working with the communities to help them revive their traditional agriculture systems based on their knowledge. The focus was on helping them adopt a system of agriculture which was based on local seeds, low cost and sustainable.

Bihanaa Maa

Adivasi women play a key role in nurturing the local seeds and have enormous knowledge on them. There
are quite a few women who still grow various millets in their backyards and on small patches in mixed crop fields. These women are popularly known as Bihana Maa or Seed Mothers.

Recognizing the role and importance of seed mothers in reviving traditional seeds, the four local farmer organizations, also called as Lok Sangathans decided to bring dignity to their role. They identified 28 adivasi women in the year 2006 to spearhead the seed knowledge in the area. The seed mothers were expected to help the villagers identify local seeds and share information about the benefit of mixed crops and facilitate free exchange of seeds across households.

These Bihana Maa in the villages play the link role between farmers to provide vital information on different seed, their character and quality of seed, process of cultivation and storage as they help sourcing of seed from one to the other.

**Seed Multiplication**

The seed mothers and the farmer organisations worked together in strengthening the biodiversity in the area. The seed mothers constantly sourced local seeds with improved traits and exchanged them with the farmers. But the traditional seeds did not have all the desired traits and had to be improved. Moreover, the quantity accessed by the seed mothers was so little that it could not be shared with all those farmers who were interested to grow. They had to be multiplied on farmers’ fields. The farmer organizations helped in identifying farmers who could take up the seed multiplication trials. Subsequently, aromatic paddy, millet and pulses varieties were grown by the seed mothers and few lead farmers in their fields first and then exchanged with other fellow farmers. These seeds are identified based on their traits needed by the farmers like short duration, and traits that protected it from the wild animals, pests and diseases etc. Over the last four years thirty two varieties of paddy, seven varieties of millets and twenty one other varieties of rare local seeds are multiplied and shared among 800 odd farmers.

**Mapping bio-diversity**

To convince the communities across villages and help them recognize the vast diversity of food and forest products available, the seed mothers participated in the biodiversity mapping of the villages. These women had demonstrated that their knowledge on forest is endless as the women at Tangpalli and Adamunda villages displayed twenty five varieties of edible wild green leaves sourced from the forest. In another exercise, on bamboo, at Jharapalli village, the community identified fifty three types of bamboo utilities in the adivasi households. This had inspired the farmer organizations to collaborate with six other people’s organizations to initiate a ‘save bamboo’ campaign to motivate families stop cutting of bamboo sprouts every second year. All the knowledge generated during this process by the seed mothers as well as other adivasi women, have been developed into community bio-diversity registers. There are now twenty two community bio-diversity registers.

**Building the crop diversity**

Traditionally, ‘Shifting Cultivation’ was followed wherein families cleared the forest, ploughed land once in a year and grew diverse crops including legumes, beans, pulses and millets, in combinations. One of the most critical farming practices prevalent in these areas is the millet centered mixed cropping practices where in twelve to twenty one types of food crops are grown on the up lands along the forest track.

Drawing inspiration from the methods of age old shifting cultivation practice, the elder farmers of the area realized the need of mixed cropping on the uplands. The seed mothers enabled about 678 families to revive their mixed cropping to ensure steady flow of food all round the year. Farmers cultivated pulses like black gram, arhar, kidney bean and runner bean with cereals like corn, paddy and jana. Some farmers mixed the millets like foxtail millet and finger millet with vegetables like bhendi, kidney beans etc.

In Malkangiri, for instance, a village level seed mapping was done to know the availability of different varieties. Based on the availability of the seeds, the farmer groups in the villages were encouraged to exchange seeds and initiate mixed cropping on their lands. In about three years time, this process has brought in nine types of millet seeds which has reached more than 500 farmers from a mere 47 households. The farmers had also brought and exchanged traditional aromatic paddy varieties like...
Kalazeera and Machhakanta seeds. As per Mr. Bijay, convenor of Community Seed Fair, their members have reclaimed more than 100 acres of uplands and raising mixed crops.

Revival of millet based farming systems had enabled 739 small adivasi families (in 2008 at Malkangiri block) to harvest at least two crops out of the 6 to 14 crops grown, when most of the regular farms failed to produce any.

Women play a vital role in ensuring food and nutritional security to the families. To optimally utilise their production across years, they store the harvest of one season for about five to ten years in their households. They also grow all types of vegetables in their backyards which includes plants that produce drinks. Twenty two village level women managed vegetable nurseries which are raised to share nutrition rich vegetable plants among the households. The seed mothers facilitated exchange of plants and seeds grown in kitchen gardens.

Community Seed Fair

Community Seed Fairs were organized from 2007 onwards by the farmer organizations to create a platform for the Seed Mothers and common farmers to cherish their seed diversity. These fairs organized immediately after the Kharif harvest, are enabling exchange of seeds as well as experiences. The seed mothers display the rich diversity of the seeds and abundance of natural resources available in the locality. Hundreds of farm women led by the Seed Mothers, demonstrate the richness of the biodiversity by displaying samples of various seeds. Scores of farmers from different places participate in these fairs and exchange seeds of all types.

The Community Seed Fair 2009 at Malkangiri, for instance had inspired farmers from six different districts of the state to join them with their seeds. During the fair, a total of 231 farmers exchanged local aromatic varieties of paddy seeds. Forty seven adivasi farmers have sold 60 quintals of aromatic paddy varieties at rate of Rs. 1400 to 1700 per quintal (Kalazeera, Samudrabali, Atmasitala, etc.) replacing the certified seeds.

The Seed Fair is also used as a platform to sensitize people on the need to protect forests. About thirty adivasi women of Ranginiguda displayed 105 varieties of medicinal plant materials (crops, plants, leaves, roots, fruits, seeds, skin, wood & latex) along with 15 varieties of roots, eight varieties of leaves, mushrooms, cashew, tamarind, mahula, etc. sourced from the local forests during the Malkangiri Seed Fair 2009.

Spreading tradition far and wide

The number of ‘Bihana Maa’ or the seed mothers is growing. In three years time, 73 seed mothers have reached about 2800 small farm households helping them to switch over to traditional seeds and traditional methods of cropping. These women are also making efforts to sensitize the mainstream society about the richness of adivasi foods by organizing food mela during the official exhibitions at the district and the state level. They have been bringing in legitimacy to millet based crops and local foods by organizing community level seed fairs, food festivals and exhibitions. These are evolving as platforms for discussing wider issues related to food diversity.

Celebrating ‘Chasi Swaraj’ by footmarch

The foot march on promotion of traditional seeds was initiated on 12 February 2009 from Jharapalli village. It moved through 55 interior adivasi villages covering a distance of 60 kilometers. The volunteers with the foot march encouraged the ordinary adivasi farmers for their efforts of protecting the seed diversity of the area through a series of street meetings. Along the way the local farmer organizations had also organized gram panchayat level Seed Exchange fairs as women from villages joined with their seed pots and exchanged seeds among them. The foot march ended on the 9th day at Malkangiri celebrating the Community Seed Fair, wherein 5000 people participated. A book on ‘Adivasi Women Seed Keepers’ was released.
Impact Studies

LEISA India has been a platform for exchanging knowledge on agroecological approaches to farming, since 1999. To see if the magazine was making a relevant contribution to small scale agriculture development in India, we have been conducting surveys and impact studies, besides having continuous feedback mechanism on the magazines. Reader Surveys have been conducted at periodic intervals to know the usefulness of the magazine. Surveys were conducted in 2004, 2009, 2013 and 2016, 2020.

The impact was measured through reader surveys, Group discussions; Individual interactions; Field visits and Impact workshops.

Latest survey results are highlighted below.

Based on the earlier surveys, we brought out publications – “Inspiring Voices” - a collection of responses from LEISA India readers belonging to various categories and “Inspiring Cases” – based on how the readers have used the contents of the magazine.
Aquaculture is recognized as a very efficient form of animal production system. Improvement in fish yield while sustaining the natural resources, depends to a great extent on the appropriate husbandry practices adopted.

Aquaculture is a highly diverse production system. The diversity of aquaculture production is reflected in terms of holding units (ponds, tanks, raceways, cages, pens etc); management levels (extensive, semi-intensive, intensive, super-intensive); nature of rearing (monoculture, poly-culture); salinity levels (freshwater, brackish and marine); climate (cold water aquaculture, warm water aquaculture) and state of motion of water (static systems and flow-through systems). Earthen pond aquaculture however, is the most common, but other efficient production systems such as tank culture, cage culture, raceway culture, integrated culture, and pen culture among others are also widely used worldwide.

Simple innovations by small farmers deserve attention

Pratap Mukhopadhyay

Fish feed is prepared using local devices
Freshwater aquaculture is a viable rural activity in India. Its contribution towards food provision of very high biological value and livelihood improvements hardly needs any emphasis. Mass production at reduced cost of operation will make aquaculture more remunerative for the farmers. This will have economic as well as ecological significance. The country’s fish production, which is second in the world, is greatly contributed by small and marginal farmers.

The key factors influencing the production are (a) appropriate pond management (b) a good breed of stocking material of right size and proportions (c) farm-made feeds using locally available agro-based ingredients and appropriate feeding strategies. Sustainable yield increase especially in small scale aquaculture is expected primarily from optimization of inputs used. This can be achieved through adoption of simple scientific principles and management measures wherever possible. Earlier, in the absence of a precise knowledge on the control of reproduction and breeding, farmers resorted to collection of larvae and juveniles from rivers for stocking in the culture ponds. Practices like ‘Bundh breeding’ where a sudden gush of rain water is forced into the spawning ground were and are even today used to induce natural spawning. Subsequently, with the advent of induced spawning technique to breed the fishes in a consistent manner, simple improvements in hatchery technology for mass breeding followed by genetic selection procedures accelerated the development of carp aquaculture in particular, through availability of stockable seed almost throughout the year.

Farmer innovative practices

Use of simple tools and implements accompanied by continuous farmers’ creative ideas in the fish husbandry process and skill of problem solving proved to be quite successful and stood the test of time. Farmers in some of the districts in West Bengal like Bankura, north 24 Parganas; south 24 Parganas, south Dinajpur, east Burdwan; Hooghly, Malda and east Medinipur, have been practicing fish production using traditional wisdom and simple indigenous innovative devices. Some of the innovative practices of fish farmers are listed in Box 1 and some of them are described below.

i) Depletion of dissolved oxygen (DO) content in pond/tank water is a recurring problem in aquaculture. In case DO level dips down to 3.0 mg/litre, water becomes stressful for the fish to live in. Large fishes, particularly carps, come to the water surface desperately to breathe. This generally happens early in the morning and that too during the days when normal bright sunshine is not there or when cloudy
weather conditions prevail. Such problem can be fatal and the farmer may lose the entire crop of fish, unless emergency oxygen is supplied. Since farmers do not have crop insurance, they cannot afford to buy expensive mechanical aerators. A simple device using bamboo baskets put in a cascade pattern is tied with 3 bamboo poles and affixed in the pond with 0.5 HP pump connection attached to hosepipe. This device is used to make good oxygen deficiency in water in a short time. This saves money and the cultured fish also.

ii) Many resource poor farmers in West Bengal villages prefer growing advanced fingerlings from fry stage. The culture period is of 3 months duration. When fish is harvested, the pond is restocked the very next day, enabling farmers to grow 3 crops a year. With continuous demand, farmers also get their returns quickly. However, the predator birds like kingfisher, cormorants, herons pose threats for fish survival. To overcome this, farmers use simple threads, spreading over the culture ponds. This has been found to be very effective and environmentalists also do not object to this process of preventing bird predation as it does not harm the birds too.

iii) Although carp or the Indian major carp species -catla, rohu, mrigal are the main cyprinids cultured throughout India in the freshwater sector,
small indigenous fish species like air-breathing catfishes - magur and singhi, murrels like Channa spp., perch like koi, feather-back like folui eels like pakal, small local fishes like mola, tangra, pabda khoira, vacha are in very high consumer demand. Hence, farmers prefer crop diversification. Installing bamboo cages in ponds enables farmers to go in for multiple species culture without facing problems in feeding or harvesting.

iv) Since feed is the most expensive input in any aquaculture system, small farmers who have no option than to go in for low external input culture system, prefer growing fish based on natural food organisms like natural zooplankton, periphyton and the like. Using organic manure prepared in situ and sometimes stuffed in hollow bamboo poles or bamboo sticks wrapped with discarded sugarcane bagasse affixed at several locations of the pond is found quite useful for the fabulous growth of periphyton- the preferred natural food for rohu. These form part of organic aquaculture also which is a currently growing trend.

v) Small farmers of most West Bengal villages with small and medium sized ponds, use simple feeding devices. One of them is the use of perforated nylon bags hung with the help of bamboo poles in ponds. This is widely used feeding practice in semi-intensive carp polyculture.

vi) Fish feed, in the form of chowmein /spaghetti, is prepared using locally available agro-based by-products. These are prepared using locally made devices and sun dried and stored in gunny bags. Tribal youth and small farmers are adept in preparing such local feed, both for their own enterprise as well as a business option too.

vii) Farmers generally remove the aquatic macrophytes, physically from the pond and do not use weedicides. Of late, farmers are encouraging the growth of plants like Ipomea which is considered delicious. Growing azolla and duckweeds have served as feed for fish and also as a biofertilizer. All such practices have helped the farmers to grow human food of very high biological value at a relatively low production cost making the entire state a model for inexpensive low external input aquaculture.

While there is no denying that application of scientific principles is important in the scaling up of the production performance of cultured fishes, ingenuity of farmers’ innovations and improvements successfully tested over time should not be overlooked and given due recognition, lest such innovative ideas and spirit get lost for ever.

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Suman Sangam is a song that began in January 1996, when we purchased 17 acres of more or less barren land. There was not even a single tree which could provide us shade. This land is about 10 km from Dharwad in Karnataka. We named it Suman Sangam, meaning Confluence of flowers and also Confluence of good minds. That is exactly what we want our forest-farm to become over time. By forest-farm, we mean what was once a big grazing land is now becoming a green patch of forest with an everincreasing species of flora and fauna. We don’t have an exact plan or a blueprint for Suman Sangam. In fact, we never had one. It has been blossoming on its own in many different ways, frequently providing us pleasant surprises.

But, from the very beginning, we had certain very well thought out broad principles about our work and involvement in Suman Sangam. First and foremost, we decided to be as eco-friendly as possible in all our efforts, operations on the land, while gradually making our own lifestyles as eco-friendly as possible. Secondly, from the very beginning, we have tried to use optimally the available natural resources. Thirdly, we have always tried our best to increase the diversity on the land. We have been trying agriculture, horticulture, a bit of forestry etc. We have also earmarked a portion of the land for our cattle to graze. All along, we have tried to be as natural and holistic in our approach.

Watershed management and water sources

Let us first look into the component of water. The land is on the edge of the Western Ghats with gentle slopes on three sides of the land, i.e., on the east, south and north. There is a downward slope towards the west.

Then

Now
southern border is actually a small hillock, enabling a bird’s eye view of the entire land.

This natural topography of the land has made the task of watershed management relatively easy. We have been able to harvest a lot of rainwater. In fact, when we purchased the land, the level of underground water was so high that water was available at a depth of six feet. But the severe drought in the last four years has pushed the water levels further and further down. The first thing we did was to go in for contour bunding in the upper half of the land. This helped a lot in conserving rain water within our land.

In all, we now have seven sources of water. Firstly, we have the well, which is about 10 mts in diameter and about 12 mts deep. This well is located in the lowest part of the land. During the rainy season, it literally overflows. Apart from this well, we have five ponds on our land.

The first one is Sampige Honda which is about 10 mts x 20 mts and about 4 mts in depth. It holds water for almost four months after the rainy season. Then, there is “Maina Honda”, 15 mts by 5 mts and about 2 mts in depth. The third one is Raghuteerth—named after my late younger brother Raghuveer. This is a quadrangular pond, about 10 x 10 mts and 4 mts in depth. As we go down the slope, we have Kavali Kola. This pond is 30 x 30 mts and about 2 mts in depth. The largest of the ponds is the Bodhi Kere, stretching for about 100-120 mts and is about 4-5 mts in depth.

Lastly, there is a borewell on the lower aspect of Raghuteerth, dug up in March 2003 reluctantly, owing to the continuing drought. We struck water at a depth of 40 metres. We went drilling till a depth of 80 metres. We also built the recharging structure for the borewell at the very beginning. This summer, fearing the worst, we had proper pits dug for each and every tree – be it a fruit-bearing tree, a forest or timber plant or some wild shrub. We have put in sufficient mulch for all these plants. As we still don’t have electricity on our farm, we use a diesel generator set of 7.5 KV and a 5 HP engine to lift water.

Trees

With reference to trees, from the very beginning, we decided that there shall be no monoculture in our farm. We have retained as many original trees as possible and allowed them to grow again. Instead of barbed wire or electric fencing, we have a live fence made up of different varieties of trees. With respect to horticulture, we have opted for dense and mixed plantation. So, unlike many other farms, our farm does not look like a geometrically patterned plantation. We realized that every tree is a naturally designed receptacle or a funnel of Mother Earth to catch the rain. Thus, we made well-designed pits for all trees to hold as much rainwater as possible. Also, we put in sufficient mulch in each pit, to reduce natural evaporation.

We can classify the trees in Suman Sangam into the following broad categories: live fence, flower-bearing trees, fruit-bearing trees, forest or timber trees and special trees. As a fence, we have bamboo, hibiscus, agave, acacia, subabul, cup and saucer, kavali, mullu harivaana, cactus and many other plants. The fruit trees are: mangoes - about 300 plants consisting of various varieties; about 100 sapota plants, jackfruit, jamun, sitaphal, ramphal, hanumanphal, laxmanphal, wood-apple, chakkota, lemon of different varieties, papaya, anjur, coconut (about 100), Singapore cherry, West Indian cherry, kavali hannu, pineapple, cherry guava, amtekai, cashew, starfruit, butterfruit, breadfruit, jackfruit, etc. Apart from the seasonal flower-bearing plants, we also have perennial flower trees like Bakul, hibiscus, etc. It goes without saying that we grow many different

Soil

As far as soil is concerned, from the very beginning, we had decided to be as clean and as green as possible. Our ground rule is that there shall be no chemical fertilizers or harmful chemical pesticides on our land at any point of time. We continue to have plenty of earthworms of the native variety along with termites. They have been helping us make our soil more fertile over the years. As a result of the increasing biomass, the farmyard manure and extensive mulching for all trees, the fertility of the soil is continuously improving. Out of the total of 17 acres of land, nine acres is under horticulture and timber or forest trees. Five acres is earmarked for cultivation of various crops like paddy, jowar, maize, ragi, tur dal, groundnut, bengal gram, beans, soyabeen, horse gram etc. Two acres are taken up by the ponds, and another acre is earmarked for grazing by our cattle.
varieties of seasonal vegetables. I must also mention some special trees that are relatively uncommon in this part of Karnataka. We have eggfruit, travellers palm, rakta chandana, lokqwat, kumkuma, gauri (Gloriosa superba), litchi, beggars bowl (double coconut) gomukha badane, and, very specially, the baobab tree (Adansonia digitata), one of the longest living trees in the world, believed to be surviving for nearly five thousand years!

**Our friends at Sangam**

A mention about our friends at Suman Sangam. We have buffaloes, cows, cats and dogs. We also have chicken and fish in three ponds. The population and variety of butterflies is increasing. We also have wild rabbits, rats, snakes and peacocks, and the population and variety of birds is also definitely on the rise.

Now, as the tree cover has increased and availability of water has improved, the bird population has increased significantly. A friend of ours who is an avid bird watcher, counted as many as fifty different varieties of birds. Naturally, the seed spread by the birds is continuously on the rise.

**Special features**

Now let me mention some special features of our forest farm. We have a small house, built with the sun-dried bricks made on the land. Nearly six years ago, we transported and transplanted five fully grown coconut trees, each about twenty years old and 30 feet in height, and five big mango trees from Dharwad to our farm. Though this was more or less an experiment, gladly enough, we succeeded to a great extent. All the coconut plants have survived. Three out of the five mango trees have survived and have been bearing fruits for us. In the middle of the land, we have kept aside a 30x30 metre patch as a mini forest within the forest-farm. In this patch, we have not allowed any human being or cattle to enter for the last 6 years. This has resulted in a very thick growth of plants in this patch.

Then, we have Kaj Mahal and Sheesh Mahal! These are the two toilet structures we built with discarded I.V. fluid bottles from our hospital in Dharwad. Very recently, we started displaying sayings, poems and quotations about environment, religion and humanity on different trees all over the farm. Obviously, Suman Sangam is not just a farm for us in the conventional sense. From the very beginning, we have tried to hold various kinds of activities there. Since last year, we have started celebrating a Sangam festival annually, during which we invite our friends and well-wishers for a day-long program. We have conducted a couple of workshops on the farm on several interesting topics.

Frequently, we take children of our school to Suman Sangam for picnics. We have enough water in Bodhi Kere to swim and a coracle, in which we often enjoy boating. Sangam is increasingly becoming a great place for meditation too.

**Our failures**

Naturally, any venture of this kind is not without its own share of failures. I must make a special mention about bee-keeping. We have tried a couple of times to keep bees in as planned a fashion as possible, but failed. We have also not been successful in vermicomposting and making use of gobar bas plant constructed four years ago. Though we realized the potential of sun energy and have a solar cooker there, we have not been able to convince our farmer friends to make consistent and proper use of the cooker.

**Our successes and gains**

Quite early into this journey, I realized that the returns of Suman Sangam cannot be quantified only in terms of money.

Suman Sangam has given us and is continuing to give us returns in many ways. It gives us clean food grains, vegetables, fruits, milk, eggs and fish - all free from harmful chemicals. Before our own eyes, over the last eight years, a small forest is coming up. Very importantly, Sangam has given us many new friends - people who have come to share their love of plants, of bees, of birds, of flowers, of environmental well-being, etc. The Sangam with its calm and quiet surroundings, enabled us to be in perfect communion with Nature.

Before I conclude, I must confess that now our dear Suman Sangam is shaping us more than we are shaping it!

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Natural capital holds the key

During 1970’s, as a small boy I was witnessing my father’s interaction with the share croppers. They were cultivating finger millet as a mixed crop in the upstream land area and local varieties of rice in the command area of the tank in ‘Punaji’, located around 35 kms from the city of Bangalore. They raised rice using direct broadcasting of seed and zero water logging method. Two water streams which ran across the land were completely covered by pongamia, neem and tamarind trees. Pongamia dry leaves were mixed with farm yard manure and tank bed soil and applied to the soils in the rain fed upstream. He used to further insist on developing biomass producing trees in the buffer zones. The gliricidia shrubs which he developed in the buffers zones of the land are still green. The crop yield was good, both the family and share cropper’s food basket was diverse with three varieties of pulses, oil seeds, finger millets and fodder for livestock. Sufficient hay was stocked in the yard for livestock.

The tag of “progressive farming” seems to have carried away my brother. He switched over to puddling of rice fields. The share croppers switched from mixed cropping to monoculture of finger millet. The circle of disorientation from regular soil physical amendment and amalgamation of both dry and wet biomass was completed in few years. My father seemed to have got worried about the shift and complete disorientation. After the harvest of rice, he was scrapping the whitish powdery substance which was getting accumulated on the soil surface. After my father expired, the farming took a leap from subsistence farming to intense vegetable production and application of chemical fertilizers. In few years, the share croppers began complaining that the pulse crops are not flowering and yielding properly in the up stream area. In the next few years, there was a shift towards bore well irrigation. The first generation of bore wells ranging from 30 to 70 meters depth started drying up.

In 2002, I thought of shifting to rotation cropping and hence planted field beans in the command area and horse gram in the upstream. But the field beans failed to flower properly and the plants had stunted growth, though sufficient quantity of FYM was applied to the soil. Even the horse gram in the rainfed upstream area failed with overgrowth, owing to chemical nitrogen residues in the soil.

In 2009, the second generation of bore wells were drying up. Seeing the sporadic and scanty rainfall, we were contemplating on plant species to green up the land. One day my younger brother arrived with ‘melia dubia’ (Great neem) saplings to buffer the farm, but the 65 meters depth bore well stopped yielding water. We were determined to go ahead. Staggered continuous trenches were constructed across the land and five rain water percolation ponds were constructed. The rain water and soil run off was reduced by 90% and we planted 400 saplings in the buffer zones along with retention of tree cover across the water courses. As the summer approached, we purchased water to protect the saplings. As I watered the plants, my younger brother pruned glyricidia shrubs and mulched the plant basins. In a few weeks, the mulching was devoured by the white ants. We thought of meeting the soil hunger at any cost and started mulching with dry pongamia leaves and continued to water.

In 12 months, the plants were standing above us with a growth of 4 meters. With the arrival of the monsoon, we started planting mango, guava, citrus, sapota and bamboo; dug up a bore well to meet the water requirement for diverse varieties of plants across the land area. Now the melia dubia plants are 8 meters tall yielding 50 kgs of fodder, annually. We witnessed the mango plants not responding to just mulching, mined the childhood memories of my father mixing tamarind husk with FYM to amend sodic soils; the plants started showing resilience in summer.

We hope to integrate the livestock with tree crops and to move in for carbon and nitrogen ratio composting method to combat land degradation. The hidden hunger and chemically induced nutrient antagonism in the soils can thus be quenched and neutralized.

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Development through Convergence

Enhancing rural livelihoods through Watershed

Suvarna Chandrappagari, D Kalpana and N Polappa

Drought although occurs as a natural phenomenon, human interventions also induce droughts, increasing the vulnerability of the poor in the semi-arid regions. Watershed development is found to be an appropriate drought-proofing solution to address the issue of drought and desertification.

Andhra Pradesh is one of the states in India which has historically been most severely affected by drought. Eleven districts in Andhra Pradesh are classified as drought-prone and Anantapur district as desert-prone, by the Government of India. The Government of Andhra Pradesh realized the fact that with proper planning, scientific approach and efficient management it is possible to increase the productivity of degraded lands while creating huge employment opportunities for landless poor.

The State Government launched a Ten-Year Action Plan (1997-2007) for development of 100 lakh hectares of wastelands and degraded lands at the rate of 10 lakh ha every year with financial outlay of about...
Rs.4000 crores by the Rural Development, Forest and Agriculture Departments, out of which 78.20 lakh ha target was set for the Rural development Department. The Government of Andhra Pradesh has been implementing centrally sponsored watershed programme under various schemes with the basic objectives to minimize the adverse effect of drought and control desertification through rejuvenation of natural resource base of the identified desert/ drought prone areas. The programme strives to achieve ecological balance in the long run as well as promote overall economic development and improve the socio-economic conditions of the resource poor and disadvantaged sections inhabiting the programme areas.

In order to achieve the objectives of the Watershed Programme, various treatment measures and interventions have been undertaken for protecting, conserving and developing natural resources and improving livelihoods of the rural poor. Reputed NGOs in the state have been acting as Project implementing agencies and Resource Support Organizations for successful implementation of the Watershed Programme.

**Community Participation**

Community participation is imperative for the effective implementation of the watershed programme at every level. A clear role has been given to the people at various phases of project implementation i.e at planning, execution and monitoring phases for maximizing the benefits. Local communities were formed as common interest user groups and watershed committees through various participatory approaches. As part of community based monitoring systems, Social Audit process is adapted to watersheds in collaboration with Society for Social Audit, Accountability and Transparency (SSAAT). To motivate the community and make the people own the programme, initially, various entry point activities are undertaken viz., promoting non-conventional energy resources like solar street lights, solar lamps, setting up of mineral water plants, conducting animal health camps, sheep camps etc.

**Initiatives to conserve natural resources**

To conserve soil moisture, conservation measures like earthen bunds, stone bunds, pebble bunds, trench cum bund, continuous contour trenches, staggered trench, water absorption trench etc., were promoted. Water was harvested through structures like vegetative check dams, brush wood dams, earthen gully plug, sand bag structures, farm /dugout ponds etc.

Efforts were made to improve vegetation through raising nurseries, block plantation, afforestation of barren hills, bund plantation, live fencing, dry land horticulture, fodder development etc. Such activities taken up on forest fringe areas falling in the upper catchment areas of the watershed activities substantially increased the green cover and helped natural regeneration of the forest.

To protect the Common Property Resources (CPRs), the land was developed, overgrazing was controlled and fire breaks were erected to prevent forest fires. All these measures resulted in the improvement in the extent of forest cover and growth of CPRs.

**Promoting sustainable livelihoods**

To reap the benefits from conserved natural resources, it is imperative that the agricultural productivity be enhanced. It plays a key role in alleviating poverty and enhancing livelihood options in the drought-prone areas. Various initiatives were taken up for improving agriculture and livestock development. Also, micro enterprises were promoted to enhance the livelihoods of landless poor.

Field initiatives included measures to improve soil fertility, micro nutrient management, INM (Integrated Nutrient Management), IPM (Integrated Pest Management), innovative practices like SRI (System of Rice Intensification) cultivation in paddy, cultivation of aromatic and medicinal plants etc. Small scale infrastructure development was promoted in the villages.
through setting up of vermi compost units, bio-pesticide units, micro-irrigation systems, seed drying platforms, custom hiring centers etc., to support farm based production.

As the poor often have low quality animals, with low productivity and access to services is also poor, a number of initiatives were taken up for livestock management. Livestock development centers, providing breeding bulls belonging to breeds such as Ongole and Murrah were established in collaboration with the Animal Husbandry Department. Fodder crops which thrive well even if there is minimum rainfall during the kharif season, such as sorghum, maize, hybrid bajra, pillipesara etc., were promoted. The farmers were encouraged to grow Azolla, a highly nutritious blue green algae, annual and perennial grasses, fodder trees in dwellings, *Stylo hamata* on field bunds and in other possible common property areas. Backyard poultry was also promoted. Village level women federations were encouraged to take up pisciculture in water tanks.

Non-farm enterprises such as leaf plate making, weaving, mushroom cultivation, basket making, group trading, edible and non-edible oil units, tamarind processing and packing of pulses were promoted among the poor households.

Convergence of programmes

One of the major strategies of the programme was to converge with various departments and programmes to bring in a holistic impact. An effective convergence arrangement is established with other programmes (MGNREGS - Mahatma Gandhi National Rural Employment Guarantee Scheme, a rural employment programme of the government) and departments (Department of Agriculture, Animal Husbandry, Forestry, Horticulture etc.,) for undertaking interventions. As the funds available under watershed development project may be inadequate to saturate a watershed, convergence with other development programmes helps not only to supplement funds for holistic treatment but will also complement other development programmes. For instance, convergence with MGNREGS programme complements MGNREGS to focus on the asset creation which will have direct impact on the soil moisture conservation and socio economic status of rural poor.

A state specific clear cut convergence policy with MGNREGS scheme for holistic treatment has been evolved and is being successfully implemented in the state.

Similarly, non pesticide management along with comprehensive soil fertility management activities viz., NPM shops consisting of all biological extracts, NADEP compost pits, household nutrition security models, custom hiring centres etc., are being taken up in convergence with Community Managed Sustainable Agriculture (CMSA) wing of Society for Elimination of Rural Poverty (SERP). For enhancing livelihoods of rural poor, Poorest of the Poor (PoP) strategy of SERP is adopted to provide financial assistance to the identified poor through women Self Help groups and federations, for promoting income generation activities.

Treatment of forest fringe areas is being taken up in collaboration with the Forest Department. Similarly, livestock development initiatives such as livestock health camps, breed improvement, nutritional support, capacity building of the stakeholders etc., are being taken up in convergence with Department of Animal Husbandry.

**Impacts**

Research studies reveal that the impact of the watershed management is clearly visible in many watersheds.
areas. The impact is seen in terms of increased soil moisture, increased ground water recharge, increased water percolation, enhanced water storage in tanks and increased soil fertility. Also degraded lands are reclaimed, carbon sequestration improved and enhanced livelihood opportunities to the rural poor are enhanced. Watershed initiatives have also contributed for the improvement of the green cover and growth of CPRs, enhanced socio economic conditions of rural poor through creation of substantial wage opportunities and livelihood options contributing to increased income levels.

**Conclusion**

The experiences of Andhra Pradesh Watershed Management programmes demonstrate that the effect of drought and desertification can be effectively tackled through integrated Watershed management measures at local level through active participation of rural communities. More importantly, it proves that an integrated approach and convergence of programmes goes a long way in achieving holistic impact in watershed areas.

However, development through convergence is a time consuming process and not without challenges. It calls for mutual cooperation, active participation and sharing of insights by each of the programmes. It is important to have a vision and a holistic design which is flexible, before planning activities with various departments. This design should be continuously revisited to accommodate changes as and when required.

One of the important reasons for achieving convergence among different programmes is that all of them belonged to the same department, *i.e.*, Department of Rural Development. On the other hand, in spite of some very good examples in the field, not much convergence could be achieved with the agriculture department at the policy level.

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Partnerships promoting digital platforms

Amit Chakravarty

Over the last few decades massive technological development and new opportunities have transformed people’s lives. However, these opportunities have not benefited the agriculture sector in a significant way. Access to timely and relevant information can benefit all stakeholders in the agriculture ecosystem. Information and Communication Technologies (ICTs) will play a key role in knowledge exchange, targeted recommendations, market integration and access to finance to make agriculture a profitable enterprise.
Agricultural production issues cannot be considered in isolation from environmental issues. The use of digital tools in agriculture helps the diverse set of stakeholders in any given context to meet the competing demands of increased production, ecological sustainability, food security, economic viability, resource conservation and social equity. Use of modern ICT tools in agriculture help reduce transaction costs; improve market transparency; promote efficient logistics and provide financial inclusion and insurance. Tools ranging from data analytics and remote sensing to information delivery through mobile phones helps stakeholders coordinate and improve efficiencies across the value chain. This enables every actor in the value chain deliver the goods and services required by the other actors, thus acting in unison to promote agroecology. Timely information helps stakeholders act in a concerted manner to create a win-win situation for all.

India has a long history of use of ICTs for agriculture. Some of the early pioneers were Warna Wired village (launched in 1998), Gyandoot (launched in 2000), Nokia Life (launched in 2009), Reuters Market Light (launched in 2007), e-Sagu (launched in 2004), e-Krishi, e-Choupal, iKisan. Initiatives like Gyandoot, Warna Wired Village and Nokia Life were not limited to agriculture. They also provided information on other aspects like education, health, entertainment, provision of government services like birth/death certificates, copies of land titles, information on government schemes, government subsidies, and a variety of other information and services. The other initiatives mentioned above are more focused on providing information and services related to agriculture only. There is a mix of government-led projects, non-government organization (NGO)-led projects, as well as private sector driven projects. In terms of information delivery channels, the primary channels are: (i) operator-mediated computer kiosk; (ii) telephony (call centers and mobile phones); (iii) web portals and (iv) different combinations of first three channels.

One of the primary premises behind the use of ICT in agriculture is that lack of information is a major impediment to improving farmers’ livelihoods. Hence the deployment of early generation ICTs has been primarily for information dissemination. However, today we have at our disposal tools for (a) capturing and processing large amounts of data; (b) analytics tools and decision support systems; (c) systems that can be operated and monitored remotely.

ICRISAT has been continuously innovating in working with smallholder farmers to meet the contemporary challenges of agriculture. These challenges have evolved from the merely technical to also include social, cultural, economic and particularly environmental concerns. Using new tools like drones, ICRISAT has innovated beyond the traditional use of ICTs for information delivery. Described below are some of our initiatives that use modern tools as well as traditional ones to enable all stakeholders work in concert to improve the lives of smallholder farmers across sub-Saharan Africa and Asia.

Sample text message sent on 27 June
1. Sowing rainfed groundnut crop can be initiated
2. Before sowing, seed treatment is essential
3. Prevention of seed and soil borne diseases is very important
4. Treat one kg seed with 3g of Thiram or Captan or Mancozeb
5. Wherever white grubs are problematic, treat one kg seed with 6.5 ml Chlorpyriphos before sowing
6. While sowing, ensure optimum soil moisture
7. Place the seeds at a depth of about 5 cm in the soil

Photo: Author
Data analytics and business intelligence to empower farmers

A new sowing application for farmers combined with a Personalized Village Advisory Dashboard will help farmers pick the right sowing time, thus helping them avoid uncertainty due to climate change. This is being piloted in Andhra Pradesh. The sowing app will help farmers achieve optimal harvests by advising on the best time to sow crops depending on weather conditions, soil and other indicators.

The sowing application utilizes powerful artificial intelligence to interface with weather forecasting models provided by USA based aWhere Inc. and extensive data including rainfall over the last 45 years as well as 10 years of groundnut sowing progress data for Kurnool district. This data is then downscaled to build predictability and guide farmers to pick the ideal sowing week. When combined with other data collected from, it can create rich datasets that can be processed to build predictive models for the farmers.

Similarly, the Personalized Village Advisory Dashboard provides an instant overview across several environmental factors that determine a healthy crop yield. In a pilot that is currently in progress, information will be sent to farmers about the sowing date via SMS in Telugu. Data collected manually from 10000 hectares each in the 13 districts of the state by ICRISAT field officers has been uploaded to Microsoft’s Azure Cloud.

The use of advanced analytics in agriculture will help streamline and strengthen farming practices. The Sowing App and Personalized Village Advisory Dashboard provide powerful cloud-based predictive analytics to empower farmers with crucial information and insights to help reduce crop failures and increase yield, in turn, reducing stress and generating better income. It has been developed through a partnership between Andhra Pradesh government, Microsoft, aWhere, and ICRISAT under the Rythu Kosam project funded by the Government of Andhra Pradesh. A local grassroots organisation, Chaitanya Youth Association, working in Kurnool, is supporting this initiative in the field.

On the ground

Shivappa is one angry farmer. “How come I don’t get any messages that the others are getting,” he protested vehemently when the ICRISAT team visited his village. So did Yusuf Basha and Madanna Kandappa of Kurnool district of Andhra Pradesh, India.

Since 15 June farmers of Devanakonda village in Kurnool have been getting advisories as text messages on their mobile phones informing them the right time to sow and the preparations needed before sowing. Currently 175 farmers, out of around 1,000 farmers, are receiving these advisories informing them the best time to sow depending on weather conditions, the crops they grow, soil health and other indicators.

Farmers in Devanakonda and surrounding villages are primarily dependent on rains for farming. Around 60% of the cultivated area is under groundnut followed by cotton (22%) and castor (17%). Other crops grown are pigeonpea, chillies and vegetables.

The advisories, for groundnut production, are sent in the local language Telugu as well as English. Many
farmers own first generation feature phones which may not support the local language, hence messages are also sent in English. To overcome the literacy barrier, some designated farmers are given the responsibility of conveying the message to others and the possibility of sending voice messages is being explored.

Ms. Rameshwaramma is very happy with the advisory service. She planted groundnut in 1.5 ha and followed all advice such as gypsum application, opening up furrows for moisture conservation, intercropping with pigeonpea and micronutrient application. Today she has a healthy crop to show for her efforts.

Many farmers like Shivappa who were not subscribing to the messages earlier are now eager to sign up, seeing how their neighbours have benefited. Tracking the farmers shows that from 24 June when the farmers were advised to start sowing, the percentage of area sown went up from 15% to 100% by 4 July.

**Conclusion**

This initiative brings together a cross-section of stakeholders on a common platform to empower smallholder farmers. In the face of climate change, helping farmers reduce risk by empowering them with information to take the right decisions, introducing crop diversity in farming systems as a risk mitigating measure, introducing tools and technologies for climate-smart agriculture require diverse stakeholders – farmers, research institutes, government, NGOs and the corporate sector – to come together and work in a coordinated manner to make agriculture profitable and sustainable.

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Rameshwaramma in her groundnut fields

Photo: Author
LEISA India consortium coordinated by AME Foundation is producing special translated editions of LEISA India in seven languages. The consortium includes NGO partners across the country, promoting ecological agriculture.

The language editions and the individuals/institutions involved, is mentioned in brackets. Hindi (Gorakhpur Environmental Action Group, Uttar Pradesh); Tamil (Kudumbam, LEISA network, Tamil Nadu); Oriya (ORRISSA, Orissa); Punjabi (Kheti Virasat Mission, Punjab), Marathi (Yuva Rural Association, Maharashtra); Kannada and Telugu (Mitramadhyama and AME Foundation, Karnataka).

**About AME Foundation**

**AME Foundation** promotes sustainable livelihoods through combining indigenous knowledge and innovative technologies for Low-External-Input natural resource management. Towards this objective, AME Foundation works with small and marginal farmers in the Deccan Plateau region by generating farming alternatives, enriching the knowledge base, training, linking development agencies and sharing experience.

AMEF is working closely with interested groups of farmers in clusters of villages, to enable them to generate and adopt alternative farming practices. These locations with enhanced visibility are utilised as learning situations for practitioners and promoters of eco-farming systems, which includes NGOs and NGO networks. [www.amefound.org](http://www.amefound.org)

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