

Biodiversity and Livelihoods

Experiences from India

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Introduction

When the study titled "The Economics of Ecosystems and Biodiversity" (TEEB) was launched during the tenth meeting of the conference of the parties (COP 10) to the Convention on Biological Diversity (CBD) in Nagoya, Japan, one of the critical questions that it addressed was how to translate the value of biodiversity (read natural capital), as elaborated in the report, into actual values that could benefit communities and countries. Co - benefits, multiple benefits and synergies currently form the basis of development and economic discourses in preparation for better governance of natural resources and environmental management. The outcomes of UN Conference on Sustainable Development (UNSCD, 2012) reiterate the need for linkages and mainstreaming in its outcome document, 'The Future We Want'.

The Key Challenge to translate the 'potential' of biodiversity and ecosystem goods and services to 'real' lies in the fact that on-the-ground experiences need to be documented and used in policy making to give a real meaning for the economic and social arguments related to conservation. Given the interest in this topic, there is an increasing need to find solutions at different levels to maximize investments in conservation and development action. In addition to looking at global policy guidance on how to achieve these benefits, one also needs to look to projects on the ground for answers to how communities are realizing benefits through their local action. The National Biodiversity Authority (NBA) focused on identifying such success stories, examining where communities have worked on multiple actions to deal with conservation of biodiversity, securing livelihoods and thereby ensured well-being at community and household levels.

The key messages from the study that form the core of the report include;

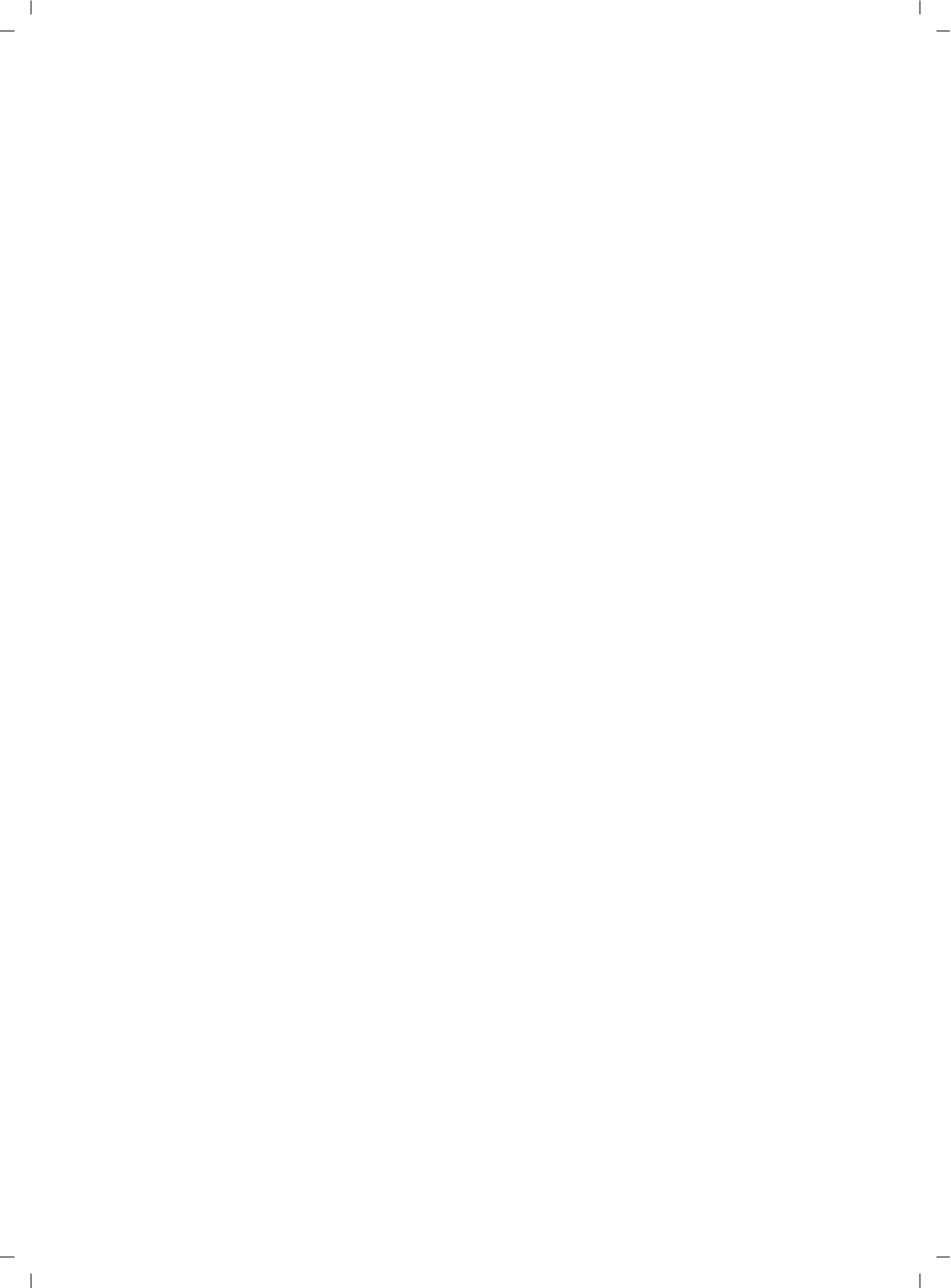
- * Community based initiatives achieved many co-benefits because of the nature of interventions adopted by the communities, although several of these projects were not designed to deliver on co / multiple benefits;*
- * The level of local participation in designing the interventions and subsequent implementation was high in the case studies presented in the report where policy followed practice;*
- * Almost all of the projects analyzed presented many policy level options to deal with synergies, mainstreaming and achieving multiple benefits for conservation, adaptation, food security and poverty reduction;*
- * The sustainability of actions have been high since many of the initiatives were integrated into local decision making processes and action programmes; and*
- * Global policy making has many lessons to learn through the analysis of these case studies for better development and governance planning.*

The case studies presented in the report also allude to the fact that developing policies on conservation, environmental management, governance and development are phase 'zero' of a multi-phase approach to securing human well – being. Implementation options need to be the mirror in front of policy making to secure co/multiple benefits.

The case studies presented in this compilation are selected based on their breadth of experiences and geographical spread in India where conservation and livelihood options are explored and put in practice. The NBA is fully aware that there are thousands of more such experiences and geographical spread in India where conservation and livelihood options are explored and put in practice. However, for operational and presentation reasons we had to minimize the number of case studies presented here. The selection of case studies presented here is based on responses we received from various organizations that we contacted for purposes of leaning from practitioners.



Agrobiodiversity





Seeds of Truth: The Story of Seed Banks

Contributed By: Deccan Development Society, Hyderabad

India has a wealth of traditional landraces of food grains. Studies have documented more than two lakh varieties of rice and literally thousands of varieties of millet being available. The arid and semi-arid regions of India have engendered the evolution of rich and diverse varieties of millets that are capable of withstanding the harsh soil and climatic conditions that mark these regions; and ensure that the farming households who grow them have sufficient to eat even under the most difficult situations. Millets are grown as part of mixed farming systems which contain a range of pulses, oilseeds, vegetables and a host of other food crops. These crops ensure that most of the food and nutritional needs of a rural household or community are met from their own lands.

The advent of Green Revolution brought sweeping changes in the Indian agricultural scenario. In a bid to augment the production of food grains in the country, intensive agricultural methods were adopted supported by mono-cropping and extensive use of hybrid/High Yielding Varieties (HYVs) seeds along with chemical pesticides and fertilizers. With the availability of easy credit, market support and other incentives, farmers were pushed to adopt these systems; so much so, that in many regions, the traditional landraces of food grains almost completely disappeared from cultivation.

While the farmers, especially the one holding large areas; and those living in well-irrigated region of India like Punjab, Haryana and coastal Andhra Pradesh reaped the benefits of green revolution, the vast majority of the small and marginal farmers in the arid and semi-arid regions which comprise of 60% of the total area under cultivation in India suffered in the long run. These farmers became increasingly dependent on the markets and agricultural extension services in order to access the basic agricultural inputs and in the process forgot about their traditional crop varieties and associated knowledge. One of the tragic outcomes of the advent of this system of agriculture is that women, who played the role of decision-makers in the traditional systems, were relegated to the role of mere spectators in the new intensive farming system.

The small and marginal farmers in Medak—most of the Dalits—faced a similar situation. The district of Medak experiences semi-arid agro-climatic conditions, and the agriculture in this region is entirely dependent up on the monsoon. While both red and black soils are found in the region, the soils, in general, are harsh. However, this region has developed a well-honed system of cropping called Panendu Pantalu. This was a well-developed system of farming that combined risk reduction with optimum use of scarce resources; and included at least twelve different types of crops including forage crops, oilseeds, pulses and millets, which together ensured that the soil fertility was maintained and the poor had access to a balanced diet (a list of crops grown during the Kharif and Rabi seasons is given). All these processes ensured the near-complete decimation of the traditional systems of agriculture; and contributed to the immense suffering of these small and marginal farmers.

Panendu Pantalu is a mixed farming system where in 12 or more food crops are planted in rows of various combinations. These include several varieties of jowar, ragi, bajra, little millet, foxtail millet, barnyard millet, kodo millet and proso millet; Lentils, red gram, black gram, green gram, horse gram, field beans, linseed, sesame, safflower, sunflower, brinjal, okra and greens like hibiscus, *gangavare koora*, and so on. The combination is usually unique to each farmer, who decides it based on his/her specific requirements. These requirements are determined by a range of factors like weather conditions, seed availability, needs of the household, and so on.

The neglect of mixed farming systems meant that the rural populace did not have access to crops like pulses, which in turn meant that they suffered from protein deficiency, leading to the undermining of their ability to work. In many parts of the study area, a wealth of traditional knowledge and agricultural practices including local varieties of food crops were completely neglected and lost where at one time more than 80 varieties of millets, grains, pulses and lentils were grown. Today only about 20 or 25 remain to be cultivated. The women recognized that it was mostly the men who were seduced by the possibility of a 'developmental leap' and were more eager to try out HYV/hybrids and newer varieties of inputs.

List of Crops Grown under the Mixed Farming System in Zaheerabad

<i>Kharif Crops (first season – Jun to Oct)</i>	<i>Rabi Crops (second season – Oct to Feb)</i>
Jowar (<i>Sorghum vulgare</i>)*	Chick pea (<i>Cicer arietinum</i>)*
Korra (<i>Setaria italica</i>)*	Safflower (<i>Carthamus tinctorius</i>)
Bajra (<i>Pennisetum typhoideum</i>)	Sai jonna (<i>Sorghum vulgare</i>)*
Sama (<i>Panicum miliare</i>)*	Lathyrus (<i>Lathyrus sativus</i>)
Kodi sama (<i>Panicum miliacium</i>)	Lentils (<i>Lens esculentus</i>)
Black gram (<i>Vigna mungo</i>)	Wheat (<i>Triticum vulgare</i>)*
Green gram (<i>Vigna Radiatus</i>)*	Linseed (<i>Linum usitassimum</i>)
Redgram (<i>Cajanus cajan</i>)*	Mustard (<i>Brassica juncea</i>)
Niger (<i>Guzotia abyssinica</i>)	
Voma (<i>Trachyspermum roxburghianum</i>)	
Ragi (<i>Elusine coracana</i>)	
Sesame (<i>Sesamum indicum</i>)	
Vulvalu (<i>Dolichus biflorus</i>)*	
Pundlu (<i>Hibiscus cannabinus</i>)*	
*Each principal variety has several sub-types, and they are an integral part of this system.	

At this point, a few women from villages like Humnapur, Kalimela and others in Medak district decided to increase the cultivation of traditional varieties and to move away from what they called the Sarkari vittanalu (government seeds). However, the revival of traditional agriculture and the productive potential of land that had been lying fallow in the fields was not easy to be revived. In order to break the vicious cycle of low yields, non availability of labor, neglect of their own fields, soil erosion and debt the concept of 'eco-employment' was tested. This is a term coined by Deccan Development Society (DDS), and it envisaged that instead of toiling on the rich farmers' fields for a meager wage, the women farmers—especially single women, widows—work on their own plots of land, with some start-up support extended by DDS. Together, they undertook extensive land development activities in order to arrest soil run-off; and the application of manure and straw and so on in order to improve the soil quality. A key decision that they took at this juncture was to return to *Satyam Pantalu* (Truth Crops) -their traditional crops- and to mixed cropping. It was quickly noticed that this system was also adept at delivering yield rates that were comparable to the more modern systems of agriculture, that on small pieces of land. This was possible due to intensive land management techniques. Different crops matured at different times thus ensuring a continuous stream of food grains. Women who were working as day laborers and led a largely hand-to-mouth existence were in a position to feed their family members well.

However, a critical problem that was faced initially was that of seeds. Years of neglect had almost completely decimated the traditional varieties of seeds; and it was indeed a tough task to procure them in large quantities. Gradually, these traditional varieties were collected from the older farmers who were still practicing these time-tested agricultural systems; and even

The International Crop Research Institute for Semi-Arid Tropics (ICRISAT) which has a large seed bank-were approached for procuring the traditional seed varieties.

The women knew the characteristics of seeds intimately; the soils on which they grow, which landraces need minimal rainfall, when to add nitrogen to the soil, resistance to pests and diseases, and a host of other characters have been researched by these women over years, through hands-on practice and trans-generational wisdom. With this knowledge, some women in every village became seed keepers, who store, multiply and distribute seeds. Now, at least 1500 small and marginal households in at 75 villages once again have access to their own traditional seed varieties. As a woman from Humnapur says proudly, “we do not need the government seed any more”.



Source: Deccan Development Society

The revival of traditional landraces has brought about an transformation in the lives of some of the poorest and most segregated women in the villages in Zaheerabad region. Dalits, small and marginal farmers and women belonging to these marginalized groups were, for the first time, consulted about the crafting and the implementation of a program that was intimately connected to their lives; for the first time they were given a space where they could articulate their concerns and also find solutions for the same.

The revival of traditional landraces ensured that women were once again in the forefront of decision-making, in agriculture. These women now decide the food crops that would be grown, how it would be grown, what food their children will eat and so on. Many of them, who started out as landless laborers are today land owners and have earned the respect of the other members of their respective villages. Several of these women have been internationally recognized and feted for their contribution to providing fuel for the onward march towards food sovereignty of these communities. Above all, many of the households where these interventions have taken shape are in a position to access nutritious food from their own lands, and also earn some cash, thanks to crops like red gram and other pulses, which ensures that their physical and the material needs are well taken care of.

Seed as Life - Agrobiodiversity Conservation by Locals

Contributed By: Green Foundation, Bangalore

Kanakapura Taluka of Ramanagar district is located in Southern dry zone of Karnataka which is characterized by poor sandy loam soils with average rainfall of 700-800 mm, mainly during June to October. Because of scanty rainfall, sometimes with long dry spells, the crops are subjected to moisture stress during different stages of growth. Usually the crops suited for rain fed situations are being cultivated in this region. Since the topography is undulating due to rolling hills, the fields on slopes are subjected to soil erosion.

With the advent of modernization of agriculture, changes in agriculture and cropping patterns led to the erosion of crop diversity. Erosion and extinction of diversity has become a major threat for sustainable livelihood of the farmers. Conserving agricultural diversity has become imperative for food security of the marginalized farmers. Conserving agro-biodiversity on farmers' field plays an important role in enhancing food security and sustainable livelihood system of the rural community.

Seed is a lifeline and source of sustenance ever since agriculture came into existence. With modern technologies the threat is not only decimation of seed but also the whole system of community seed supply. Conservation of the gene pool is of paramount importance to sustain the food security of the marginalized people in the rural areas and the role of women cannot be underestimated as women contribute to the science of conservation. It is to revive this system amongst farmers that an initiative has been taken up with women at the center stage to conserve agro biodiversity and contribute to livelihoods.

To address the declining diversity and improve accessibility of traditional seeds for farming, the GREEN Foundation began to conserve indigenous varieties of crop plants suited to the ecological niche; integrate on-farm conservation through participation of the farming community; collect, select and produce indigenous crop diversity; ensure production of quality seed and planting material, minimize the farmer dependency on the public and private seed supply system and strengthen farmer to farmer exchange of seed and provide infrastructure for storage facilities and develop a resource and training centre for the community.

Dry-land agriculture and irrigated agriculture are the major forms of cultivation in the country. Much of the production is for subsistence and many people rely on uncultivated and wild food sources, as well. People depend on common property resources such as ponds, lakes and forests to meet their domestic needs of food, fuel, wood and fodder. The crop diversity in the area is varied. The staple food crops of the area are finger millet and paddy. Around 8 varieties of finger millet are most popular among farmers. These include *kempu ragi*, *sharavathi*, *dodda ragi*, *ragalli shivalli ragi*, *halukuli ragi*, *jade ragi*, *hasiru kaddi ragi*, and *bonda ragi* and are predominantly grown as main crop together with field bean, castor, sorghum, niger, mustard and amaranth.

The number of households in the project area is around 4200 in about 89 villages. Most of the households belong to backward and scheduled caste (SC) and Scheduled Tribe (ST) community. About 68% of the population lives below the poverty line. Of the total farming community, 93% of the households are small and marginal farmers having landholdings of less than five acres.

Conservation of biodiversity had been approached through various well planned activities evolved over the past several years. The activities have not remained static and were evolved as needs arose. The system is based on the philosophy that farmers

Variety	Characteristic
<i>Kempu Ragi</i>	Grown under monsoon season Medium tall, more vigorous and profuse tillering Medium maturing with red grain colour
<i>Sharavathi</i>	Grown under monsoon season, medium tall, vigorous tillering, light red grain colour, short duration crop, good yield
<i>Dodda Ragi</i>	Grown under monsoon season Medium tall, vigorous and Moderate tillering Medium maturing with brown grain colour
<i>Ragalli Shivalli</i>	Grown under monsoon season Medium tall, more vigorous and profuse tillering. Resistant to Finger blast, drought tolerant. Medium maturing with light red grain colour.
<i>Halukuli</i>	Grown under monsoon season Medium tall, more vigorous and moderate tillering. Medium maturing with light red grain colour
<i>Jade Ragi</i>	Grown under Khariff season, resistance disease and pest, , high tillering, medium tall, 105 days crop, light red grain colour, big sized earhead and grain.
<i>Hasiru Kaddi Ragi</i>	Grown under monsoon season Tall, vigorous and profuse tillering. Medium maturing with red grain colour.
<i>Bonda Ragi</i>	Grown under Khariff season, Tall , profuse tillering, 100 days crop, red colour grain

Key activities: In manner to achieve the objectives of biodiversity conservation and securing livelihoods, the following activities were undertaken.

Seed mapping: Seed mapping was carried out to quantify the genetic diversity available with the community. Seed mapping exercise involved meeting with the community and gathering information about the varieties of seeds that had been in use and either become extinct or fallen into disuse. The exercise was carried out in Thali near Dharmapuri district Tamil Nadu. “We thought it was a game” laughs Sujathamma as she described the programme. She attended the meeting along with her 90 year old grandfather and 35 year old mother. Together they came up with 11 varieties of ragi that have been or are being grown in Thali. Participatory seed mapping conducted in the northern dry regions of Karnataka for instance has helped to recognize 61 varieties of sorghum and eight varieties of pearl millet. The process of dialogue and debate that evolved during the mapping also threw insights that helped farmers to see for themselves the effects of mono cropping, loss of diversity and conversion to high yielding varieties.

Seed Yatras and Seed Fares: Seed yatras, were marches by the farmers and staff of the GREEN Foundation carried out processions of decorated bullock carts around the village. The aim was to build awareness among the villagers on the need for and the revival of traditional seeds, impacts of emerging agricultural challenges. This mainly helped in building networks among different villages. Seed Fairs were held where varieties of indigenous seeds are exhibited and helped in sensitizing the farming communities in the value of conserving indigenous seeds and to locate diversity.

Exposure visits: Exposure visits helped in cross learning between farmers between villages.

Setting up of seed banks: Community seed banks are important for safeguarding of traditional seeds. Seed banks were set up an important strategy for maintaining genetic diversity of local agrobiodiversity.



Source: Green Foundation

Capacity building and training: Farmers who are the custodians and managers of local agricultural biodiversity were informed about the technological advance agricultural practices besides being trained in subjects like seed treatment, germination test, biointensive gardening, vermicompost, production of bio pesticides and seed storage and others.

Seed and crop improvement: Trainings on seed selection and methods on how the seed quality can be maintained were also taught. Several rare varieties of seeds collected were planted and farmers were encouraged to grow these to see the qualitative and quantitative elements of traditional agriculture.

Kitchen gardens: Kitchen gardens are rich in genetic diversity and translate into dietary variety and nutritional levels for household throughout the year. Kitchen gardens were promoted as an important activity in the process of sustaining a healthy farming community. Income generation programmers were organized through farmer's networks.

Kitchen garden crops: Local varieties of vegetables like *bhendi* (3), *beans*(6), *Palak*, *Amaranthus*, *Greens like Chakotha*, *Sabisge*, *ridge gourd*, *pumpkin*, *cluster beans*, *chilli*, *ashgourd*, *tomato*, *pumpkin*, *ridgegourd*, *brinjal*, *sponge gourds*

List of crops available at GREEN Foundation Genebank

Crop	Number of varieties
<i>Ragi</i>	55
Wetland Paddy	90
Dryland Paddy	29
Tomato	18
Carrot	4
Chili	17
Pumpkin	13
Bendi	12
Beans	29
Peas	2
Cowpea	3
Gourds	9
Cucumber	7
Brinjal	6
Leaf vegetables	11
Milletts	9
Oil seeds	15
Medicinal seeds	19
Vegetables	104

Results and Impacts: More than 330 native varieties of paddy, finger millet, minor millet and vegetables have conserved. On-farm conservation through participation of the farming community in more than 63 villages in 40 Self Help Groups (SHGs) comprising men and women was achieved. The programme resulted in the reduced dependency of farmers on public and private seed supply. Seven Community Seed Banks (CSB) were established and managed by local women farmers was a success through this initiative. Kitchen gardens have become very popular among the women folk and have spread widely in the villages. Now farmers are more aware about the importance of conservation of indigenous seeds and are motivated to spread the idea through 'Seed Melas' (Seed Fairs) and 'Seed Yatras' (Seed March). Awareness and interests were created among farmers and other organizations have increased with the initiation of a regular column in a local newspapers and magazines.

Significant soil and water conservation actions have been assured through trench cum bunding, farm ponds and micro watershed activities in the project area.

Increased awareness and participation of women in seed bank management, seed conservation, crop improvement, People's institution. Increased participation of women in Village Development Committee (VDC) was also realized

Some challenges : Transitions towards indigenous seed for cultivation, transition towards sustainable farming practices, resistance from other community members against organic farming and the attraction to subsidy for fertilizers and HYVs provided by the government were the challenges to ensure continued practice and promotion of traditional agricultures.

Seed Banks established during this initiative can be the future resource centers where not only seeds are available but other organic inputs and technical know how is also available. The sustainability of seed banks lies in projecting the seed banks as community owned institutions.

Even though, the farmers were not ready to take the responsibility to maintain the seed bank, the infrastructure support was difficult to obtain, the financial incentives were absent and social aspects like caste, family background, gender were an obstacle. The concept of Community Seed Banks were very farmer friendly and also to empower them through various seed bank management trainings which also took up the social aspects.

The initiative from its inception placed a strong focus on women based on the knowledge system. It is women who take decisions regarding the amount of seed to be stored, the variety and ways to store them, selection of what crops to grow as the important function of selection of healthy seeds for sowing. Women members of SHG were selected as members of Seed Bank Management Committee on certain criteria. Their main responsibilities were in proper management of the CSB through promotion, storage, maintaining records and selection.

The women met at regular intervals where they also discussed the various aspects of agriculture like pest management, exchange other information related to literacy, health, livestock. These empowered them to actively participate in discussion at home and other SHG level meetings.

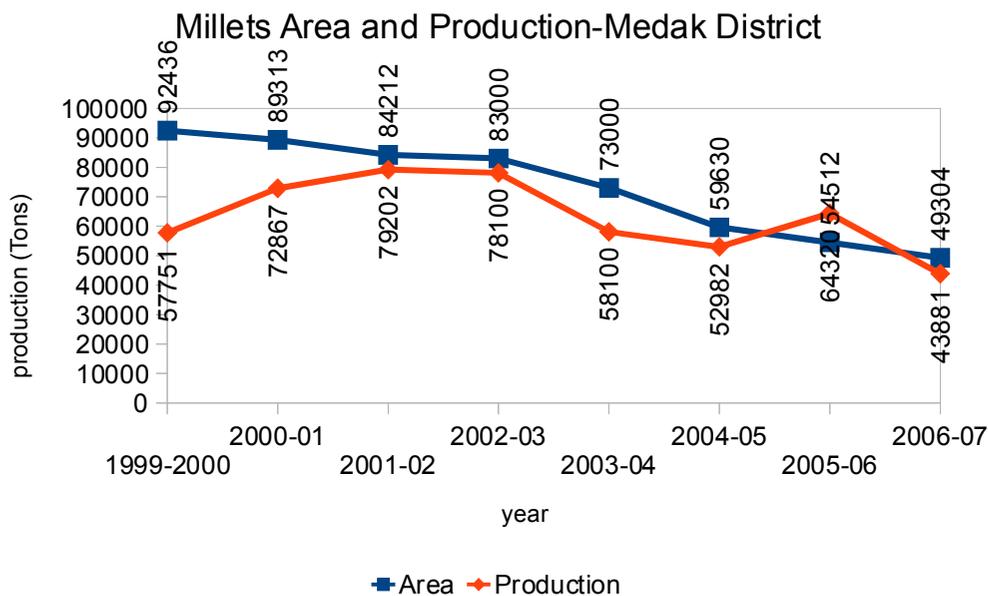
Alternative Public Distribution System: Experiences from Andhra Pradesh

Contributed By: Deccan Development Society, Hyderabad

For the last four decades, India has implemented a Public Distribution System (PDS) with an aim to ensure that poor and very poor households are able to access affordable food and other essentials needed for a dignified life. While there is no doubt that PDS has proven to be one of the most important affirmative actions that the Indian state initiated, its shortcomings cannot be ignored.

The major concerns against the current PDS is that it has homogenized Indian food system by supplying only two grains, rice and wheat, as grains to feed the country's population which has a very diverse food and culinary culture. Consequently, in nearly 65% of the dry land India, which had a rich millet based food culture, people have been completely deprived of their culturally unique, nutritionally extraordinary local food systems.

A spillover effect of this rice-wheat crop of India's food systems can be shown in a frightening fall of millet cultivation in the dry land India which accounts for 65% of the country's farmscape. Over the last fifty years, since the advent of Green Revolution and the rice wheat based PDS, the area under millets has shrunk by more than 50%, and stands at a meager 18 million hectares. At the same time, the production of millets in the last two decades or so has declined by more than 3 million tons. Medak district, the study site for this case study in the state of Andhra Pradesh, too witnessed a decline in the area under and the production of millets (see figure).



It is often proved that several indigenous communities living in some of the most remote places in this country do not have access to PDS, and even if they do, it is by travelling to distant food depots where the services are erratic. This could have been remedied very simply by decentralising the production, storage and distribution of PDS grains.

The third important shortcoming is that the PDS was unable to provide people with nutritious and diverse food. This is assumed as the fundamental reason why India finds itself in the lowly 127th position among the comity of malnourished nations globally. The food grains provided under PDS—which are hybrid and High Yielding Varieties (HYV)—are far inferior to the traditional landraces of food grains—including millets, local rice and wheat varieties—in terms of their nutritional composition.

In response to these multiple challenges of the PDS, an Alternative Public Distribution System (APDS) based on community production, community storage and community distribution has been implemented by the Deccan Development Society [DDS] a civil society group, working in the semi-arid area of Medak District in Andhra Pradesh. As a consequence of this APDS the local village communities have not only been able to control their food systems that has evolved over thousands of years but also have adequate nutritious food for their consumption in contrast to the national statistics of shrinking millet cultivation areas, these communities have been able to reclaim their fallowed lands and cultivate a myriad varieties of traditional landraces of food grains. The amazing biodiversity on their fields must be seen to be believed.

Zaheerabad, in Medak District, Andhra Pradesh, is a region that has traditionally fed itself on a variety of millets including sorghum, pearl millet, foxtail millet, little millet and so on. However, the introduction of cheap rice under PDS weaned many people away from their traditional food grains; after all, rice was easy to cook. Many women considered it to be a great blessing. However, it was only much later that the full implications of this shift in the food habits became clear.

These communities began noticing a marked decline in their household nutrition. Rice offered required carbohydrates, but very little protein and other nutrients such as iron, calcium, minerals and fiber. But the hard-working bodies of the farmers required a high amount of proteins and other nutrients, which their traditional millets and other food grains were capable of supplying.

Because PDS rice was available easily and at a very cheap price [one day of wages could now buy three months ration!], many farmers started leaving their fields fallow because keeping them productive meant hard toil. Gradually, the traditional landraces that had sustained these communities for generations started to decline. The complete 'de-milletisation' of their communities seemed a fait accompli; but the women who took a wider view of their food and farming, decided to remedy the situation.

The first step they took was to bring fallow land back under cultivation. By breathing new life into these lands and by cultivating a variety of crops, they would re-establish autonomy over their agriculture. The women approached Deccan Development Society and thence the Ministry of Rural Development which saw merit in their initiative and agreed to support the formation of community grain banks. Support to the tune of Rs.2600 per acre was extended to the women, and the initiative was launched in 30 villages; with 100 acres of fallow land being brought under cultivation in each village. Most of these lands were owned by marginal and small landholders. The effort was undertaken with the farmers in a partnership mode. This meant that the farmers—especially women farmers—were involved at every stage of planning and implementing the intervention.

In each of the 30 villages, extensive consultations were held with the farmers to chalk out the best course forward. The objectives of the initiative were clearly explained to the farmers. This was followed by participatory exercises wherein the women identified the fallow lands, mapped the soils on these lands and other relevant details. Further, the women also started explaining the reasons for leaving these lands fallow; and slowly a picture began to emerge of a forced deprivation from farming.

Following these exercises, the idea of a decentralized public distribution system was placed in front of the communities; it was immediately evident that the idea kindled hope in their minds. It thus became all the more imperative that this PDS was fashioned in a participatory manner, led by farmers, and with utmost transparency. It was decided that the DDS Sanghams would advance the money required for ploughing, weeding, applying manure and for other activities aimed at reclaiming the lands. During the participatory exercises, communities further stated that they would rather use farm yard manure which ensured that the lands remained fertile for as long as three years, instead of chemical fertilizers which helped the lands only for a year or less.



Source: Deccan Development Society

Similarly, the communities identified various challenges that they would face in their bid to reclaim the fallow lands.. The estimates [in 1994 when this initiative began] to reclaim an acre of fallow worked out to Rs.2700/- Following these consultations, the Sanghams released money as a loan to the identified farmers, for the purpose of fallow land reclamation. It was further decided that instead of repaying the loan in the form of cash, the farmers would repay it in the shape of grains. As it was difficult to get high yields right from the first year, it was decided that the repayment would be made in an incremental manner. For example, in the first year, the farmer would pay 100 kgs of Jowar [sorghum] while 200 kgs would be repaid in the second year, and so on. These arrangements had the total approval of all farmers and were embedded in agreements that were drafted through mutual consultations and agreement.

Committees of women were formed in each village and were made responsible for the oversight of this initiative. Each woman was entrusted with 20 acres of land to oversee personally. In the very first season, more than 2500 acres of fallow lands were brought back under cultivation and more than 800,000 kilograms of sorghum was produced. This translated into three million additional meals in the 30 participating villages, or 1000 additional meals for each participating household. The fodder generated from this initiative could support 6000 additional heads of cattle in the 30 villages where it was implemented. During the first season, the total grain collected in the form of repayment amounted to 10,000-15,000 kilograms in each village; enough to feed 100 households in each of them. This set off the process of identifying the 100 'poor' households in each village, which was nothing short of fascinating.

In an unprecedented move, dalit women, and those from the most backward social and economic backgrounds within the village were invited to identify who among them were then poorest and the most deserving of the support that was to be extended in the form of food grains. An array of highly sophisticated and sensitive criteria were laid down by these women to define poverty itself and those households who can be identified as poor in their respective villages. In a participatory wealth ranking exercise where the entire village community participated these criteria were discussed and approved by the entire community. For example, a set of people, aged and support less were designated as destitute and the maximum grain support was committed to them. The hard core poor were those who had no land and had to do daily labor to earn their meal for the day. Those who owned only one acre of land, had no draught animals and no irrigation were identified as poor. Similarly, if a couple had a number of small children who were not in a position to work, they were also considered as poor. People who had out-migrated due to survival difficulties were not eliminated.

Single women and their households were top among the categories of poor. Such identified poor were graded according to the intensity of the poverty they faced. On the community household map, the identified categories were painted with specific colours. In all, five categories of poor were identified and colour codes of identification: black (for destitute), red (for poor), blue (for less poor), yellow [non poor] and white (affluent). In the first year, 127 poor households were identified in all, and were supported.

Following this, each household was issued an appropriate ration card carrying the colour they were identified with.



Source: Deccan Development Society

This entitled the family a fixed quota of sorghum during six months of the year, when food and work were scarce and the poor struggled the most. In this way, the APDS plugged the critical gap in the poor households' ability to access nutritious, eco systemically adopted local food.

The initiative that started in 1994 had, by 2003 expanded to include 3600 acres spanning 51 villages. Subsequently, the APDS spread to other villages within the district and to other parts of the state and the country. As on date, 79 villages in Medak and 46 outside of Medak are covered by this project on nearly 7000 acres and supporting close to 6000 farming households. Together, these lands produce more than 2 million kilograms of food grains and have succeeded in generating about 350,000 person-days of employment in these villages. In all, the APDS is servicing more than 11,000 consumer households comprising of more than 60,000 people and has been successful in providing more than 2.7 million extra meals every season.

The sale proceeds are deposited by each village in their own Community Grain Fund, and are used to bring more and more fallow lands under cultivation; and for other land development activities.

This ensures that the food security net spreads wider and wider with each passing year. The program entailed only a one-time investment from the government, following which the entire initiative was taken over by the communities themselves; and since the entire program was planned and implemented with the active participation of the communities involved therein. That this task was managed by groups of dalit women, non-literate and marginalized, who have never been allowed to manage anything in their lives, is the most emphatic socio-political statement made by these women. After taking a look at the system, Mr.K.R.Venugopal, senior bureaucrat and a member of the National Human Rights Commission and founding father of PDS in India said that *"As one associated with the development of the PDS in Andhra Pradesh and India, I record here on the basis of my study of the project, that this indeed is the PDS we need in our country – a PDS that assures agricultural, food and seed security in the context of the urgent need for a decentralised, autonomous green revolution and Public Distribution System"*. Acknowledging these efforts, and works of others on similar lines, the Planning Commission has recommended that millets be made a part of the public distribution system. Further, the women who spearheaded this initiative have been recognized at various national and international forums, as having conquered hunger. Thanks to the efforts of these women, the National Biodiversity Action Plan- of India, made a strong argument for reorienting the public distribution system towards the use of agro biodiversity, linking it to food, nutritional and livelihood security; in particular; focus on producing and distributing local food grains through the PDS (there by providing incentives for revival or continuation of agrobiodiverse farming), and decentralize control over the system to women's committees. All these have come has huge endorsements for the efforts that these women have been putting, in their struggle for food sovereignty.

Blessing for the Poor: Underutilized diversity

Contributed By: Deccan Development Society, Hyderabad

Agriculture, especially of the poor in Zaheerabad in Andhra Pradesh, India as in the rest of the arid, semi-arid and hilly regions of India—is marked by a profound respect to biodiversity. In this region, the small and marginal farmers adhere to a system of farmer called *Panendu Pantalu*, wherein they grow a minimum of 12 crops which include a host of millets, pulses, oilseeds and a variety of vegetables. As can be imagined, this combination ensures that most of the food and nutritional needs of a given household are taken care of. One of the hallmarks of this system is the range of 'uncultivated foods' that are grown, and that play an important role the food and cultural lives of the farming communities of Zaheerabad. These uncultivated foods have been a source of life for the poor, for several generations; and are truly a celebration of biodiversity.

What is uncultivated food?

The word uncultivated was used in a general way to denote one of the following three categories.

- ❖ The greens from land that are not cultivated such as plant, creepers etc.
- ❖ The greens that are not cultivated but are available as a associated crop in a cultivated field.
- ❖ The greens that are available from cultivated plants, but the product was not the explicit objective of the cultivation.

It is estimated that an adult consumes between 100 and 150 grams of green vegetables on a given day. Many types them are consumed as vegetables, and most are rich sources of calcium, iron, carotene, vitamin c riboflavin and folic acid. These greens are inexpensive sources of many nutrients, which are essential for growth, and maintenance of normal health

Most of the rural people, especially the poor, consume uncultivated crops for at least 50-80 days in a year. Poor people, while working in their fields, gather these greens and bring them home for consumption. *Doggali Koora*, *Gangavayeli*, *Sannavayeli* and *Pundi* are consumed throughout the year. *Pundi* and *Doggali Koora* are eaten more than 20 times in a year by most of the families.

History indicates that uncultivated foods formed a major share of the food consumed during famines and stress periods. There have been times when people survived for as long as 4 months by eating only these uncultivated greens specially *Doggalikoora*, *Gangavayeli*, *Sannavayeli*, *Pundi*, *Gunugu Koora*, *Uttareni* and *Kapringa Pandlu*. This clearly hints at the fact that the biodiversity-based agriculture, of which, the uncultivated foods are an integral part, lend the poor households a tremendous degree of resilience, which is woefully absent from the present-day mono-cropping systems.

The total worth of the uncultivated foods consumed by a household in a month is estimated to stand at Rs.500-1000, depending on family size. Some of the greens like *Gunugu* are sold as green fodder in near-by towns. Uncultivated foods like *Chennangi*, *Soyikoora*, *Adonda* and *Adivikakarakaya* are also sold in towns, as they are preferred by people in towns, and are considered to be healthy. Greens like *Talaili* and *Kashapandla chettu* are never uprooted, as their availability is less, and also because they have high medicinal value. This shows its importance in the lives of people and their concern to protect them.

Classification of uncultivated foods

More than a 100 varieties of uncultivated foods are collected by the people in Zaheerabad region. These are classified according to seasonal availability and their occurrence in irrigated and dry land conditions. The prominent ones under each category have been mentioned herewith.



Source: Deccan Development Society

No	Local name	Scientific name
Rainy season (June to September)		
1	<i>Doggali Koora</i>	<i>Amaranthus polygamus</i>
2	<i>Yennadri</i>	
3	<i>Peddakasha pandla koora</i>	<i>Solanum nigrum</i>
4	<i>Yelakachevula Koora</i>	<i>Merremia emarginata</i>
5	<i>Gurmasi Koora</i>	
Creepers		
6	<i>Ataka mamidi Koora</i>	<i>Boerhavia diffusa</i>
7	<i>Chinna kakarakaya</i>	<i>Mormordica charantica</i>
8	<i>Polapatram</i>	<i>Gymnema sylvestre</i>
9	<i>Tella Bacchali</i>	<i>Spinach oleracea</i>
10	<i>Tondaku</i>	
11	<i>Doosari Teega</i>	<i>Cocculus hirsutus</i>
12	<i>Summer</i>	
13	<i>Talaili Koora</i>	
14	<i>Sannavayeli Koora</i>	
15	<i>Gangavayeli Koora</i>	<i>Portulaca oleracea</i>
16	<i>Pundi Koora</i>	<i>Hibiscus cannabinus</i>
17	<i>Shyama Koora</i>	<i>Colocasia antiquorum</i>
Trees whose leaves and flowers are cooked are available throughout year		
18	<i>Munuga Aaku</i>	<i>Moringa oleifera</i>
19	<i>Avisha Koora (Kaya and flowers)</i>	<i>Sesbania grandiflora</i>
20	<i>Tellarjam</i>	
21	<i>Sada puvvu</i>	<i>Sesbania egyptica</i>
22	<i>Ryala puvvu</i>	<i>Cassia fistula</i>
Uncultivated Foods on Dry lands		
23	<i>Taduka dobbudu</i>	
24	<i>Doggali Koora</i>	<i>Amaranthus polygamus</i>
25	<i>Ganagvayeli Koora</i>	<i>Portulaca oleracea</i>
26	<i>Adivi Mentham Koora</i>	<i>Trigonella foenum-graecum wild</i>
27	<i>Pappu Koora</i>	<i>Portulaca sps</i>
Uncultivated Foods Irrigated lands		
28	<i>Yennadri</i>	
29	<i>Tagirancha</i>	<i>Cassia tora</i>
30	<i>Tummi Koora</i>	<i>Leucas aspera</i>
31	<i>Doggali Koora</i>	<i>Amaranthus polygamus</i>
32	<i>Kodijuttu Koora</i>	<i>Celosia cristata</i>
33	<i>Chinna kashapandlu</i>	<i>Solanum nigrum</i>

Deccan Development Society has been striving for the last 25 years to revive and strengthen millet based mixed farming systems in the region around Zaheerabad. In over 75 villages, the organization has been trying provide to give fillip to the *Panendu Pantalu* system, of which the uncultivated foods are such in integral part. The senior women in every village, who had seen these systems during their youth, were aware of the salutary benefits of these uncultivated foods to the health and nutrition of a person; and were roped in, to engage with the younger generation. Through a number of participatory exercises, with the help of a range



Source: Deccan Development Society

of tools like Food Pies, Crop Matrix, and Trend Analysis and so on, they were able to successfully make the other members of the communities sensitive to the importance of this agricultural system; and to the significance of these greens. Today, these foods have become an inseparable part of the diet of the rural households in the said region. Through films shot by the Community Media Trust, a Trust started by DDS comprising of women film-makers from the communities in question, and through other creative means, DDS has managed to underscore the importance of these uncultivated greens. Uncultivated greens have indeed contributed to the improvement of the nutritional scenario of these communities.

Biodiverse farming systems have an inherent risk-mitigation characteristic; which ensures that the rural populace, especially the small and marginal landholders and the landless that they have something to eat even under the most adverse of climatic conditions. The decimation of these systems in many parts of the country has meant that the rural population has to depend on external sources—markets, usurers and others that are exploitative—in order to secure food during times of crisis. This has only contributed to exacerbating the agrarian crisis that has gripped the Indian countryside. In order to restore dignity to the lives of the poor, and to help them on their way to food sovereignty, it is important to give fillip to the wide range of mixed farming systems that abound in this country, and that have played such a marvelous role in securing food and nutrition for some of the poorest sections of the society.

Reclaiming Endangered Livelihoods: Untold Stories of Indigenous Women

Contributed By: Anthra, Hyderabad

The Aseel is a famous indigenous poultry breed of India selectively bred by the Adivasi communities of East Godavari in Andhra Pradesh, India. We describe the efforts of Adivasi women, and their adivasi organizations, which took the lead within their communities, to conserve the Aseel poultry breed and reclaim endangered livelihoods. Indigenous women (Adivasi) of East Godavari district, Andhra Pradesh, India are unique in that they have over generations protected and bred the world-famous Aseel poultry and other local breed varieties.



Source: Anthra

Birds managed under backyard systems contribute crucially to women's livelihood, and are of critical cultural importance in the lives of indigenous communities. A combination of factors resulted in the fast decline of Aseel poultry populations and associated sub-strains, in their traditional geographic locations in the early 1990s, resulting in a loss of livelihoods, and income for adivasi women and a decline in diversity of these unique poultry breeds.

It is critical to note that this community conservation and livelihood revival endeavor was not a pre-conceptualized "project" formulated to protect and conserve Aseel birds, but emerged from a wider ongoing collective effort involving peoples organizations and support Non-Governmental Organizations (NGOs), to inquire into the linkages between peoples land rights, resources, and livelihoods.

In 1996, participatory appraisals carried out by Adivasi peoples organisations in their villages in East Godavari district revealed that, while the potential annual earnings from an adult hen was Rs. 4000 after accounting for acceptable losses, in reality the farmer was earning less than half of this due to production losses resulting from egg spoilage/infertile eggs (63%) and chick mortality (37%) which was largely due to predators, fowl pox and salmonellosis. The average annual mortality amongst the village poultry population ranged between 70-80% and was primarily due to diseases such as ranikhet (Newcastle disease) and salmonellosis/ bacterial white diarrhoea.

There are approximately eight different strains or sub-strains of indigenous chickens that are recognized by the communities in the area such as *Nati kodi*, *Shankar jati kodi*, *Geesa kodi*, *Medajari kodi*, *Rencha kodi* or *Agees kodi*, *Denki kodi*, *Mattedu kodi* and *Juttu kodi*. Among these, it is the *Aseel* that has historically been the breed of choice, valued for its tasty meat, cock fighting abilities, agility and ability to escape predators that frequent the forest regions.

This translated into an average annual monetary loss of between Rs.30,000 to Rs. 50,000 in every village. In a livelihood scenario where every Adivasi family is steeped in debt that could run into thousands of Indian rupees, this loss was recognized as critical.

The *Kondareddy*, *Koyadora* and *Kondakammari adivasi* tribes live in the Scheduled V regions of East Godavari. Agriculture along with livestock rearing and collection of forest produce are the major livelihoods of the adivasi people. They rear local breeds of cattle, goat, particularly the hardy dwarf “*Kanchu Meka*” breed, backyard poultry like the Majestic Aseel and local pigs. Cattle are reared primarily as a source of manure, ploughing, offspring to produce good plough bullocks, and as a source of meat. Cows are never milked, and the milk is left for the calves. Goat kids are sold as well as consumed at home. Poultry are reared by every family, for consumption, income through the sale of birds, and most importantly for festivals and agriculture rituals. Piglets are sold as a source of income. Women are primarily responsible for the care and management of the bird under backyard poultry systems. It is also the only resource, which is completely owned and controlled by women from the moment of selection of the bird to sales/purchase and control over the income earned from the birds. Culturally, poultry are an essential pre-requisite to celebrate important festivals of indigenous communities and to honour guests and relatives who visit each other's homes.

Girijana Deepika and Tholakari Adivasi Mahila Vedika Adivasi peoples organizations, anchored the community conservation and livelihood revival efforts, and organized their own communities, particularly Adivasi women to protect their livelihoods and the associated biodiversity embedded therein, including the revival of the Aseel Poultry breed. Adivasi women took the leadership in this process. Anthra supported the efforts of Girijana Deepika with technical inputs. Yakshi is a support group for Adivasi people's organizations, and worked closely with Girijana Deepika to build Adivasi leadership to work for the revival of cultural identity, way of life, knowledge, and rights to resources and territories. Yakshi was supported by Hivos-India in some of the livelihood interventions, including poultry related, with Adivasi communities. Other participants included the Integrated Tribal Development Agency, Government Animal Husbandry Department and the Government Veterinary Hospital.

The efforts were grounded on a collective appreciation that sustaining the Aseel poultry birds, would support livelihoods which not only enhance incomes, but also rebuild biological and cultural diversity and valuable indigenous knowledge systems within the community. It involved the following process:

1. Community assessments and appraisals to analyse the role of the poultry birds in their livelihoods, the production systems, the linkages to resources, role of women and men, relevance to culture, factors threatening the breeds and livelihood, including production losses.
2. Discussions within the community about the threats and evolving collective strategies to overcome the challenges.
3. Women evolved a strategy that included multiple collective actions:
 - ❖ Re-establishing ecological and diverse agriculture cropping, this provides vital by-products for feed for the poultry. Women rebuilding their diverse food-farming production system, which provides nutrition for the family as well as by-products of food crops as a key source of feed for birds, thereby ensuring there is essentially no competition between food grain for humans and the backyard poultry.
 - ❖ Apply modern and indigenous health care and management practices to prevent and control diseases; Encouraging women to prepare and use a basket of herbal medicine practice both in prevention and cure. Access government veterinary services to ensure that birds were protected against critical diseases (new castle, fowl pox), which were decimating the population each year.
 - ❖ Innovations with traditional systems of asset building known as “*Vaata*”.

The innovation through *Vaata* was based on a traditional system of sharing and building assets popular among Adivasis in Andhra Pradesh. Under this, individual women members of *Gottis* (local village women's groups) were given a few Aseel hens and each village some breeding cocks. Each recipient was asked to return half the subsequent chicks produced by the hens once to the group corpus. The returned chicks were redistributed free or sold and the savings were accumulated within the *Gotti* accounts.

Results: When the problem was identified, *Adivasi* women responded through multiple collective actions: to re-establish ecological and diverse cropping, which have provided vital by-products for feed for the poultry; apply 'modern' and indigenous health care and management practices to prevent and control diseases; and innovate with traditional systems of asset building.

The strategy has shown to have an extremely positive impact on stabilizing the Aseel poultry population in the area, regenerating the bio-diversity of the region and enhancing household food sovereignty and income.

Herbal remedies that have been shown to be effective in building immunity and treating certain conditions are now widely used and adopted by women who in turn share this knowledge with others both within and between villages. Women were successful in bringing pressure on the government animal husbandry department to provide free vaccinations for NCD, which played a role in controlling the disease. The increase in Aseel population translated into increased consumption of birds at home, and increased income, with women now being able to market their birds at a later age. Critical to all this has been the huge success of women in rebuilding their diverse food-farming production system, which provides nutrition for the family as well as by-products of food crops as a key source of feed for birds, thereby ensuring there is essentially no competition between food grain for humans and the backyard poultry.

The interventions resulted in considerable reduction in poultry morbidity and mortality. Mortality rates fell from the baseline survey levels of 70% in 1996 to 25% in 2008, dipping to as low as 6% in 1999. Sample surveys conducted in January 2008, revealed an increase in poultry income compared to surveys conducted in 1998

This initiative also had its share of challenges. These include, Building the immunity of the birds was closely linked to improving the feed-base of the birds, which in turn depended on the crop-residues derived from traditional food crops. Reviving the diversity of crops, which in turn generate crop-residues for the birds, was a challenge, which continues, under the continuous impact of macro-economic development forces that constantly attempt to persuade adivasi farmers to shift their cropping from food crops to non-food cash crops and mono-crop plantations.

The second major challenge has been ensuring that the government supplies timely vaccinations, which continues to be extremely erratic, despite the pressure brought on them. This is related to the larger issues of government dismantling its own public health care systems, and privatizing services such as preventive vaccinations.

The third major challenge has been to convince the government agencies to stop distributing so called “high egg producing” breeds such as *Vanaraja*, *Giriraja*, and other such non-local breeds, which threaten the Aseel gene pool. These challenges are being addressed, by community mobilization to build pressure on the government to change its macro-policies, and programs, as also to utilize the provisions of the Panchayat Raj (Extension to Schedule Area) Act, 1996, which empowers Adivasi communities living in Schedule V regions, to draw up their own development plans, and exercise their Free and Prior Informed Consent before any top-down development program is implemented.



Source: Anthra

Lessons learned: The most important lesson from this experience is that indigenous breeds will survive and adapt to changing conditions, only when the community controls the gene pool.

This experience celebrates the success of a community led effort that enhanced women's livelihoods provided economic returns as well as facilitated local mobilisation around Aseel conservation. It also highlights that people aptly know the value and potential of their genetic resources. Observing the impact of this effort in East Godavari, *adivasi* women from 6 other districts in Andhra Pradesh, (Vizianagaram, Visakhapatnam, Srikakulam, West Godavari, Khammam and Adilabad) learnt and adapted these strategies from their Adivasi sisters in Girijana Deepika. Dalit women in eastern parts of Chittoor used similar strategies to rear and conserve the Kalahasti breed of indigenous poultry.

The experiences were presented at the World Poultry Congress in 2008, and later published in the peer reviewed World's Poultry Science Journal, Vol. 65, in June 2009. It was documented as a “best practice” case study by the FAO, in their South Asia Pro-Poor Livestock Program in 2010. Unfortunately despite sharing the strong positive impact of promoting indigenous poultry breeds both in terms of livelihood and biodiversity conservation, the mainstream policies and plans and budgets and credit programs, refuse to adopt this strategy, and persist in financing non-indigenous “high-yielding” breeds and production systems that are linked to industrial and intensive farming systems, where the genetics of the birds are controlled by the companies, and not by the people.

The Deccani sheep story: Community Initiative

Contributed By: Anthra, Hyderabad

In Andhra Pradesh, about 400 pastoralist/agro-pastoralist families spread across 24 villages in Hathnura, Jinnaram, Narasapur, Narayankhed and Shivampet mandals of Medak district are involved in direct intensive community action on conservation of the Deccani sheep breed. Anthra's work revealed that Hathnura, Jinnaram, Narasapur, Shivampet along with Veldurthy in Medak district are amongst the handful of remaining geographic locations in the state which continue to have significant numbers of the total sheep population of 'pure Deccani breed population'. In Maharashtra, the community initiative in the three districts of Satara, Solapur and Kolhapur focuses on the seven taluks or blocks of Hatkanangale, Khandala, Koregaon, Malsiras, Mann, Phaltan and Sirol.

Anthra's journey with the Deccani sheep began in 2005 when it responded to the requests of local shepherds of Medak district, to engage with their concerns of growing ill-health in their sheep flocks, which they traced to the dilution of the Deccani breed, which was being outcrossed with other hairy mutton sheep breeds, as part of government policies.

The Deccani sheep breed is valued for its wool, meat and manure. This sheep breed is a coarse wool-cum-meat breed and is unique worldwide because of its wool, which comes in various shades of black. The wool is important as it protects the animals

This unique black wool breed of sheep is completely adapted to the local ecological conditions in Telangana and other semi-arid parts of the Deccan, and provides a livelihood to a wide range of shepherds, craftspeople and farmers.

from the weather patterns and extreme temperatures that are typical of the semi-arid Deccan plateau. The Deccani sheep wool is the source of the *gongali/gongadi/kambali* (a local blanket) – one of the most essential and multi-purpose traditional apparels worn and used by the communities across the Deccan, particularly the pastoral communities.

The Deccani breed is being rapidly out-crossed with other non-wool, primarily, meat-sheep breeds – the Red Nellore in Andhra Pradesh, the Madgyal in Maharashtra and the Yelugu in Karnataka. The policies of the government and market forces have

resulted in the gradual disappearance of the breed leading to a disruption in the cycle of life of the community.

The black wool has also been the source of livelihood for shepherd women and in Maharashtra for the Sangar weaving community where the wool has traditionally been felted and made into floor throws and mats called *jenn*.



Source: Anthra

The state animal husbandry departments have encouraged shepherds to replace their Deccani breed with heavier non-wool sheep breeds. The second biggest threat to the breed today is the rapidly diminishing grazing lands. This breed essentially survives by grazing on common property resources, forests, and harvested agricultural fields which has been converted into horticultural plantations, privatized properties with industrialised and non-food agriculture. Economic reforms in India, in the early 1990s, resulted in coarse wool being suddenly out-priced from the market, which was flooded with cheaper imported 'shoddy' wool products, from Australia and other countries. It also resulted in policy decisions that favored export of meat from India to other countries. In the context of the declining market for coarse wool and the steep increase in the demand for mutton, shepherds began to opt for meat breeds rather than wool breeds. The resulting mixed breeds began to lose their wool cover which increased their vulnerability to the sweeping weather changes that are found in the Deccan. The new breeds also required greater quantities of fodder, and the combination of factors, made increased increased their susceptibility to diseases, forcing many shepherds to leave their profession. Thus the conservation of the deccani breed was extremely important for sustaining the livelihoods of the shepherds and also preserving the genetic pool and bio diversity of sheep.

The Deccani sheep breed found in the semi-arid Deccan tracts of Andhra Pradesh (Telangana), north eastern Karnataka and central Maharashtra are medium-size, coarse wool sheep with black being their dominant colour. It is a short-tailed sheep and lambs thrive in two years. It is ideally suited to the extreme temperatures of the Deccan and is a hardy breed adapted for long-distance migration in search of food and water, which is a necessary coping strategy of animals and the people who rear these animals in the arid and semi-arid zones.



Source: Anthra

The culture and livelihoods of the traditional Kuruma, Kuruba, Dhangar shepherding communities are interlinked. The Deccani sheep find a place in stories, festivals, celebrations, songs, and seasonal offerings. When the flocks return home after migration each year in Medak, the shepherds celebrate the new agricultural season by performing a marriage between a ram and a ewe in the flock! They pray that there will be fertility and the ewes will reproduce and care for their young ones.

The shepherds community, have been key players in conserving the breed. The sanghams of shepherds and women were key actors in this process of reviving the breed and the traditional knowledge. These community-based sanghams, (Guts in Maharashtra) comprising of both men and women of the villages, are the backbone of the Deccani sheep breed conservation efforts. One such collective, the Uni (wool) Sangham in Medak district, Andhra Pradesh, is concentrating on the process of reviving the gongadi craft. It comprises shepherds, spinners, weavers, kada specialists (who produce the gongadi borders), and advisors from Anthra. Constant interaction and dialogues with the animal husbandry department has been key factor in the conservation of the breed. Anthra has engaged with the community in thinking about strategies to revive and sustainably use the breed. Anthra was able to garner support for this effort from Misereor, Germany and the South-Asia Community Biodiversity Management Program, anchored by Li-Bird in Nepal, and supported by Development Fund, Norway. The revival of wool crafts was supported by Textile designer Elana Dickson, from the UK, who has had over 3 decades of experience working with weavers in India and Ms. Kathy Sreedhar, from Holdeen-India Program.

Anthra's key strategies to catalyse and enhance collective interest and commitment amongst shepherds to continue to rear the Deccani breed range from community level actions to research, development and advocacy.

- ❖ Forming strong community-based institutions/*sangham* of men and women to protect their breeds, collectively address their problems and to campaign to protect their rights to resources.
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- ❖ Working on the prerequisites to protect the breed – improving health care services and addressing the problems of disease and ill-health, improving access to grazing and fodder resources, and improving access to water.
- ❖ Enhancing people to people learning and sharing platforms for communities to learn from one another and to get involved in actions towards protecting their breed, such as decisions to replace Nellore Breeding Rams with Deccani Breeding Rams.
- ❖ Initiating village-level campaigns on the importance of the Deccani breed; Annual Deccani breed jathras and celebration which occur from village to district levels.
- ❖ Conducting research on village Deccani flocks to map and describe the breed according to shepherds' perceptions and knowledge, and to record phenotypic, reproductive and productive parameters of the village flocks.
- ❖ Encouraging shepherds to select their best lambs as the Deccani breeding rams for sale or exchange with other shepherds interested in replacing their non-Deccani rams.
- ❖ Developing a community fund for pastoralists, managed by women shepherds to assist shepherds with loans for the purchase of Deccani rams, ewes and lambs.
- ❖ Revitalising wool-based livelihoods
- ❖ Exploring new marketing avenues for the Gongadi and other wool crafts, in local markets
- ❖ Lobbying and advocating with scientists, policy makers, government departments, political representatives.

Deccani breed '*Jatharas*' organised from village to district levels since 2005 in Andhra Pradesh and 2007 in Maharashtra, served as a community strategy to map the spread and extent of the breed, and also acted as a platform through which the communities realised the importance of their breed, and strengthened their resolve to revive and re-establish it. From 2007 onwards, shepherds from several villages in Andhra Pradesh and Maharashtra began to replace their Red Nellore/Madgyal rams with good Deccani rams.

The deccani rams were selected by experienced shepherds and were raised in the pure flocks and then were available for others shepherds. The shepherds have also begun to pro-actively contact government veterinary doctors and access medical facilities when their animals fall sick, instead of resorting to self-medication or seeking the medical advice of shopkeepers. The shepherds collaborated with Anthra to develop a flock level disease recording calendar/booklet as a tool for the shepherds to record the changes in their flocks in terms of morbidity and mortality on a monthly basis, which acts as an internal mechanism of understanding their flock and planning strategies. They have reduced their dependency on antibiotics, and have begun to treat their animals with herbal and homeopathic remedies. In Medak district, Andhra Pradesh, the purity of Deccani flocks has been steadily increasing. Increased purity of the breed, resulted in improved quality of wool, and it became materially possible to begin the next phase of revitalising the dying wool-crafts.

The re-weaving and revival of the *gongadi* in Medak district, Andhra Pradesh, is a collective effort of shepherds, spinners, weavers, kada specialists, herbalists, veterinary scientists, folk artists, ecologists, designers, healers, and farmers, leading to sustainable and creative livelihoods for all concerned.

Shepherds have identified the absence of grazing lands and lack of water and fodder for their flocks as major constraints to sustaining the Deccani breed. Anthra has encouraged shepherds to negotiate with their Panchayats to ensure that the Gram Sabhas pass resolutions that will protect their remaining common lands, and protect the access rights of shepherds to these lands to graze their animals and access fodder trees. In



Source: Anthra

those regions, where shepherds depend upon the forests to graze their livestock, they are continually struggling to defend their grazing rights. More recently, they are exploring ways to use the Forest Rights Act to defend their rights to graze in the forests. In addition, they are introduced to practical ways of enhancing fodder such as growing traditional fodder varieties on private and public lands. They are attempting to mobilize Panchayat funds to renovate village ponds and tanks, which are the primary source of drinking water for the sheep and goat. The shepherds are also seeking funds to help construct drinking water troughs along their grazing routes. Robust sheep health is also tied to a robust and responsive State public veterinary health care system, which should be able to provide timely vaccination coverage, disease monitoring and preventive management programs. The community continues to struggle to “access and benefit” from their breed, against increasing odds: Restoring the local market value of wool and the slower growing Deccani breed without any State support, threatens to be engulfed and swept away by the hungry tide of demand from external urban markets for fast-growing sheep. The latest roadblock is the decision of the State to expand Hyderabad city into India's second largest metropolitan city, which will wipe off the face of the map 600 villages in its vicinity, including these villages in Medak district that are in the forefront of the struggle to conserve the Deccani sheep. The FPIC of the people is not a pre-requisite, and the State can do precisely what it desires.

The villages are once again gearing up, determined to use the Gram Panchayat, to resist this take over. Influencing policy makers and researchers includes strategies like sharing field-level experiences through local, state, national and international level seminars, conferences and workshops, disseminating information through publications and the media, and a proactive effort to engage and debate with scientists and research institutions, policy makers and political representatives, in the hope that they will finally make this their concern as well.

Lessons learned: The collective effort has undoubtedly generated local and national interest in the Deccani, with several concrete steps having been taken by the local communities in resisting and halting the erosion of the Deccani gene pool. However, the efforts of a few NGOs and committed shepherds to conserve and sustain these threatened breeds for today and tomorrow are insufficient without the wholehearted support of the scientists and the government to assist communities in this uphill battle. The conservation of breeds cannot happen through patenting life forms and genes, and intellectual property rights. Breeds can only be conserved if the shepherding and wool-weaving communities are enabled to sustain their livelihoods. This demands a completely different political ideology and development vision, for which the people have to struggle to change the current formulation of government policies and practices, and markets.

Managing Livestock : Role of Ethno-veterinary Medicine

Contributed By: Anthra, Hyderabad

The action-research on Indigenous knowledge systems in animal health was initiated by Anthra between 1996 and 2003 in three distinct agro ecological zones, in the two states Andhra Pradesh and Maharashtra. The present case study illustrates the work done in the hilly-forested *Adivasi* tracts of East Godavari district in Andhra Pradesh.

Indigenous knowledge (IK) of animal rearing and health care had always been a vital body of knowledge and practice in the lives of peasant, pastoral and adivasi communities in India, and an intrinsic element of their daily agriculture and livestock based livelihoods. A primarily oral tradition, this body of knowledge was found to be rapidly disappearing within the community, in the process of agriculture transforming from sustainable food-farming systems to green revolution industrial farming systems. This process of industrial farming, was the primary reason of marginalisation of earlier modes of knowledge and practice. These concerns emerged through conversations between Anthra and the peasant, pastoral and adivasi communities with whom Anthra worked in different parts of Andhra Pradesh and Maharashtra. Young people from the communities were inspired to engage with their dying traditions, and capture their oral heritage into a written format, which would remain with the community for future generations.

The overall objective was to facilitate a process whereby young people from farming, pastoral and adivasi communities would take the lead to document, socially validate and encourage their community to actively utilize and re-integrate dying livestock management and ethno-veterinary practices into their agriculture-livestock based livelihoods. Our research explored the following specific areas: local production systems in relation to landholding, caste and production goals of different livestock rearing communities; local breeds and breeding strategies; livestock shelter; feeds and fodder; preventive management and treatment; elements of healing; and finally marketing of livestock and livestock products. Enquiring into the gender issues in IK and livestock production was an underlying theme of our research. The project was divided into three phases: (i) documentation (ii) community appraisal and social validation (iii) revival of the knowledge through practice.



Source: Anthra

East Godavari district is located in the north coastal part of Andhra Pradesh. Geographically the district has the hilly eastern ghats located towards the west, and plains to the east bordering the Bay of Bengal. The district has 5 revenue divisions (Kakinada, Rajahmundry, Peddapuram, Rampachodavaram and Amalapuram), 60 mandals and 1011 gram panchayats. 7 mandals are included under the Vth Schedule of India, colloquially known as the Agency area, which is the traditional homeland of adivasi communities. Nearly 50% of the land in the Schedule V regions of East Godavari is classified as forests, which are described as tropical dry/mixed deciduous. The agro-ecological zone is hot, dry and sub-humid. The normal rainfall of the district is 1280.0 mm.

The Kondareddy, Koyadora and Kondakammari adivasi tribes live in the Scheduled V regions of East Godavari. Agriculture along with livestock rearing and collection of forest produce are the major livelihoods of the adivasi people. They rear local breeds of cattle, goat, particularly the hardy dwarf “*Kanchu Meka*” breed, backyard poultry like the Majestic *Aseel* and local pigs. Cattle are reared primarily as a source of manure, ploughing, offspring to produce good plough bullocks, and as a source of meat. Cows are never milked, and the milk is left for the calves. Goat kids are sold as also consumed at home. Poultry are reared by every family, for consumption, income through the sale of birds, and most importantly for festivals and agriculture rituals. Piglets are sold as a source of income.

The *Adivasi* peoples organization Girijana Deepika, anchored the process with their community, in collaboration with Anthra. Traditional healers (women and men), Traditional elders, Gram Sabhas, Community barefoot researchers/ animal health workers, Adivasi women's groups and a Technical Advisory Committee, comprising scientists from different disciplines, sociologists, traditional leaders from the community guided the action-research.

Key activities: Discussing and formulating the framework for the action-research with the community, and obtaining the Free and Prior Informed Consent from the Community, before initiating the action-research.

Formal signing of agreement between *Adivasi* Peoples Organisation Girijana Deepika, representing the community and Anthra. Setting up a Technical Advisory Committee to guide the research. Regular review of the research process and protocols with the technical advisory committee. Selection of young community researchers, half of whom were women, by the village gram *sabhas*.

- ❖ Identifying and organizing traditional healers and formation of healers platforms
- ❖ Evolving protocols for documentation of animal shelters, feeding, breeding, management, healing, local markets and the gender dimensions therein.
- ❖ Training of the community researchers as animal health workers
- ❖ Orientation and capacity building to the community researchers on documentation,
- ❖ Documentation of animal shelters, local breeds and breeding strategies, feeds and fodder, preventive management and treatment, elements of healing, marketing of livestock and livestock products, gender dimensions of indigenous knowledge.
- ❖ Social Validation of the Ethnoveterinary practices involved disease-wise, region-wise plant indexing, prioritizing diseases for which treatments would then be assessed, ranking and categorizing of treatments based on Anubhava Siddha Chikitsa' (experiential validation/empirical information) and secondary literature, and finally field-testing of select treatments.
- ❖ Social Validation of Traditional Feeds and Fodders
- ❖ Dissemination of knowledge through people to people transfer and sharing of knowledge and information, low-cost publications, training programmes, *jatras*, campaigns and school textbooks.
- ❖ Pilot efforts by community to conserve and promote valuable fodder and medicinal plants through community and kitchen herbal/fodder gardens.

Results and Impacts:

Increased use and application of knowledge and practices pertaining to breed conservation, raising traditional foddors, preventive and curative ethnoveterinary practice, and management practices, by the younger members of the community. Recognition to the traditional healers, and healers playing a prominent role in disseminating knowledge to younger members of the community. Transfer of knowledge from male healers to Women Animal Health Workers (AHWs) cum community researchers. Women AHW's played key role in validation of remedies and increased use of all practices and knowledge by women at household level.



Source: Anthra

Ethno-veterinary remedies while found effective against a wide range of common disease conditions, are not a panacea for all disease conditions, particularly contagious diseases and other emergent diseases such as Peste an Petits Ruminants (PPR) and blue tongue. Ethnovet practices are not a substitute for a comprehensive public-health care system, which has to play a critical role in preventive and curative health care.

The action research resulted in developing an extensive computerized database on medicinal plants, animal diseases, treatments, profiles of traditional healers, and perceptions of farmers and livestock rearers. Increased productivity of livestock due to better management of health. Decrease in morbidity and mortality of livestock.

Increase in family consumption and nutrition due to increase in livestock holding. Increase in incomes at household levels and decrease in expenditure on animal health.

Community Conservation of herbal medicinal plants, treatments, indigenous breeds and fodder varieties on farmer's fields, and community spaces. A biodiversity park was established at Thungamdugula in Addateegala mandal where 200 medicinal and fodder species are grown. A medicine making unit with basic infrastructure to produce herbal medicines was also set up. This park is also a training and educational center.

Challenges: Community healers were very clear that this knowledge should not be misused, but should be used for the benefit of their community people. They also instilled in the young people / community researchers who apprenticed with them that this is not knowledge that can be learnt overnight, but requires patience, commitment and integrity. The young people were initially impatient, as they thought that by merely noting down everything they could learn to become specialized healers. However they soon realized that they had to be a "shishya" or student and learn hands-on, by going to the forests, observing the animals and plants, distinguishing different plants, learning the correct way to collect the plants and prepare the remedies, and administer them. They also learnt the important lesson that treatment alone was insufficient, and it was holistic health and its principles which had to be documented and understood. Some women healers were scared to participate, as they feared being branded as witches practicing black magic. Healers were extremely concerned that the loss of medicinal plants which was happening rapidly was going to result in an inability to use their indigenous knowledge and practices.

Beyond results: Adivasi farmers, primarily women, took the initiative to stem and reverse the process by which their food crops were getting replaced by cash crops such as cotton and tobacco and tapioca. They conserved over 40 different varieties of crops: pulses, oilseeds, millets, cereals, vegetables, tubers, leafy vegetables, fruits and took pro-active ownership to take control over their food-farming systems and re-diversify.

This resulted in revival of diverse crop-residues to feed livestock, and revival of several fodder trees and grasses. It is a ground-breaking community effort to conserve the *Aseel* poultry, and *Kanchu Meka* – a dwarf variety of goat. The technical advisory committee comprising of scientists from national level research institutes such as Indian Veterinary Research Institute (IVRI), Kotakkal Arya Vaidya Shala and Haryana Agricultural University played an important role in the protocol development and social validation. The findings from the action research contributed to the inclusion of ethno veterinary knowledge systems at the undergraduate curriculum. After the completion of the research Girijana Deepika and Anthra helped and guided a host of other people's organizations, NGOs, to document traditional animal healing and management practices. The research findings were widely disseminated to communities, and findings published in several national and international journals of reputation resulting in widespread recognition of the significance of indigenous livestock management and ethno veterinary practices, the participatory action-research methodology as also the importance and pre-requisite of Free Prior Informed Consent (FPIC).

The *Adivasi* community successfully conserved and are sustainably rearing the *Aseel* Poultry and the Dwarf *Kanchu Meka* Goat, an amazing dwarf goat breed with high twinning rate.

The grass called *Kanapa gaddi* (*Sorghum helpense*), is an excellent fodder for large ruminants, and is today extensively grown, and fed to cattle, especially during the monsoons.

Feeding trials using *Parimi* (*Zizyphus oenopliea*) to understand its effect as a supplement to goat kids, was found to have a positive impact on growth as also built immunity amongst the goat kids. This encouraged many *adivasi* goat rearers to grow and use the plant. It is fed to the goat kids when they are left at home, at the time when the dams (goat mothers) go off to graze. *Gilla pappu* (*Entada scandens*) is a useful dewormer, and is judiciously used to deworm goats and calves; *Peddamanu chakka*, or the bark of *Ailanthus excelsa*, is used to treat cattle that are suffering from indigestion and abdominal pain. It is also extensively used as an excellent remedy to treat bacterial white diarrhoea in poultry.

The Animal shelter built on stilts known as *Baddi paka*, is an excellent form of housing that prevents the accumulation of dung in the shelter, thereby reducing the incidence of intestinal worms, foot rot, and respiratory diseases, as also protects the goats from wild-life. Many *adivasi* families continue to construct this shelter for their goats. Foot rot, a disease condition that occurs during the monsoons, is prevented by making the animals stand in a mud-bath that is treated with a mixture of herbs such as *Billakodise* (*Cleistanthus collinus*), *Vepa* (*Azadirachta indica*) and *Musidi* (*Strychnos nux-vomica*).

Lessons learned: The real value of Indigenous Knowledge is seen only, when it is applied within a larger, holistic farming systems perspective, which encompasses land, livestock and agriculture. For instance, there is little value in treating animals with a herbal remedy if the agricultural system continues to be chemical- and pesticide-intensive and promotes crops devoid of food and fodder value. Hence indigenous knowledge needs to be viewed in its entirety, as a world view and body of knowledge that provides insights and answers to a farming system which is increasingly becoming industrialized, and witnessing the artificial separation of agriculture and livestock as two independent instead of 'integrated' and interdependent production systems.

IK has a lot to offer in terms of healing the land with ecologically sound practices that at once enhance production and promote diversity. Only if the land is healed, can the livestock be healed using IK. Indigenous knowledge of livestock production and animal health has wide applications in dryland agriculture, watershed and other natural resource management efforts.



For IK to become prevalent in these areas require efforts of individual farmers coupled with major policy changes.

Simultaneously we find another significant external threat to people's knowledge and its associated genetic material: the privatization of biodiversity, its knowledge and associated genetic material through intellectual property rights and other patent regimes, as a result of both national and international development policies and trade regimes. On the one hand, communities are increasingly facing declining access to local plants due to commercial overharvesting and loss of user rights to resources. On the other hand, all these ethno-veterinary practices are being abstracted out of a broader context, and being identified as 'innovations' which have the potential to be patented, commodified, and sold as 'ITK products', through further scientific research. We strongly anticipate that this latter path of research on traditional knowledge far from enhancing access to a larger number of farmers, will, in fact, only further restrict access, as IK becomes a tradable commodity available only to those who can pay.

Community knowledge must remain in the public domain for the benefit of the people and should not be privatized or commercialized, traded, patented or made a source of profit for corporations or the government bodies.

Building Fodder Security in Rural Areas

Contributed By: Anthra, Hyderabad

The action-research to document and validate the traditional knowledge of farming, adivasi and pastoralist communities with respect to feeds and fodder was initiated by Anthra between 1996 and 2003 in three distinct agro ecological zones, in the two states Andhra Pradesh and Maharashtra. Communities from 6 districts (East Godavari, Medak and Visakhapatnam in Andhra Pradesh and Pune, Ratnagiri and Latur in Maharashtra) located in 18 blocks/mandals and 54 villages were involved in the process of re-claiming and reviving their knowledge and practice.

Indigenous knowledge of animal rearing and health care has been an intrinsic element of everyday agriculture and livestock based livelihoods of peasants, pastoral and adivasi communities in India. In the midst of rapid transformation of agriculture from sustainable food farming systems to green revolution based industrial farming systems; this body of knowledge primarily passed on through oral traditions is found to be rapidly disappearing from the community. This transformation was triggered through various agriculture policies of the Government of India from the 1970s onwards. The marginalization of traditional modes of knowledge has been further catalyzed by the intrusion of industrial farming systems. The community articulated these concerns through conversations between Anthra and the peasant, pastoral and adivasi communities with whom Anthra worked in different parts of Andhra Pradesh and Maharashtra. Youth from the community were inspired to learn from their elders and prevent the complete loss of their heritage. They took a lead in the restoration and revival effort which would remain with the community for future generations.

The major objective was to identify indigenous feeds and fodder, grazing and feeding practices used in the past and compare these with present practices (present refers to 1996-1998 coinciding with the first phase of our collective research), the seasonal difference in feeding practices, the traditional evaluation or assessment of a feed by farmers/pastoralists, the palatability and availability (both temporal and actual quantity over time) of fodder. In addition, the project looked at ways of storing feed and fodder, and special feeding practices during disaster situations. Mapping grazing routes and practices, and watering practices was an integral component of the research. The most critical innovation was that documentation did not occur as an externalized process of recording information by outsiders but was an organic process involving diverse members of the community along with "non-local community" members. It facilitated several networks of learning and sharing both horizontally and vertically. It stimulated practice of documentation, self-analysis and reflection within the community. It enabled scientists trained in the formal paradigms of "modern science" to engage with "traditional science" and help validate this body of knowledge which goes beyond the narrow and limited definitions of "monetary value" being placed on traditional knowledge systems.

In context of recurring periods of drought and fodder scarcity, young farmers were interested to explore traditional systems by which their elders had managed to feed the animals, and strategies whereby they survived periods of scarcity.

Poor and marginalized farmers, livestock rearers, *adivasis*, *dalits*, and pastoralists including both men and women participated and anchored the enquiry within their communities. 540 households were involved directly in the action research and many more households were reached through meetings and campaigns as part of the process of knowledge dissemination. The major livelihoods of the rural communities in these regions are agriculture, livestock rearing, wage labour and forest based livelihoods, which vary from region to region. The villages selected were mostly remote villages; some do not have basic infrastructure facilities like roads, schools, markets and hospitals. Literacy levels are fairly low. There have been huge fodder and drinking water scarcity in summer season.

The documentation and action research was conducted in three different agro ecological zones i.e., semi arid regions, hilly forested regions and coastal regions of Andhra Pradesh and Maharashtra. Each region has different fodder species and different feeding and lopping practices. The semi arid regions have high temperatures and less rainfall, 900 mm/year and green fodder is not available in the summer months, while in the hilly forested regions the rain fall is above 1200 mm and fodder from trees, shrubs and herbs was available except for few months. In the coastal regions the rainfall was high with canal irrigation and a greater availability of grass species. The diversity of the fodder species has been declining due to several factors such as the deforestation forests which are being cleared for dams, mining, infrastructure and commercial timber, diversion of open grazing land for non-farm activities, change in cropping patterns and indiscriminate use of chemical fertilizers and pesticides which effect the local vegetation.

Anthra took the lead in conceptualizing the participatory research but it evolved and took shape in collaboration with the active participation of key community members such as community documenters, healers and elders and youth from different sections of the community. The active support of local peoples organizations and collaborative NGOs in other instances, facilitated the process. Anthra along with knowledgeable members of the community took responsibility for training the young community researchers to document their oral traditions.



Source: Anthra

The information generated through this action research project has been brought out as several booklets and books in Telugu, Marathi and English. The one in English is named "Plants used in Animal care". There is a book in Telugu titled: 'Sahaja Metha Sampada' (Natural Fodder Wealth) and a book in Marathi titled 'Shyadrithil Chara Sampathy'. These are available with Anthra at their Hyderabad and Pune offices. Communities were encouraged to raise these traditional fodder varieties on their own fields, around their homes as also on community lands (forests and non-forest). Many farmers also began to diversify their crops and return to cultivating food crops, which would yield diversified crop-residues.

Phase I and II of documentation, validation and dissemination was facilitated through a research grant to Anthra from the Swiss Agency for Development Cooperation. Phase III of farmers active participation integrating practices into their livelihoods was partly supported by the Animal Husbandry Department, as also the Department of Science and Technology, Government of India. Local NGOs, Peoples Organisations, and Gram Sabhas, provided all the support for the participatory research. They helped in selecting the barefoot researchers (men and women) and the selection of villages which were part of their work areas. Farmers representing different sections of the community - caste, land holding, gender, age-group, participated in sharing their knowledge with respect to fodders grazed upon by different species and also participated in pilot

experiments to evaluate different indigenous fodder varieties. Scientists from formal research institutions as also knowledgeable community elders, experimental fodder farms as also independent researchers and academicians provided technical guidance for the research protocol, identifying fodder species and participated in periodic review meetings.

The entire experience with traditional fodders can be broadly divided into Three phases:

i) Phase of Documentation: 1996-1998 - Designing methodology, adaptation of participatory tools, species identification, computing the information, analyzing information using computer software to retrieve the information and consolidation.

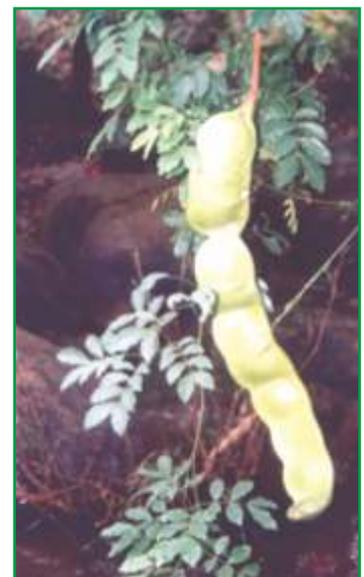
This phase resulted in generating a database of information on the traditional Knowledge on fodders, which could be accessed based on various needs (species, availability, palatability etc..)

ii) Phase of Validation, preparation of extension materials into local language and Dissemination to the community 1998-2003. The nutrient content of traditional fodder varieties was tested in the laboratories.

iii) Phase of dissemination of information and consolidation of activities - 2003-08

Animals feed cyclically through the year on a range of different feeds and fodders. In the summer months it is predominantly crops residues and standing crop-stubble in harvested agriculture fields; in the monsoons it is natural grasses, herbs; in the winter it is fodder from trees and shrubs. A major finding of the research was that the dramatic shift in cropping patterns in all areas from food to cash crops, had resulted in a drastic change in diets for livestock, and reduced variety and quantity of feed available for livestock - especially a reduction in the quality and quantity of crop residues. There was a distinct decline in public grazing lands and increase in private lands and fallow, resulting in increased hardships for marginal farmers who depended on common resources for grazing. Another perceptible shift was the replacement of perennial grasses by annuals. A disturbing observation was a general loss of knowledge on fodder types amongst members of the younger generations. A total of 440 traditional fodder varieties in Andhra Pradesh and 298 in Maharashtra comprising trees, shrubs, herbs, climbers, grasses and crops were documented, of which 9-11% were abundantly available, 28-38% were moderately available, 43-54% occasionally available and 9% were scarce. Many of the fodder varieties documented as scarce had become so due to commercial harvesting.

Many fodder types that were very palatable to livestock, in fact, were found to be substantially available. A similar distribution was found in both the states. Farmers have a definite knowledge about the palatability, value and traditional effect of the fodder species eaten by all types of animals. From their experience they say that certain types of fodder increases milk yield, certain species give strength and certain others help for faster growth in kids. The farmers also have knowledge about the side effects of certain fodder species like Jerripothu gaddi (*Panicum repens*), a grass species recorded from Medak district, Andhra Pradesh, results in higher milk yields in buffaloes. Goat kids fed on Parimi (*Zizyphus oenoplia*) leaves, grow faster according to farmers from East Godavari, Andhra Pradesh. Leaves and fruit of Babul/Nallatamma (*Acacia Nilotica*) increases the growth rate and milk yield in lactating does. Excessive intake of "Gatharekulu/Adavi ulli" (*Urgenia indica*) results in bloody diarrhea.



Source: Anthra

In Andhra Pradesh 81 fodder species consumed by bovines, 104 varieties eaten by goats and 50 varieties eaten by sheep were prioritized, of which some 70 varieties were tested for their nutritional values. There was close parity between the traditional effects reported by the farmers and the nutritional values recorded after testing in laboratories. Five different field trials were conducted to validate/assess traditional ways of utilizing fodder in Andhra Pradesh and Maharashtra.



Source: Anthra

The process of documentation, validation, dissemination and practical applications were vital in

the effective re-integration and revitalization of traditional knowledge systems pertaining to fodder. The methodology used ensured the complete participation and involvement of the local communities who bring in their traditional knowledge and experience. The scientific and traditional validation methods have shown remarkable similar findings, especially regarding the nutritive value of specific grass and tree fodder. This has helped to break the myth prevailing in the mainstream regarding the fodder value of traditional species.

1. Women farmers have sound traditional knowledge regarding nutritive value of different fodders and grasses. Community-led action research coupled with scientific validation methodologies is important in blending people's scientific knowledge with mainstream scientific knowledge.
2. In rain fed areas, traditional feed and fodder species are more suitable as compared to hybrid irrigated varieties. Fodder development need not always be done by promoting irrigated varieties of grasses or other fodder species which resource poor households cannot adapt. Introducing irrigated fodder varieties in dry land regions can be detrimental to the environment depleting the scanty water resources of the area.
3. Documentation of traditional knowledge concerning plants, feed and fodder species has to be conserved to pass it on to future generations. This needs concerted efforts, financial and human for a considerable period of time and can lead to the revitalization of traditional knowledge systems both by individuals and as a collective, which in turn, can result in positive changes in their livelihood systems.
4. Everyone involved in the action-research realized the importance of reviving traditional food crops, as these provide crop-residues which are the key sources of feed during the summer months.
5. Lopping of branches of trees undertaken in traditional ways facilitates enhanced growth of branches leading to more fodder production demonstrating that the traditional practice of lopping of trees in forest areas does not harm the forest in any way.
6. There is tremendous scope for departments and government plans and policies to utilize funds to promote indigenous fodder yielding trees, shrubs, grasses, instead of growing timber yielding, biofuel and other non-fodder plantations species, through their programs such as the National Rural Employment Guarantee Scheme, watershed programs, and other restoration work, with active community participation.



In the context of severe fodder shortage existing in our country, enhancing the fodder base and make it available around the year should be the priority of all government departments involved with rural livelihoods and development agencies. It is advisable to adapt an action oriented approach with a precondition to recognize the value of the traditional knowledge. Sincere commitment to ensure that the traditional knowledge is restored and communities take the control of the knowledge and use them is critical.

Scientific documentation and monitoring of lopping practices, served to challenge biases and myths about the practice, and consolidate information on effective lopping practices. The activities not only supported enhancing and maintaining biodiversity but resulted in better livestock management and securing livelihoods for the local poor.

Improving the Quality of Life: Livelihood through Sustainable Use of Local Biodiversity Resources

Contributed By: Paribesh Unnayan Parishad (PUPA), Kolkata

The Sunderbans is the world's largest mangrove ecosystem spread over an area of 9,630 Sq. Km. in India. Apart from being a unique mangrove ecosystem, the region supports one of the highest densities of the Royal Bengal Tiger. The delta consists of 102 low-lying islands of which 54 are inhabited. The islands and its ecosystems, biological resources, and the communities residing in the islands are severely stressed on availability of natural resources and highly vulnerable to changes in climate.

Agricultural yields are poor because of host of complex issues including decreasing cultivable land, increasing salinity, sandy soil, weather hazards, tidal ingressions, poor irrigation facility, all contributing to severe local livelihood problems. Sagar Island lies on the continental shelf of Bay of Bengal, about 100 km (54 nautical miles) south of Kolkata with an area of around 300 km². It has 43 villages and a population of over 2.2 lakh (2011 Census of India). This Island is considered to be one of the most backward regions of the state. Monsoon rain is the only source of water for cultivation. Yet much of the monsoon rain, having limited to no harvesting system, flows out unused to the nearby river. It is therefore, mostly a mono-crop area with *kharif* (rice) as a single major crop.

The primary objective of the project was to train the local people particularly the youth and the women to manage and use their own biological resources in a sustainable manner. Enhance awareness leading to practicing sustainable agriculture, conserving traditional knowledge and germplasm, pisciculture, animal husbandry, and all other interrelated & interlinked activities.



Source: Paribesh Unnayan Parishad

The participants of the projects are from scheduled caste farming households, and the women Self Help Group (SHGs) members primarily depending on farming for their livelihoods. The other stakeholders supported the project are the NGO Paribesh Unnayan Parishad (PUPA), West Bengal Biodiversity

Board (WBBB), agricultural department, commercial banks and National Bank for Agriculture and Rural Development (NABARD). The NGO approached the GEF UNDP/Small Grant Programme and mutually developed a project strategy to enhance mutual respect and trust, community ownerships and sustainable actions in conserving the local resources. Participatory Micro Planning (PMP) techniques were used to identify, analyze and prioritize the needs of the communities.

Agricultural yields are poor because of host of complex issues including decreasing cultivable land, increasing salinity, sandy soil, weather hazards, tidal ingressions, poor irrigation facility, all contributing to severe local livelihood problems. These are clearly documented in the local language by the communities, promoting reflections over time during the project period. The objectives of the micro-plan were to identify the available bio-resources in the community and plan their optimal utilization & conservation.

If there were any constraints, collective decisions were taken to overcome them. Village level meetings regularly held with proper record keeping and all the modalities for all activities agreed within communities' decision making processes.

Facilitated and promoted informal, kinship based-common interest Self-Help Groups (SHGs) largely of women for increasing collective bargaining, community negotiations and for implementation of the program according to the plans. Twenty three functional women SHGs were formed and linked with banks. Enhanced the skills and capacities of a range of local community volunteers and local resource grass root persons, (including both men and women) to plan, implement, manage and monitor local bio-resources and activities according to the plans.

Trainings & exposure visits helped in developing knowledge on biodiversity and stimulated to observe nature and understand the same. Participants learned the techniques of data collection and compilation of collected information led to the preparation of People's Biodiversity Registers (PBR) for 15 villages. Information related to wild and cultivated plants (357 types) and wild and domesticated animals (109 types) from 16 villages was recorded by the coordinators with the help of Biodiversity Conservation Corps (BCC) members. In addition, resource mapping, transect mapping, seasonality, time line and economic ladder were prepared for 15 villages from the target area.

The indigenous varieties of crops which are cultivated at present and in the past were recorded in the group meeting. The project also created awareness among the farmers regarding the importance of conservation of indigenous varieties of crops and sustainable agricultural practices in the group meeting. Conservation of indigenous varieties of crops in a sustainable way was attempted in the kitchen gardens.

There was a decrease in the diversity of freshwater fishes due to various reasons in the study area. The major reasons are indiscriminate use of pesticides in the agricultural fields and drying up of freshwater bodies particularly because of the spread of beetle-vine cultivation, a cash crop of the region. The fishes such as *koi*, *magur*, *singhi*, *latha*, *sol*, *chang*, *tangra*, *punti* etc., used to breed in the open agricultural fields at the onset of the rainy season and grow in the field itself. Brooders were available in the pond of the agricultural field or in canals. These brooders are not available for further propagation since they are all consumed or sold before utilizing all the water in the pond for intensive agriculture during summer months.

Under the guidance of the project team SHG member and Eco-club members were engaged in catching juveniles from paddy fields after the first rain. They were cultured in closed net (*Hapa*) and in earthen pots (*majla*). After the fish reached a size of 1.5 – 2 inches they were released in ponds (the market value of these fishes is Rs. 60/- per kilo). After two months when these fishes attained a size of 4 inches, they were sold in the market at a rate of Rs. 150/- per kilo.

The traditional varieties of vegetable seeds were collected from different corners of the Sagar Island and distributed among the owners of the kitchen gardens. The seeds of the different vegetables grown in the kitchen gardens were then exchanged among the farmers of the different kitchen gardens. This resulted in diversification of the sources of gene pool within the study area. 272 kitchen gardens developed in the villages with 25 types of vegetables of which 14 are of traditional types. Seeds (12 types of traditional varieties) were supplied for establishing kitchen garden involving SHG members of the locality, with an agreement of returning seeds after harvesting. These seeds are kept in local Seed Banks for distribution amongst the villagers in next season.

Participatory demo farms established the System for Rice Intensification (SRI) for rice cultivation; established vermiculture (Vermiculture Unit) at village level in Phulbari. Five plant nurseries were established with local fodder, timber and fruit trees, the plantations were taken up by the SHG members and nearly 96,000 plantations were made and 60 % survival, led to gap filling in the later years ushering a new sense of ownership within farmers.

Integrated farming systems approach of fish-duck-paddy farming was encouraged through a number of trainings by PUPA and CEE through State Biodiversity Board (SBB), Agricultural Department support. An innovative cost sharing methodology was developed in the project to work with all stakeholders. A small portion of the agricultural land was shaped to store rain water where pisciculture was practiced and it also provided water for irrigation during the dry seasons, thus increasing farming intensity. It helped in conserving aquatic biodiversity in addition to economic benefit. Socially, this activity provides nutritional resource to the poor in addition to reviving traditional food sources. It also generated alternative livelihoods to those who capture and sell fish juveniles, which are released in ponds for pisciculture.

Results:

- ❖ The integrated agriculture farm is acting as model live-demonstration centre for dissemination and of the technological interventions within the community; nearly 350 farmers adopted the technology.
- ❖ Since the development of the farming methods were done to match the local environments, the yields are encouraging and helping the community in shifting to organic farming adopting low cost measures, nearly 700 farmers have adopted these methods;
- ❖ Conservation of locally available resources including the soil and associated biodiversity helped farmers a better understanding in the use of resources;
- ❖ Idea of development of Village Fund for making the community moving towards self-reliant was accepted as a innovative model and replicated in other villages;
- ❖ Increased capacities of the locals through exposure, trainings encouraged communities in adopting a multi pronged activities approach to cover risks and vulnerabilities and ensure increased incomes.
- ❖ Organic farming is practiced with less capital and improved yields, particularly in SRI in the case of paddy
- ❖ The project was made sustainable even after the project completion by adopting cost benefit sharing approach of funding the SHGs. Fifty percent of the funding for any activity undertaken by the members of SHGs were provided from the project grant and the remaining amount was provided by the members themselves. The members who borrowed fund from the project had to return the money to the group fund, along with the interest. This ensured that the members carried out the activity sincerely as fifty percent of the money was contributed by them and this also ensured peer monitoring as the remaining fifty percent would go to the group fund which could be borrowed by others or used for repeat borrowing.

The local people will be benefited in the long run through soil conservation by maintaining the soil fertility with low inorganic and high organic input and by cultivating the traditional varieties of crops (paddy & vegetables) with optimum utilization of available resources through integrated sustainable farming practices.



Source: Paribesh Unnayan Parishad

Breaking Free: Empowering Rural Women

Contributed By: JAGRITI, Kullu District

Kullu district in Himachal Pradesh, India has a sex ratio of 928 women per 1000 men. The 2001 census puts the literacy rate for Kullu district at 73.36% with 84.55% male literacy and 61.24% female literacy. Harsh climatic conditions and inaccessibility to basic services, including credit imposes greater drudgery and livelihood pressures on poor households in meeting their needs. Even within the poor households the burden is much more on women and the girl child because of the nature of their activity profile like collecting fuel wood, fodder, grass cutting, grazing cattle, fetching water etc.



Source: JAGRITI

Gender inequality in India is impacting the rural women negatively in the absence of proper knowledge and skills. The NGO JAGRITI approached the GEF UNDP/SGP in CEE to address the issue through the project where women face similar kind of problems. Initially the organization found difficult to involve women for various activities due to their tight household schedules, orthodox values, lack of opportunities to address the issues for themselves and other social barriers.

The Gadsa and the Pahnalla valleys represent the scattered settlement patterns in higher altitudes (3300-3500 Mts) in the Western Himalayas. As a consequence of the low fertility of this land, harsh climatic conditions and inaccessibility the communities live in a highly exposed and fragile ecosystem. Limited opportunities for livelihoods, limited resources making them more vulnerable and led to migrate to other places for better lives and livelihoods.

The project activities initially centred on women members of the poor and marginalized communities who are directly involved in project implementation with JAGRITI. The project was implemented in 112 villages in Kullu District of Himachal Pradesh state of India.

WSCGs (Women Self Care Groups) are the primary actors in the project, local banks are the other major partners where the group savings are deposited on monthly basis; Forest and Agricultural Departments of Himachal Pradesh (HP) provided seeds and technical knowhow on traditional crops; GB Pant Institute facilitated identification of wild plants and its potential use Department for Science and Technology (DST) provided post-harvest technology related support.

The Project started with an idea of recognizing *the power of grassroots* and centred around creating small women groups based on kinships and common trade. Social mobilization and institution building, formation of Women's Saving Care Groups (WSCG) was preceded by a detailed survey based on location specific indicators of identification of poor households.

Record keeping and group management were key for effective group functioning. Today, more than 67 WSCGs are functioning and regularly meeting, adopting minutes of meetings and discuss their problems and find solutions for better lives. More than 1200 women are members of these groups. This art of facilitating participation is laying the foundations for robust community leaderships. Panchayat level meeting of the group members facilitates inter group learning and sharing of experiences. Training programmes, workshops, *mahila mela*, forum for confidence building and effective participation in public are organised by JAGRITI.

Women were encouraged to raise conservation of threatened medicinal plants like *Aconitum heterophyllum*, *Picrorhiza kurroa*, *Valeriana wallichii*, *Podophyllum*, and *Dioscorea deltoidea* by setting up nurseries and making people aware about the sustainable use of natural resource.

It was found that some of the products like fruits and forest produce are available in small quantities and in order to reduce the transaction costs, local collection at village level and then at the panchayat level provided monetary benefits to members. Procurement system of good quality apricots and peaches was introduced. Nearly 20,000 kgs of peach kernals are collected in a season giving nearly 400 litres of oil and an additional income of Rs. 4 lacs for SHGs. Members of 51 WSCG's came together, formed and registered a producer company called Mountain Bounties. Value addition and marketing of the local fruits and forest produce collected by the Women's saving and Credit Groups in the villages is the hallmark of JAGRITI. Amaranthus flour, apple chips, apricot oil and scrub, beeswax cream, buckwheat flour, corn flour, rose-chip herbal tea, roasted barley and soya bean, popped amaranthus are some of the products from the range of products marketed by JAGRITI. A marketing outlet was established at Kullu-Manali main road in the name of Mountain Bounties. This is linked to the women groups and is marketing a range of products for a total value of Rs.20, 000 per month. 27 WSCG's have 80 pits engaged in the production of vermin composting to 1800 plus quintals of which 293 quintals are used by members in their fields, while the remaining is sold to larger farms and orchids. The critical step of demonstrating awareness through action has been the cornerstone of JAGRITI. Officials from Leh have shown interest and come to learn the use of *rose hip tea* making from the JAGRITI as the rose hip is endemic to the Jammu and Kashmir region.

Results: It is clear that women's lives have improved when involved in the decision making processes and when given opportunities in planning the actions, implementing and monitoring the program. Women see women workers as great inspirations in the program, more so when they are managing and dealing with financial matters and resources.

A total of 495 *hamams*(water heating device) have been distributed to women members on cost sharing basis. More efficient use of household and agricultural waste for water heating and lesser trips to forests in summer for fuel wood has resulted in energy savings and reduce drudgery. The project has also introduced energy efficient devices as pressure cookers.

The enterprise has been institutionalized as "Mountain Bounties" a community managed retail outlet at 3 places eg, Kullu, Manali and Shimla in Himachal Pradesh. Nearly Rs. 4 lakhs was earned in a season as additional income by the SHG members.

In the Initial stage of the project, there was strong resistance from Stakeholders but after carefully planned village entry and regular meetings and interactions with all sections of the community, trust building efforts led to form cohesive groups. Scattered pattern of households in high altitudes of Himalayas is another challenge in involving the communities for livelihoods and institutionalized approach. A range of actions linking the different sections of communities into enterprise management was not easy in the hilly regions.

Initially members were hesitant in sharing the cost for the water heating devices but looking at the benefits the community shared more than 50% of the total cost of 495 *hammams* distributed. Harsh climatic condition was an add-on challenge as these project areas are situated in remote villages of the State having no proper road connections with lack of other sources communication.



Source: JAGRITI

The NGO Jagriti has been given the best women managed award in 2012 by the EARTH DAY NETWORK and the UNDP, India jointly. The efforts in enterprise management were also rewarded in 2008

with the SEED award. The enterprise development model has moved from a meagre sale of Rs 2 lacs (2006-07) to Rs 24.5 lacs in (2011-12) and aims to create a more robust business model to conservation and use of local resources.

JAGRITI has been working with organic Partners, an organic herbal supply company, to get organic and fair trade certification of its products. This would open up broader access to international markets – and also require scaled up production operations. Organic Partners has been involved in organic herbal agricultural production, supply chains and marketing for 25 years. The company specializes in the providing plant-based raw materials and ingredients to international manufacturers and traders of food, beverages, medicines and cosmetics. Producers are offered a financial stake in the company based on a share of annual profits. Jagriti wants to establish a business model approach at every household and empower the women into an era of self-sustainability. http://organicpartners.com/sourcing_and_projects.html, <http://www.jagritikullu.org/product.html>

Lessons Learned: Linking the WSCGs with various government programmes gave better visibility to the programmes and provided respect and credibility to the locals. A holistic approach adopted to address the needs of the communities led to better rapport and the trust within the communities and the NGO. Actions and timely delivery of the work with the communities further made in-roads to mutual relationship with the NGO and the communities. The SGP Secretariat has provided platform to the NGO for participation in various National/International workshops. This has given visibility to the project and women groups got the encouragement by the huge sales of their products in such forums.

Organic Production and Trade: Inclusive Approaches

Contributed By: M.S. Swaminathan Research Foundation, Chennai

Certified organic farming has been promoted in Thonimalai located in Dindigul district, the lower Palni hills of Western Ghats in the state of Tamil Nadu wherein by default the production systems were organic.

Certified organic farming has been promoted as a market strategy with premium price and to integrate environmental responsibility and accountability with the farmers. The demand for organic products has been steadily increasing. However small and marginal men and women farmers could not participate or adopt it due to the high cost of organic certification and lack of capacity to carry out certain procedures involved in the certification process. In addition they do not have access to information on markets and international standards which restricts their interest and participation. On the other hand, quality and productivity of the products from small and marginal holders to meet the market standards needs to be improved. A modest attempt has been made in 2006-07 to facilitate the inclusion of resource poor small holders in organic production and trade.

The objective of the initiative is to improve the economic returns and strengthen the production systems through certified organic farming approach by considering the comparative advantage of niche market for organic products and conservation of ecosystems. The primary issues addressed were demonstrating the organic certification for the 'organic by-default' production systems in the hilly region among small and marginal farmers, improving the quality and productivity of the crops, linking the producers with niche market through appropriate market linkages in partnership with public and private companies.

Thonimalais is located in the western end of Lower Palni hills and the altitude is around 1000-1350 M Mean Sea Level. Multi-tiered plantation of coffee, lemon, pepper are commonly cultivated under rainfed condition with different combinations of silver oak, Erythrina, guava, banana, orange, sour orange and jack fruit. The millet based subsistence cropping system was shifted to commercial plantation crops during the 1960s. But farmers continued in adopting traditional production techniques without the use of any external chemical inputs. Under these conditions the functional diversity is promoted by adopting multi-tier cropping system which in turn has been improving and benefiting from ecological service functions such as insect pollination, soil quality, and water storage in the soil. Apart from this, species richness and abundance in the region was very high due to the practices of agro ecological principles (mixed crop rotations, non-chemical nutrient and pest management, natural habitats and non-cropped zones or sites etc.,).

The primary stakeholders are 119 small and marginal farmers from socially marginalized sections. Of the total households nearly 37 % of the farmers are having less than a ha of land and 40 % of them are holding the land between 1 – 2 ha and about 20 % of them are holding more than a 2 - 5ha and 3% are owning 5-10 ha of land. Agriculture is the primary livelihood depends much on family labour for cultivation, supplemented with back yard stall fed goat rearing.



Source: M.S. Swaminathan Research Foundation

The other stakeholders are IMO, Bangalore, certifying agency for inspection and certification of the cultivation practices and products, research institutions such as Coffee Board, Horticulture research station, Thadiyankudisai under Tamil Nadu Agricultural University in providing quality seedlings and technical guidance; private companies in providing linkages for the niche market and traders; farmers association (Reddiyarchatram Sustainable Agriculture Producers Company Ltd (RESAPCOL), Kannivadi) and National Agricultural Bank for Agriculture and Rural Development (NABARD) in organizing farmers in to groups/clubs.

The major activities include

A. Facilitation of inspection and certification:

The area brought under this initiative is 220 ha covering 119 small and marginal holders in the geographically isolated marginal ecosystem in Thonimalai. Certification has been carried out by an international certification agency and collective market is being facilitated. Since more than 90% of the farmers are small and marginal holders, the certification is facilitated through the scheme of 'small holder's group certification' based on an Internal Control System to achieve the scale and reduce the cost of certification. In this M.S.Swaminathan Research Foundation, Chennai, India, a non governmental organization working with a mission of 'fostering science and technology for sustainable and equitable rural development' is the mandatory and the farmers group are the contractors. Studies indicated that the group certification reduces the cost up to ten times. The certification helped to establish internal control and monitoring systems to improve its market potential. Every year internal and external inspection is being carried out to renew the certificate. Since 2007 onwards the products are reaching the market with the organic label and necessary transaction certificates from the certified agency.

Technologies selected for improving the quality and productivity

Based on the existing need to improve the quality of the organic products following nutrient and pest management technologies have been identified for demonstration and training in three hamlets

Nutrient management technologies:

1. Composting of crop and animal waste residues through either vermicompost or Effective Microorganisms(EM) enriched composting techniques or use of pancha kavya for quick composting.
2. Application of enriched compost with local specific biofertilizers species like *Azospirillum* and *Vesicular Arbuscular Mycorrhizae* (VAM).
3. Use of biodynamic products and locally produced plant growth promoters

Pest management practices

Coffee berry borer: Regular pruning of twigs and dried branches, Manual collection of beetles, Continuous release of Mexican beetles (*Cephalonomia stephanoderis*), Use of bait traps and application of *Beauveria bassiana*.

Lemon – Canker: Removal of diseased twigs and dried branches, application of *Pseudomonas fluorescens* and spraying of garlic extract.

Pseudostem weevil – Banana: Application of neem cake, application of fungicide- *Pseudomonas*, stem injection of neem oil, removal of leaf sheath and use of pseudostem traps.

Wilt in pepper: Application of *Trichoderma viride* – a biofungicide, soil drenching of *Paecilomyces lilacinus* and application of neem cake mixed with *Pseudomonas*

B. Improving the quality and productivity of the systems:

Participatory need assessment on the constraints of production especially on nutrient and pest and diseases was carried out and appropriate technologies were identified in such a way that they are very simple, easy to follow and low cost. The details of the technologies selected for improving the quality and productivity is given in the box below.

The coffee berry borer and stem weevil management strategies were put into practice at the farm level required widespread adoption at the landscape level in that region to become effective due to the characteristic and behavior of the insect/pests. Hence all the farmers were motivated to carry out the integrated pest and nutrient management practices and some of the crucial practices were facilitated as mandatory one through evolving Internal Social Control Practices to implement it at the community level. The training and capacity building programs was carried out for two years and after that the improvement in product quality and productivity is observed in all the four crops.



Source: M.S. Swaminathan Research Foundation

C. Facilitating Farmer to farmer learning:

Farmer Field School approach was adopted for training and capacity building and the men and women farmers were selected and organized in to village wise groups. In order to enable the participation of women farmers' demonstration and training has been carried out in three hamlets which are physically located farther. Time of the training was also organized in such a way that it suits the women and all the men farmers could participate on it. Participatory demonstration was carried out and members were motivated to observe, learn, practice and reflect the experiences during the programme. As part of the programme cross field visits to other farmers fields and exposure visit to research organizations to see on-station demonstration fields was carried out stem weevil management for Banana, grafting and coffee berry borer management for coffee, nursery management to raise healthy seedlings production etc

D. Linking small producers with niche markets:

Forward linkages were established with the marketing agencies for the organic products using the certification; So far pepper and lemon is being marketed in organic label since 2008-09. The companies which purchase pepper are Pronature Organic foods, Bangalore, ITC, Hyderabad and Arokiya foods, Chennai and Plant Rich Pvt Ltd and Purple Hills Development Society purchased lemon. So far 8 tones of pepper and 17 tones of lemon were marketed in organic label. Recently an agreement has been signed with ECIS company, Chennai for the market linkage of lemon, pepper and coffee. The farmers were trained in maintaining the quality aspects and grading, maintaining the moisture content, cleaning etc. The collection procedures and aggregation methods were developed during this process, which enable the community to act collectively.

E. Community mobilization and institutionalization:

The horizontal network among farmers has been formed which enable the farmers to share knowledge, skills and resources with other farmers. Farmers were mobilized and organized in to four men groups and three women's group (each consist of 15-20 members). Till 2011-12 the certification cost was paid by the facilitating agency (MSSRF) and necessary mechanisms were established that the marketing agency, ECIS pvt limited, Chennai shall cover the certification cost in addition to buy back of the products with 10-15% premium price. The farmer groups were linked to RESAPCOL, a Farmer Producer company, Kannivadi, located in down hills as share holders, which is facilitating the business development services including the market links.



Results

Outputs

220 ha's were received the organic certification for four products (coffee, lemon, pepper and banana) under small holder's certification systems. Farmers were mobilized and organized in to groups and linked with a Farmer Producer company. Simple pest and disease management following non chemical methods was field tested and demonstrated for all the certified crops. The study also fine tuned partnership model with private companies for market link.

The activities resulted in developing a model to link resource poor small and marginalized holders with niche market for organic products with premium prices. Private companies coming forward to work in a partnership approach with farmer's group were also identified.

The following are some of the challenges

Market risk in the changing global context: Consistency in buy back of the products by the private agencies for the niche products and timely payment to the farmers

Risk in Production: Farmers could not supply the product as estimated or assessed due to the variability in rainfall in the recent years

Standards: Quality of the products to meet the international market standards and demands and the organic certification alone will not help to get the premium prices

Lessons learned

- ❖ The Key lessons learned include, the organic farming can be promoted as a potential poverty reduction tool among small and marginal farmers in addition to ensuring environmental sustainability; Certification cost can be minimized by adopting group certification and adopting compliance with organic standards through Internal Control System processes. This will be addressed by facilitating a community based farmers association at the local level; Social capital among the men and women farmers is the base to build the group certification and collective marketing strategy

Eco Enterprises: Options for Livelihoods

Contributed By: M.S. Swaminathan Research Foundation, Chennai

The initiative is field tested in the semi arid agro ecosystem in Reddiarchatram block, Dindigul district of Tamil Nadu state. The mean annual rainfall of this area is 845.6 mm. The agricultural season starts with the onset of northeast monsoon (October - December) when nearly 50% of the annual rainfall is received followed by Southwest monsoon. Agriculture is the primary economic activity and more than 60 % of the farmers are small and marginal land holders.

Intensive cultivation of crops and inadequate integrated soil fertility management strategies adversely affected the soil health which is the base for sustainable agricultural productivity in this region.

The introduction of chemical fertilizers and pesticides influenced the soil fertility management practices and promoted intensive cultivation without adequate application of organic matter and bio inoculants to the soil. The changes in the soil nutrient status especially decrease in the soil organic matter content severely affected the microbial diversity. To address the issue, external application of biofertilizer' technology as an augmentative approach was introduced. The adoption of the technology by small and marginal farmers and the sale of biofertilizers in the input market is less than 5% when compared to chemical inputs. Government sponsored agricultural extension services have been advocating the use of biofertilisers and supply to farmers which is sub standard in quality and not reaching the farmers in time and. However the awareness, knowledge, technical knowhow, access to quality and efficient bio products to small and marginal farmers etc were considered as major factors hindering the adoption. Since the available microbial population and its diversity play a critical role in management of soil health which is the function of physical, chemical and biological properties, research and appropriate field level action was felt necessary while facilitating sustainable agriculture.

The primary goal of the intervention is to improve the resilience capacity of the soil by augmenting its microbial load and diversity by promoting locally adopted strains. The specific objective is to create an access to quality biofertilizers using the locally adapted strains and necessary knowledge and skill to use the product for crop production among small and marginal farmers following farmer-led approaches.

To reach the above objective it is essential to facilitate access to production of quality products using local strains by demystifying the technology for village level production, and improved the small and marginal farmers' knowledge and skill to adopt the technology to in his/her farm.

Participatory technology development approach for local adoption, promoting ecoentrepreneurship among socially and economically disadvantaged women, community mobilization for institutionalizing the initiative as part of the Self Help Group federation, a community based institution development and promoting farmer to farmer learning on the use of biofertilizer for soil health management.

The intervention is promoted as part of the promotion of sustainable agricultural practices in a semi arid agroecosystem where the soil is intensively used for crop cultivation. The soil organic matter in the local agro eco system has decreased from 1.4 percent to 0.8% within a period 15 years. The interaction from farmers indicated that the application of organic matter to the soil is reduced to a greater extend in these years and does not apply any biological products to augment the soil microbial diversity.

The major cropping system is intensive maize cultivation, cotton, vegetables like bhendi, tomato, onion, gourds, brinjal and lab lab, sugarcane, lowland paddy, flower crops, coconut, chickpea etc. Wage labour in the agricultural fields is the main livelihood for the landless households in the region who inhabit 50% of the block. The main season for the rainfed crops are during October- December. For other crops based on the underground water availability 2-3 crops are cultivated in a year. On an average two to three crops are cultivated in a year in irrigated areas and one crop in a year in drylands. The region has both red and black soil and the average soil nutrient status indicates that pH of soil is saline and alkaline, organic carbon is low to medium, the primary available nutrients are medium to high in status and available micronutrients are low to medium depending upon the cropping intensity, soil fertility and soil type.

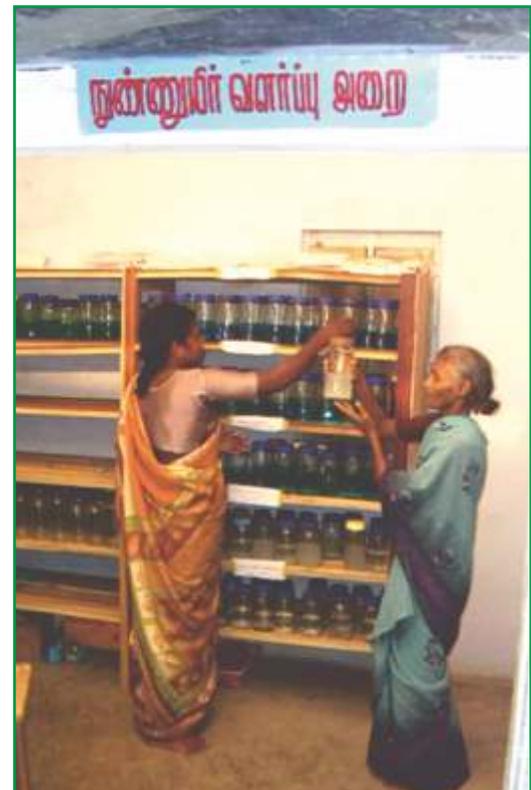


Source: M.S. Swaminathan Research Foundation

Both small and marginal men and women farmers as well as women agricultural labourers were part of the intervention. Women from agricultural labourer households are involved in ecoentrepreneurship initiative where in the members are organized in to Self Help Group affiliated to Kulumai Self Help Group federation, The small and marginal farmers, the users of the product, played a key role in farmer to farmer horizontal learning to improve their knowledge and skill on the use of biofertilizers.

Apart from the local farming community, Tamil Nadu Agricultural University, Coimbatore was involved in providing technical support and commercial bank for the financial linkage to establish the production unit and input agencies (both at the regional and local levels) and a farmers association operating in the region as a community based organization for marketing and creating awareness among the farmers. The SHG federation provided business development services to the groups based on the need like training on business, plan facilitating bank linkage, supporting training programmers and also the possible marketing support.

An ecosystem approach is adopted in promoting the soil microbial diversity in the semi arid agro ecosystem. The basic step is effective strain identification since microbes differ in their ability to fix or mobilize nutrients, tolerant to abiotic stresses, multiply and colonize the roots and establish endophytic relationships and produce metabolites that are important to success. The efficient native strains of *Azospirillum lipoferum* and phosphobacteria (*Pseudomonas* and *bacillus* spp) adapted to the stressful conditions in the local system (e.g., high N fixation rates, good competitive ability, tolerance to salinity and alkalinity and dryness) were isolated from the soil in the region which posses potential to perform better than the commercial strains from other ecosystem is followed to promote local microbial diversity.



Source: M.S. Swaminathan Research Foundation

The developments in the biotechnological sector reached a remarkable state however, such innovations were not percolated to the level of agricultural labourers or small farm holders. The mass production technology for the biofertilizers were highly appropriate for large and medium scale industries and very limited efforts are being made to decentralize the production of biofertilizers, which could benefit small and marginal farmers and labourers. With the technical support of Tamil Nadu Agriculture University and the microbiology lab of M.S.Swaminathan Research Foundation (MSSRF), Chennai the production technology was refined using cost effective and locally available materials and designed in a simple manner without compromising its functional principles. Basically the technology is scaled down to produce 1000 kg in a month using simple instruments and processes. While refinement of the technology the members were involved in the process and based on the error it was improved which provided an opportunity for the members to learn from mistakes. The total unit cost of the unit is Rs 1.5 lakh and the unit has the capacity to produce up to 12 tonnes per annum.

Twelve members from agricultural labour community belong to scheduled caste were organized in to SHG (Jhansirani women SHG, Kuttathuavaramapatti, Reddiyarchatram block, Dindigul dt, Tamil Nadu) which is affiliated with Kulumai SHG federation. The members are primarily landless and get employment for only 160 number of days in a year. In order to improve the employment opportunity and diversify the livelihoods, ecoenterprise was initiated by the group with the guidance of the federation. The Kulumai federation supported the group to link with banks for credit support based on their last three years performance and facilitated the technical support from TNAU and MSSRF.

During the initial years of establishment, members carried out the marketing with the support of MSSRF. But from 2008-09 onwards, exclusive business development services were initiated on collective basis by the SHG federation.

Azospirillum can utilize atmospheric nitrogen and contribute to plant nitrogen nutrition, it can also improve the plant nutrient uptake and contribute towards the balance of the root environment through protection against pathogens and equilibrate nutrient flow in the soil. It can fix atmospheric nitrogen to the tune of about 15-20 kg/Nitrogen/acre/year, which reflects in an increase in the crop yield by 15-20 %.

Phosphobacteria: Several soil bacteria and fungi, notably species of *Pseudomonas* and *Bacillus spp* secrete organic acids that bring about the dissolution of the unavailable phosphates in the soil.

The mass multiplication of the biofertilizers was converted in to an ecoenterprise and the members were trained in the effective strain identification, production process, quality control measures as well as management of the unit. At the initial stage exclusive business plan development training was organised and members prepared their plan and submitted to the local commercial bank for the loan for an amount of Rs 1.5 lakh. Following table shows the yearwise production and net profit as well as monthly income for a member apart from wages earned through the employment generated in the unit. On an average the unit generates an employment for 2400 days per annum.

Year	Sales	Net profit (Rs)	Average income per member* per month
2005-06	1100	22000	The profit was used to repay the bank loan taken to establish the unit
2006-07	3200	64000	
2007-08	3800	76000	
2008-09	4250	85000	787.00
2009-10	4626	92520	856.70
2010-11	7400	148000	1370
2011-12	8700	174000	1611
*- apart from wages for employment in the unit which is on an average of Rs 1000 to 1200/month per member			



Source: M.S. Swaminathan Research Foundation

Farmer to farmer learning

Small and marginal farmers in the region were trained in the methods of use of biofertilizers using participatory demonstrations, field visits, field schools and exposure visit to the units to understand the principles and processes. The experienced farmers were identified as trainers and to prepare contents for the learning material from their experiences which helped the farmers to contextualize the benefits. Simple booklets, pamphlets and interactive CDs were prepared and shared with farmers -learners to facilitate the adoption. More than 5000 farmers in the region were trained over the period of five years and of which 1260 farmers (780 men and 480 women) were regularly using the biofertilizers for more than three years.

Results : The following are the results from this intervention

Decentralized production facility was established with a focus on local effective microbial strains which promotes plant growth. Members of women self help groups from resource poor and marginalized sections emerged as ecoentrepreneurs and created a permanent asset (collective) in their own names. It created an additional employment days of 2400 days in a year. Members received a profit on an average of Rs 1500 per month apart from their employment wages in the unit. More than 5000 farmers in the region was trained in the use of biofertilisers and more than 30% of them are repeated users covering 2000 ha in the region. On an average it reduces 25% of the chemical fertilizer use and thus creating a positive influence in the soil ecosystem.

Apart from economic benefits, it created a benefits on social front, brought changes in terms of mobility, negotiation ability, decision-making, control over assets, skills, awareness, knowledge, workload, responsibilities, self-confidence, status in the family and community, participation in public life of the women members. Enhancing the capacity of the members and attitude to cope up with the changes in the technology, eg now the production technologies are upgraded to produce in liquid forms than talc powder based ones which need new machineries and equipment and necessary skill. Convincing and getting the support of the formal technical institutions like Tamil Nadu Agricultural University to collaborate in a project to demystify the technology with women in rural areas. This was overcome by the support of proactive professors to take part in the collaboration.

Lessons learned: The decentralized production units at the village level help the farmers to get quality product in time with locally adapted effective strains which have the capacity in promoting microbial diversity. Access to crop specific and soil specific strains received wider acceptance from farmers in the local region due to field level training and interactions in a participatory manner. The experience reveals that harnessing the technological improvements in the mass production of biological products into a small-scale rural ecoenterprises help to create a multiple livelihood system especially for the poor, landless and marginal land holders. Mobilization of women and men, group formation, establishing need based relevant ecoenterprises, forward and back ward linkages with different institutions,



capacity building to manage enterprise as a successful business venture are the crucial factors while establishing such decentralized production systems. It is learnt that creating access to technology through demystification as well as capacity building brings more agronomic, economic and social benefits to the local communities, and enriches the soil microbial diversity which helps to attain Sustainable and Equitable Development. Beyond the results: with similar efforts, several other microorganisms – biofertilizers re produced in the decentralized units and several other women groups are involved in the production and marketing of similar products. Planning to up scale the number of units – with the support of NGO, CBOs and also with the support of government agricultural department.

Making the Mighty: Story of River Dolphin and Freshwater Turtles

Contributed By: WWF-India, New Delhi

The Ganges (Known in the sub-continent as the "Ganga") basin is the largest river basin in India, with a geographical area of 861,404 sq.km. It is a source of livelihood for over 450 million people (40 percent of India's population). The river carries with it a huge amount of fertile silt and the floodplains results in the creation of the some of the richest agricultural areas in the sub-continent. But the Ganges River Basin is threatened by manmade pressures, such as water abstraction, urban development, and land use changes. Additionally, the basin has witnessed unprecedented levels of pollution and deterioration of aquatic resources.

WWF-India identified the Ganges River Dolphin and turtles as a species of particular concern, thus initiating the conservation programme. The programme was initiated in Naudevi and Bhairia villages, Bulandshahr district of Uttar Pradesh in 2010 by WWF-India to improve livelihoods and enhance the conservation status of the river dolphin and turtles. The villages fall in the Upper Ganges basin. The two villages were identified on the basis of extent of dependence from a rapid assessment carried out in 20 villages located in the Upper stretch, the residents of the villages belong the other backward castes the Mallahs, Dhimar, Baheliyas and Kushwas. The main occupation of the community is agriculture. Some of the families do not own land, but do farming on the river bank. Villagers are also engaged in fishing, shopkeeping, casual labor, workers in factories. The other partners in the project were the Forest department and local NGOs.

Fresh water turtles and Ganges river dolphins (*Platanista gangetica gangetica*) are among the highly endangered aquatic species inhabiting the Ganges-Brahmaputra-Meghna and Karnaphuli-Sangu river systems of Nepal, India, and Bangladesh. This vast area has been altered by the construction of more than 50 dams and other irrigation-related projects, with dire consequences for these species.

The Ganges river dolphin is one of the four species of fresh water dolphins found in the world. The species is under severe threat due to over exploitation of its habitat by manmade activities. A recent survey conducted by WWF-India and its partners in the entire distribution range in the Ganga and Brahamaputra river system - around 3,700 miles - identified fewer than 2,000 individuals in India. The main threat to the survival of this species is the presence of barrage and dams which is blocking the free movement of these long diving mammals. Use of chemical fertilizers and pesticides in agriculture, industrial pollution, mortality in fishing gear, incidental entanglement in fishing net



Source : WWF-India

and prey base decline are also adding to the threat. Due to its declining number, the species has been enlisted as endangered by IUCN. Due to importance of this species in the riverine ecosystem, the Ministry of Environment and Forests (MoEF) notified the Ganges river dolphin as the National Aquatic Animal in May, 2010.

Populations of freshwater turtles also declined drastically during the last few decades as a result of direct and indirect human interventions. Freshwater turtles in the Ganga river are used for food and medicinal purposes. Locals in the bank-side villages, fishermen and other turtle poachers frequently catch large number of turtles. During fishing operations small turtle species die in fishing nets.

The fishermen intensively fish in the river, using various types of nets. Small turtles often get entangled in the nets and die due to drowning. To conserve the above species, it is required that their habitats are protected with the active help of local community who depend on the river. Community engagement in protection of habitat can be an effective tool in strengthening conservation efforts.

The usage of chemical fertilizers in agricultural fields for purposes of higher yield is quite prevalent in the area. As a result of the above practice, leaching of nitrogenous fertilizers into river has led to nitrate pollution in the river and in turn, endangered the species inhabiting the river. It was thus realized that communities need to be educated about the effects of their agricultural practices on the habitat of these endangered species and develop alternatives to existing practices that strengthen conservation while ensuring livelihood security.

In addition to this, the villages on the bank of the river face the problem of erosion every monsoon. Many villagers, who have their agricultural lands close to the river, suffer huge losses from floods. Thus the villagers started practicing island farming in dry season from October to June. These islands are extremely suitable for the cultivation of crops of *Cucurbitaceous* family. The sowing season i.e. October coincides with the nesting season of the freshwater turtles. Prior to the initiation of conservation efforts, the nests of these turtles were either damaged during farming or they could not find appropriate sites for laying eggs.

Commercial fishing along the river bank was quite rampant as well. Assessments were done to understand the extent of dependence on fishing for livelihoods and it was found that fishing was providing supplementary income to the households engaging in the activity and was not their major source of income. Considering the negative impacts of commercial fishing on the river biodiversity and health, the need was felt to gradually reduce the activity and encourage community to do fishing for subsistence only.

The major activities undertaken to ensure that the local community played a significant role in the conservation of the river dolphins and freshwater turtles include the following:

Awareness programmes were conducted in different villages along the bank of Ganges River mainly targeting the fishing community and farmers whose total dependency is on the river. The awareness programme carried out were discussions and film shows focusing on field demonstration of wise use of the river banks, pesticides/fertilisers. Lectures by experts and exchange farmers programmes were also conducted where the farmers could share their experiences and discuss what are the changes they have made in their village.

In the project villages Bhariya and Naudai around 55 vermicompost units were installed by WWF-India in each village. Training was also provided to the farmers to produce the vermi compost. The compost was used in 62 hectares of agricultural land. Another 58 hectare of *palaze* (sand agriculture) land was also used for adopting the vermin compost farming. One could demonstrate that the yield from these lands were good and there was no run off of pesticides/fertilizers in the river. Looking at the success of the technique, farmers from nearby villages got interested and around 20 more river bank villages have adopted this technique.

The turtle habitat was improved by organizing training programmes and workshops in different stretch of the Ganges River. Prior to the training programme all the islands were used for *palaze* (sand agriculture) by the river bank farmers. After the interventions, most of the island were not used for *palaze* and farmers are now willing to shift their *palaze* from nesting place to other areas, where the concentration of turtle is very less.

However, in case if any the farmers see any turtle nest in their *palaze* they shifted the eggs in the nearby enclosers developed by WWF-India.

WWF-India did a comprehensive study on the economic benefits of the *palaze* farming. The result shows very less benefits to the farmers due to various reasons such as irregularities in the water regimes and climate as well as proper marketing facilities of the agricultural products. WWF-India provided training for alternative livelihoods such as candle making, tailoring, carpentry, cycle mechanic etc. These were also linked to the available government schemes in the village. This also assured round the year income and acted as an incentive to the community.



Source : WWF-India

Plantation on the bank of two villages was done in Bhariya and Naudai village because; both the selected villages were more prone to soil erosion. About 3500 plant sapling were planted on the river banks of both the villages covering an area of about 4.6 hectare. This helped in stopping the bank erosion.

Results/Impacts

- ❖ Increase in the participation of local community in river and species conservation efforts.
- ❖ Establishment of 40 vermi compost pits in two project villages. Till December 2011, 176 units were in operation in 22 villages and the numbers are expected to increase in the future. Presently, 600 acres of agricultural land in the project area is using organic fertilizer as a nutrient input.
- ❖ Decline in the practice of commercial fishing along the banks of the river.
- ❖ Better productivity and reduced pollution from the usage of organic fertilizers. The beneficiaries of vermi composting have received better market rates for their crops compared to the rates they received earlier. The seeds were reported to be healthier and heavier in weight too.
- ❖ Enclosed hatcheries established initially in 3 villages and replicated to 4 other villages. Communities handed over any turtle nest they encountered while farming to the WWF team. More than 6500 hatchlings were safely released into the river between January, 2010 to May, 2012.

The main challenge to carry out these activities was to change the mindset of local people. People were not easily convinced to use vermi-compost instead of chemical fertilizers and pesticides in the agricultural fields. Initially, it was equally challenging to convince farmers to prevent damage to turtle nests due to farming. However, due to consistent efforts of WWF-India, people are increasingly becoming aware about the importance of river dolphin and turtles in the Ganges River and are actively participating in conserving these species.



This effort has demonstrated models for river bank agriculture and conservation of species. More villagers have adopted vermicompost for farming and have stopped using chemical fertilizers. Villagers are also vigilant and proactively help in turtle conservation. Working with communities to augment and improve livelihoods, while improving the management of the natural environment is complex. There is a need to have sustained engagement on the ground of new and innovative approaches have to be tried and tested. A key lesson is that working with communities needs significant and long term investment.

A New Awakening and Pride: Rice Production System

Contributed By: SWASHARAYA, Kerala

The rice productivity in the low lying areas in Kerala state is declining since 1970s. The area has declined from 9 lacs ha to 3 lacs ha. Rice productivity was 1.7 tonnes per ha in the sixties and then rose to 2.5 tonnes per ha through the support of high input related agriculture but of late even though the productivity remains the same the cost of cultivation is increasing with high inputs and labour costs. Kerala produces only 1/10th of its requirement of rice and with the increase in costs of inputs viz. seed, fertilizer, manures, etc is becoming less attractive. The project was based at Vadakkencherry Village, Alathur Thaluk Palakkad district of Kerala, Southern India. This decline in rice cultivation has posed serious threat to livelihoods and food security in the region. The only way out of this problem is enhancement of productivity to profitable levels through technological interventions and therefore the farmers of the region approached the Kerala Agriculture University and found out the System of Rice Intensification (SRI) techniques as a viable option. SRI technology details were discussed with and in between all stakeholders as a viable option as it uses lesser inputs ie. less seeds, water, chemical fertilizers and pesticides and relies on more organic manures. The Non Governmental Organization SWASHARAYA then approached the GEF SGP/UNDP through CEE representatives to experiment the approach.

The objective was defined as enhancing rural food security through introduction of a rice production technology that ensures high productivity with significantly low water requirements through the use of local gene pool of rice. The project adopted participatory technology development to facilitated the adoption of the improved method of rice cultivation and subsequently develop the local community seed bank. Native varieties *Kunjukunju* and *Thavalakkannan* and modern high yielding varieties Kanjana, Athira and Jaya were the main rice varieties used by farmers for SRI trials. The small holders growing rice from different farming communities including scheduled caste and muslim farmers are the active participants. Other stakeholders include agriculture department, Govt of Kerala; Panchyats (local bodies); Agricultural banks; Indian Council for Agriculture Research (ICAR) office and Kerala State Agriculture University, Women Self Help Groups (SHGs) and local banks.

The NGO SWASHARAYA after the selection of areas for taking forward the method with the rice growers, called several meetings to discuss the new technology with the participating farmers. There were workshops and technical sessions were organized to explain the new technology, the details like cost of cultivation per hectare, inputs required and methodology were often discussed with photographs and the results achieved in other places. Self Help Groups (Kudumbasree - women's co-operatives) were involved in the implementation of the project activities.

An agriculture expert provided farm advisory service, documentation and technical liaison with research stations and scientists. Six crops of a mix of local and modern varieties, *Kunjukunju* and *Thavalakkannan*, Kanjana, Athira and Jaya were used by farmers for SRI trials. There has been a systemic increase in field trials adoption of the SRI methodology ie. . (April-*Kharif*(first season) 2007 – 10 farmers); (September-*Rabi*(second season) 2007 – 14 farmers); (April-*Kharif*2008 – 29 farmers); (September-*Rabi*2008 – 47 farmers); (April - *Kharif*2009 – 74 farmers); (September-*Rabi*2009 – 121 farmers). To improve the irrigation facility, building of water storage, distribution and drainage structures, and two water ponds were renovated. Periodic community meetings were held to evaluate the program and incorporate corrective measures.

Another activity undertaken was liming the soil. In order to alleviate problems associated with soil acidity the NGO advised farmers to add lime as an amendment. The practice had resulted in enhancing soil fertility and consequent high rice yields.

Introduction and demonstration of SRI method of rice cultivation for six seasons enhanced the yield up to 50 percent over the traditional method with 90 % of the participating farmer families. Seeing this, more farmers adopted the SRI method. In the year 2011 and 2012 more than 200 families have adopted SRI method, the area under rice cultivation has substantially increased.



Source : SWASHARAYA

This method has reduced the usage of water in rice cultivation up to 50 percent which proved to be a boon to the community. An unexpected benefit of the SRI method is the very high biological activity in soil. A visible example is the profusion of earthworm casting in SRI-fields which is absent in flooded rice fields. The benefit to the participant arose mainly from the increase in net profit consequent to higher yield and low investment on plant protection chemicals.

The average yield of rice in the area under the conventional method is nearly 3.0 – 3.5 Mts per hectare and the best trails in SRI resulted into 7.5 – 8.0 Mts per hectare; the average production with SRI has been 6.0 – 6.9 Mts per hectare. The SHG members of Kudumbashree obtained 7.5 tonnes of rice per hectare from the SRI. During the season their yield was best among all SRI trails.

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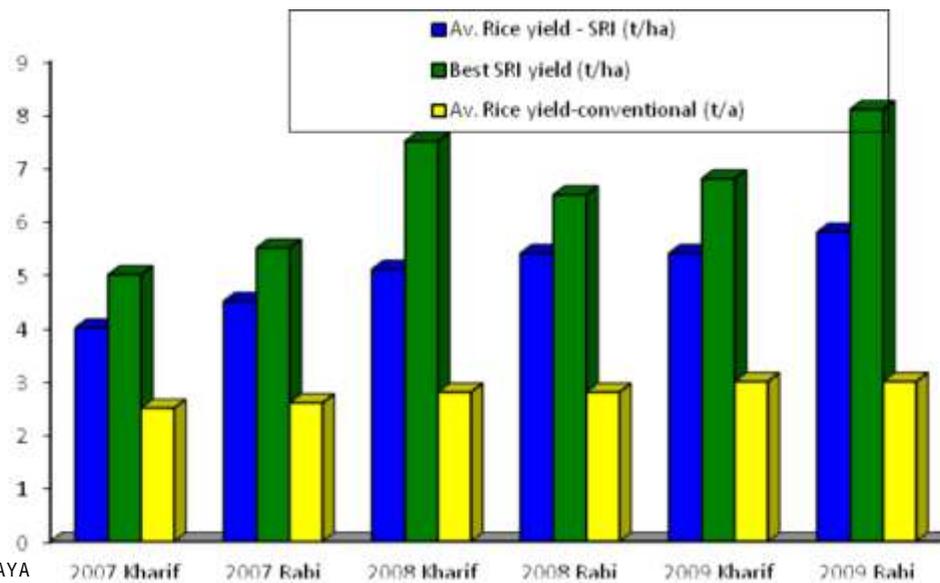
The farmers observed a greater number of tillers in the SRI method nearly 30-35 than 15-19 in conventional plants. Also, many farmers felt in SRI Plant the tillers are thicker, stronger and greener. Another observation has been that the watering charge as during the *rabi* season nearly costs the farmers Rs.750/acre in conventional method, but in the case of SRI the watering charge varied from Rs.250/- to Rs 300/-.

It is worth to mention here that yield increase by SRI method of rice cultivation was substantial not only for high yielding varieties but also for native varieties. One local variety, *Kunjukunju* returned grain yield as good as high yielding variety. Today more than 250 farmers are practicing SRI and benefitting in a total area of around 300 hectares in the area.



Source : SWASHARAYA

The farmers faced problems initially to use the heavy weeder specially designed to use in the SRI fields, later it was tailor made by the local artisans based on the inputs from the farmers, the improvisations helped to use in the local conditions effectively. The other problem encountered was labourers hesitation to do planting in SRI method, it was labour intensive and time consuming, trainings conducted to the labourers helped them to overcome the problem and complete the task without taking much time.



Source : SWASHARAYA

Sulaiman's story: Mr. Sulaiman and his brother are innovative entrepreneurial rice farmers of Adiparanda village in Palakkad. They did not give up rice production even in the face of declining returns and when profitable alternative crops were available. Since 2008 the brothers were following SRI method of rice cultivation in part of their paddy fields along with conventional method. They have achieved a very high return 8.16 Mts per hectare. He also mentioned that although initially SRI appears more labour intensive but through practice the farmers could reduce the labour involved.

The State Department of Agriculture, initially reluctant to participate in the SRI trials but joined later after witnessing the benefits. The results also encouraged the members of Kudumbasree (women's co-operatives) to actively participate in the programme.

The overall benefit of SRI to the practicing farmer was nearly 60 % on an average because of the saving of seeds (seeds and water saved for 1 acre of about 25-20 kg with nearly 200 farmers in 2009 saving was 6000 kgs; saving of irrigation water by 40 % (8419 m³ ha⁻¹ instead of 16,634 m³ ha⁻¹). SRI not only reduced drudgery but also cost of cultivation. Use of the weeder has already become popular and efforts are on the way to develop motorized weeders and convert the transplanting machine to suit SRI principles of single seedling and wider spacing.

Also important to mention that the native and the modern varieties adjusted well to the transplantation taking between 7-14 days seedlings (two leaves stage) and transplanting single seedlings in line with a distance of 10-12 inches between seedlings than the traditional methods of rice cultivation.

Lessons Learned: While introducing a new technology, if the risks, fears, doubts and anxieties of the farmers are addressed timely and appropriately it helps to gain the confidence of the farmers. Only personal experience in the application of new technology helps farmers to overcome their doubts and adopt a new technology. SRI method of cultivation can be expected to give enough incentives for preserving native varieties.

Coastal and Marine Biodiversity



Mangroves For Future: Community Based Joint Mangrove Management

Contributed By: M.S.Swaminathan Research Foundation, Chennai

Community based Joint Mangrove Management programme was implemented in six mangrove wetlands areas in India, namely, Muthupet and Pichavaram mangroves in the state of Tamil Nadu, Krishna and Godavari mangroves in Andhra Pradesh, Devi mangroves in Orissa and Sunderbans in West Bengal.

These above mangrove wetlands are managed by the State Forest Department with the support of the Ministry of Environment and Forests. However, sustainable management of mangrove wetlands has been proving challenging due to difficulties in policy making and subsequent implementation. For example, till late 1970s, mangroves were considered as wastelands and mangrove management meant only total exploitation and conversion of mangrove wetlands into other land uses. During early 1980s, importance of mangrove wetlands for the services they provide and goods they supply was recognized that resulted in a shift of focus in mangrove areas management from total exploitation to total protection. During late 1980s and early 1990s, attention on mangrove management included focus on restoration.

But many of the restoration activities did not yield expected results. One of the reasons was that in most of the restoration and management plans only the forestry component of the mangrove wetland was given importance and inadequate attention was paid to hydrological, oceanographic and sedimentary processes, which are also responsible for the health and wealth of the mangrove wetlands. Another major reason for failure was marginalization of local communities in developing and implementing mangrove wetland management plans. In order to fill this gap between science and management and local community and management agencies the Joint Mangrove Management (JMM) programme was initiated in 1993.



Source: M.S. Swaminathan Research Foundation

The objective of the programme was to enhance the capacities of local community, local self- governance structures, Non-Governmental Organizations (NGOs), Community Based Organizations (CBOs) and research institutions to restore and sustain mangrove wetlands through participatory analysis of issues and action. The major issues addressed were i) developing and demonstrating mangrove restoration techniques, ii) ensuring genuine community participation in the management approaches and iii) developing adequate changes in government policy and programme to increase support for community based mangrove management that included securing adequate livelihood support systems.

Mangrove wetland is a characteristic feature of tropical coastal line and they are normally located in the areas where river water mixes with seawater. Salinity – both of water and soil – of this ecosystem varies widely, sometimes from zero to more than seawater salinity. Trees and shrubs growing in the mangroves develop a number of adaptive features to live in a marshy, less oxygenated and saline environment and hence, they are unique. Mangroves are also rich in fishery resources and support livelihood of thousands of poor asset-less fishing families. All the mangrove wetlands where JMM was implemented were in a severely degraded state in 1993 both quantitatively and qualitatively. The area of degraded mangroves varied from 38% in Godavari mangroves to 75% in Muthupet mangroves and in many mangroves one or two species were dominant

The communities dependent on mangroves were mostly fishing families and a few farming communities. Both the traditional and non-traditional fishing families participated in the programme of JMM. Most of these families were socio-economically backward, had low income, limited assets, low literacy rate, limited housing and health facilities. Most of them used improvised crafts and nets and other equipments to harvest fishery resources from mangroves mainly for subsistence. In some areas, women used only hands to fish and prawn by sitting in knee deep water and groping on the mud. Farming community mostly utilized mangrove wetland for grazing their animals in the peripheral areas and in some areas firewood collection from mangroves was high.

Apart from the mangrove user community, the other primary stakeholder is the Forest Department, which owns and manages the mangroves. Secondary stakeholders include aquaculture farm owners, who find mangrove environment is the most suitable place of aqua farming and NGOs interested in conservation and development.

Participatory research

Since it was repeatedly mentioned in the Forest Working Plans that attempts to restore degraded area yielded limited results and there was conflicting reasons for degradation between the Forest Department and local community, research was conducted with the participation of the community and the Forest Department. This showed that clear felling system of management practiced from 1930 to late 1960s was mainly responsible for degradation. "Clear felling in coupes" is a system of forest management whereby trees are felled on a rotation basis every 20 or 30 years for revenue generation in coupes (plots) of about 10 to 15 ha. Studies indicated that coupe felling exposed large areas of mangrove wetland to sunlight, which caused evaporation of soil water. As a result, soil in the coupe-felled area shrank, changing the flat topography into a trough. Tidal water entered the trough-shaped portions and became stagnant. Evaporation of stagnant water increased soil salinity to a level lethal to mangroves. As a result, no regeneration of mangrove plants was seen in the coupe-felled area. This was the main cause of degradation rather use of resources by the community.

On the basis of the above finding a simple physical intervention was tried to restore degraded mangrove areas. This technique included a canal system, consisting of main and feeder canals, which was designed and dug in the demonstration area. The main canals were connected to natural canals nearby. This enabled tidal water to flow freely in and out of the degraded area (instead of stagnating), thus decreasing soil salinity and increasing soil moisture, which in turn supported mangrove growth. This improvement in biophysical condition helped in natural regeneration of mangroves also.

Community mobilization and institutional development

At the end of the successful demonstration three key questions were asked: i) how artificial canal system can be maintained? ii) how to upscale restoration activities? and iii) how to sustain restored mangroves? Answers to these questions led to community based participatory management programme. As a first step mangrove user communities of the mangrove wetlands identified and project villages were identified on the basis of intensity of resource use, socio-economic condition and willingness to participate in mangrove management. Following an intense process, in each village a village level institution namely, Village Development and Mangrove Council (VDMC) was established with a decision making and executive body. The decision making body or the general body consisted of one woman and man from each participating family as members and executive body that consisted of leaders and members with equal representation for woman and man and also representatives of the Forest Department and M S Swaminathan Research Foundation (MSSRF), which facilitated this development.

The capacity of the village level institutions was constantly improved through orientation workshops, training on participatory methods, exposure visits to successful participatory natural resource management projects, technical training on restoration, participatory planning, implementation and monitoring.

Micro planning

Participatory Rural Appraisal and socio-economic survey was used to identify concerns of the community and the Forest Department relating to mangrove conservation and management and socio-economic and infrastructural development. On the basis of these, micro plans were prepared and implemented to address the concerns identified through Participatory Rural Appraisal (PRA) actions and survey. Funds were mobilized through project support, Forest Department (FD), financial institutions and from government institutions.

Mangrove management unit and restoration

Mangrove management unit is defined as a part of mangrove wetland which is traditionally used by the community of a village to meet their basic needs. The communities, FD and MSSRF jointly were involved in identifying and demarcating suitable management unit for project villages and also in designing canal system for restoration. Funds were provided to the Village Development and Mangrove Council and they mobilized both women and men in canal digging, collection of planting material. Plan for after care of the plantation was prepared by the VDMC in consultation with FD and different villages followed different methods to protect the plantation and nearby mangroves. It was made mandatory for the VDMC to involve women in all activities and provide equal salary to women and men, though which was initially resisted by men but later accepted as a norm through persistent efforts.

Apart from ensuring access to mangrove resources, particularly fishery resources, a number of livelihood strengthening and poverty reduction activities implemented in the project villages, which played critical role in sustaining people's interest in participatory mangrove management. For example in one of the villages a primary school was started with the support of project, (which has now grown into a middle school) which encouraged parents of children to take



Source: M.S. Swaminathan Research Foundation

active participation in the processes of mangrove management. In addition, a substantial amount of fund was given to each VDMC as corpus fund for granting loans among its members, which avoided exploitation by money lenders.

Different kinds of interventions were attempted to improve livelihoods of local communities that included: i) improved fishing and related actions, ii) demonstrations potential income generating opportunities in a participatory mode so that viable demonstrations would be taken up in the future and iii) training to impart vocational skills. Experiences indicate people were more interested in interventions that would enhance or strengthen existing livelihood activities rather than alternative livelihood or income generating activities.

Key Results

An innovative, simple and cost effective method was developed and demonstrated to restore degraded mangroves. A science based, people-centered and process-oriented approach to restore, rehabilitate and sustain mangrove wetlands was developed and pilot tested. Established 33 village level institutions (VLIS) for Joint Mangrove Management with about 5240 mangrove user families as members in the states of Tamil Nadu and Andhra Pradesh and Odisha; many of these VLIs are currently working with the Forest Development Agency to restore and conserve mangrove wetlands. With the support of local communities restored 1447 ha of degraded mangrove wetlands through these village level institutions about 6.8 millions mangrove saplings planted in the restored area, of which nearly 75-80% survived. About 12000 ha of flourishing mangrove forests brought under JMM 194 Self Help Groups – both women and men - were organized and linked to various government schemes

Perceptions about local communities in mangrove degradation drastically changed since it was understood that they were not responsible for degradation. The two major stakeholders, community and Forest Department gained confidence to restore mangroves in a scientific manner through participatory approach. State Forest Departments of others states used the model to mobilize resources and started replicating the model. Also NGOs who were trained in JMM started replicating the model. Mangrove restoration activities generated 90 man days of work per hectare restored and thus 135000 man days of work generated through this particular intervention. It continues to create employment since mangrove restoration activities still continues. PRA indicates that fishery resources, particularly crab resources of mangrove increased substantially after mangrove restoration.



Source: M.S. Swaminathan Research Foundation



Impacts : The actions to restore and conserve mangrove wetlands at the national and state level increased manifold which was indicated by increased allocation of resources from the Central Government to State Governments for mangrove restoration and management programmes. The Ministry of Environment is currently implementing a National Mangrove Action Plan which included JMM as the best available and most suitable model for mangrove management

A study indicates that daily 11 kg shellfish and 4 kg of fish can be harvested sustainably from one hectare of healthy mangroves and hence, restoration of more than 1500 ha would have increased income of families fishing in the project sites. The recent Forest Survey of India report indicates that mangrove forest cover of India has increased of 593 sq.km from 4046 sq.km in 1987 to 4639 sq.km in 2009. The community based Joint Mangrove Management programme played catalytic role both in terms of developing, demonstrating suitable models also also in bringing changes in programmes and policy of Ministry of Environment and Forest, Government of India.

Integrated Farming System: Mangroves and fisheries

Contributed By: M.S.Swaminathan Research Foundation, Chennai

Integrated Mangrove Fishery Farming System (IMFFS) is being demonstrated in Pichavaram and Vedaranyam regions in Tamil Nadu and near Krishna and Godavari mangroves in Andhra Pradesh. In Tamil Nadu a prototype model was developed in association with SSS Marine Farms in a village called Pulianthopu, near a fishing village called Pazhayar, Pichavaram region and it is now being pilot tested in Tamil Nadu and Andhra Pradesh.

It is always considered that mangroves and coastal aquaculture cannot go hand in hand because biophysical requirements of these two systems are not similar. Hence, mangrove forests were cleared in large scale for aquaculture development particularly in Africa and South Asian countries.

Nearly 54% of mangrove loss in the world is mainly due to shrimp and fish culture in the coastal environment. Such a large scale removal of mangroves leads to loss of valuable goods and services offered by this important ecosystem.

According to recent studies, nearly 54% of mangrove loss in the world is mainly due to shrimp and fish culture in the coastal environment. Such a large scale removal of mangroves leads to loss of valuable goods and services offered by this important ecosystem. On the other hand, shrimp farming, which emerged as an important sector in fisheries in 1980s in South and South Asian countries, reached peak in production in mid 1990s, after that has suffered setbacks in terms of production, value and acreage.

Monoculture, disease, poor seed quality, excessive use of artificial feed, increased input costs and decreased market value were given as important factors for such decline in aquaculture production. Above all, poor environmental management and lack of different activities to diversify livelihoods within the aquaculture farming system are also responsible for the current poor status of coastal aquaculture both in India as well as in many other parts of the world. The social impact of decline in prawn farming is enormous, particularly in India. Many of the farmers, who converted their agriculture land into aquaculture farms, are currently getting no income either from agriculture or from aquaculture. Many of these families now migrate either temporarily or permanently in search of employment and livelihood to nearby urban areas.

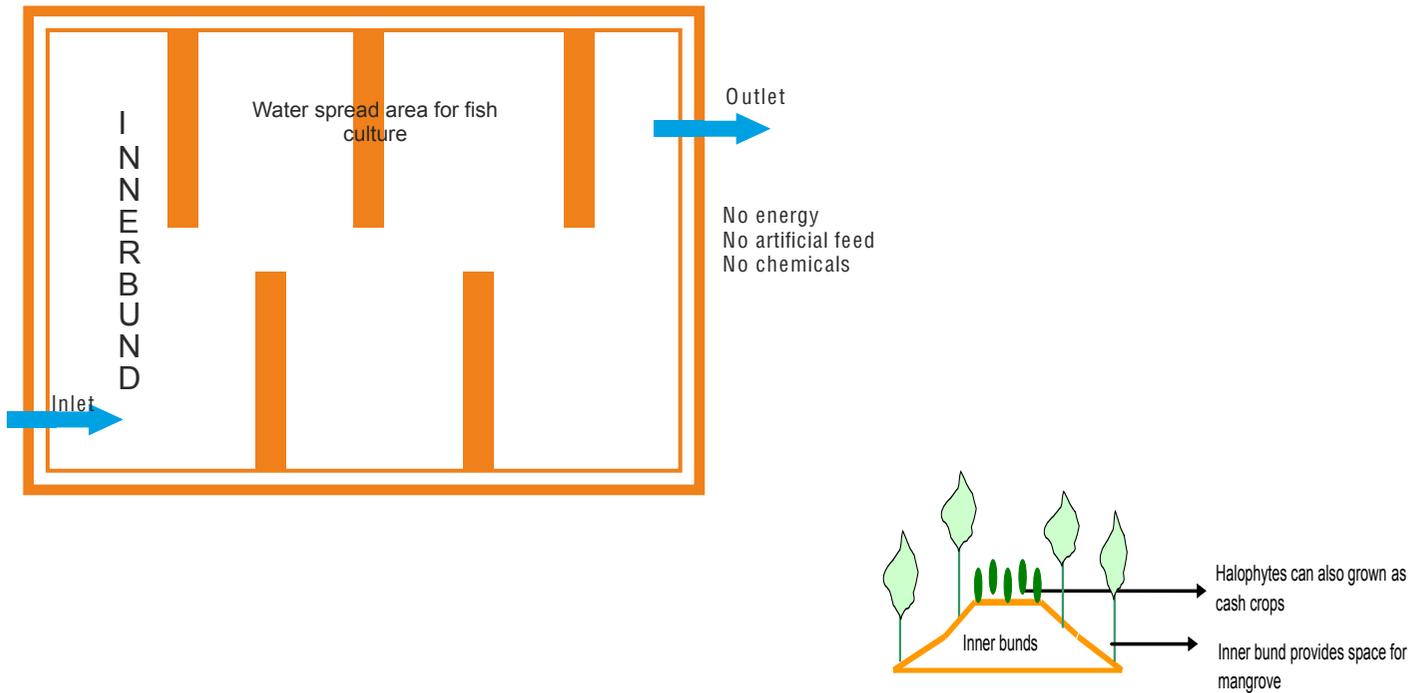
In this situation, Integrated Mangrove Fishery Farming System, wherein cultivation of mangroves, halophytes (salt-loving plants) and culture of fish, crab and prawn are integrated, provides some tangible solutions to make coastal aquaculture as a source of sustainable livelihood option and also strengthen resilience of coastal communities through development and conservation of mangrove forest. IMFFS also provides opportunity to enhance adaptive capacity of local community to sea level rise.

The objective of IMFFS is to develop and demonstrate brackish water based farming system wherein cultivation of mangroves, halophytes and fish are integrated for multiple benefits including sustained income and employment to the coastal communities. It also serves the purpose of demonstrating models that link biodiversity conservation and livelihood enhancement.

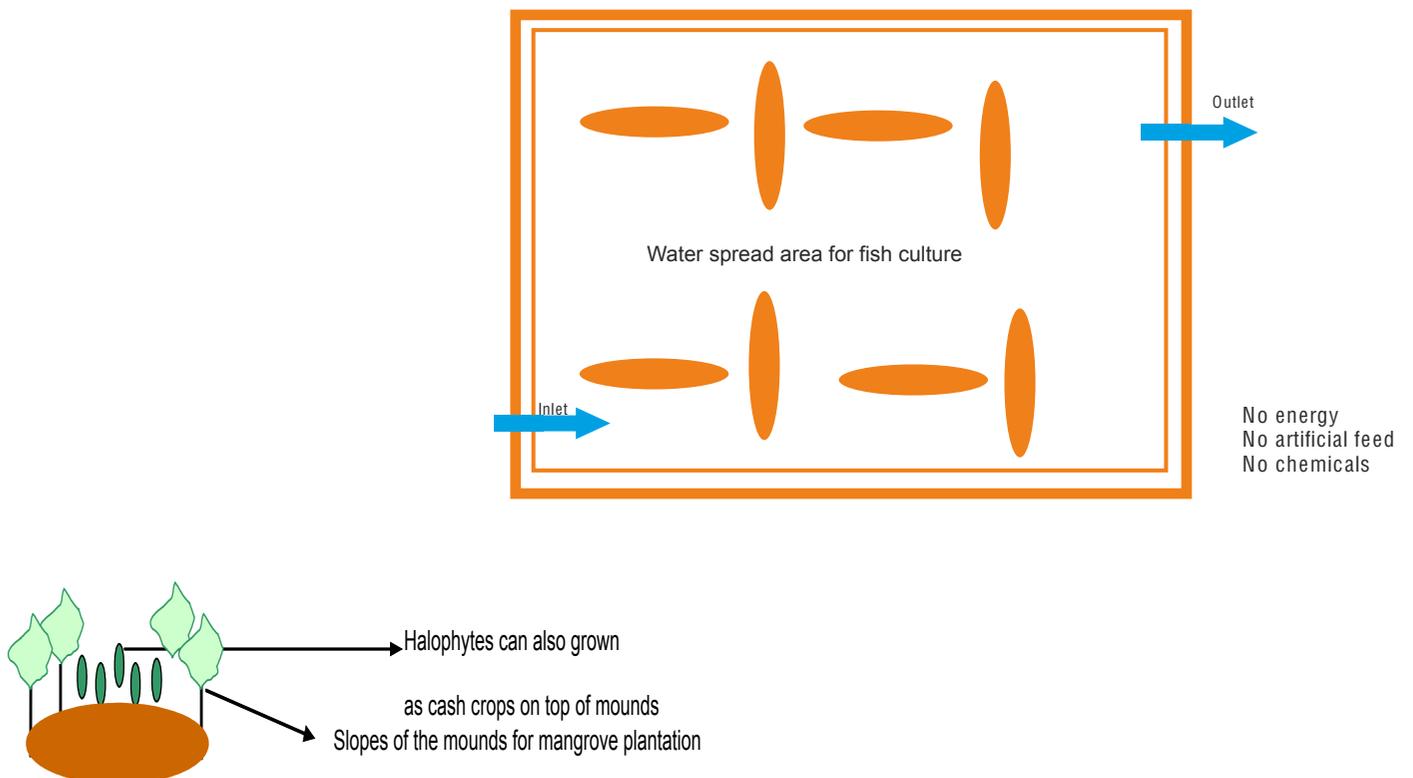
The traditional fishing community and marginal and small aqua farm owners are the primary stakeholders of this programme. The traditional fishing community has now realized that fishery resources are definite and marine fish stock are fast depleting. They are looking for diversifying fishery related livelihoods, which should give them regular and sustained income.

Hence, they are interested in IMFFS. Similarly, aquaculture farm owners have understood that in order to have sustained income from aquaculture, they should follow more nature-oriented shrimp and fish farming system rather than totally artificial systems. Secondly, it is easy for them to market shrimps or fish that have reduced carbon foot print and IMFFS gives them chance for them.

Design of a seawater based integrated agro-aqua farming system with inner bunds



Another design of the seawater based integrated agro-aqua farm with earthen mounds



Forest and Fishery Departments are secondary stakeholders on IMFFS and their interests relate to conservation of mangrove plant resources and regular income for fishing families and reduced pressure on capture fishery. Revenue Department is another important stakeholder since it owns large areas of saline mud flats in the coastal areas either as surveyed or un-surveyed lands.

Formation of village level groups

In each of the project villages, fishing families interested in participating in pilot testing of IMFFS are organized into groups for site selection, planning, implementation and monitoring IMMFS farms. From each family one man and one woman have been included as members and in most cases opportunity is given to youth to participate in the entire process.

The Site selection is most important activity in developing IMFFS since a) development of IMFFS should not cause salinization of land and water, b) soil condition should be suitable for aqua farming and mangrove plantation and c) there should be easy access to tidal water. The lands for pilot tests were selected on the basis of the above criteria. In some cases, abandoned shrimp farms owned by the poor and marginal farmers are also selected for testing IMFFS model.

Design of the IMFFS farm

The IMFFS farm was designed in such a way to create more space for raising mangrove trees and enough space for the culture of fish or prawn or crab. In the present pilot testing, space for mangrove plantation are created by constructing inner bunds or mounds inside the aquaculture pond as shown in Fig 1a and 1b. It is ideal to have 30 to 35% of space for mangrove plantation and 70 to 65% for fish/prawn/crab culture. The pond should also be designed in such a way that 3 to 4 feet of water should be there in the pond all the time to support fish culture. This can be achieved by keeping tidal inlet 3 to 4 feet below tidal outlet.

Mangrove plantation

Species that are locally available can be selected for plantation in consultation with the participating communities. In the pilot testing, *Rhizophora* species are selected for planting in lower edges of bunds and *Avicennia* species for upper rows because *Rhizophora* species requires regular wetting by tidal water. In the prototype IMFFS farm, a total number of 1723 *Rhizophora* saplings, and 327 *Avicennia marina* saplings were planted during February 2006. *Rhizophora* saplings were planted in two rows along the lower edges of the bund whereas *Avicennia* saplings were planted about 2 m above the *Rhizophora* plantation. Both *Rhizophora* and *Avicennia* were planted at 5 m intervals in a row. Data on growth parameters of both *Rhizophora* and *Avicennia* were collected at 3 month intervals and survival rate was observed once a month. At the end two and half years, *Rhizophora* trees reached an average height of 2.26 m with large number of silt roots and *Avicennia* trees reached 1.69 m. Growth rate of mangrove trees is almost similar to natural conditions.

Fish culture

Culturing of sea bass – a commercially important fish – was attempted in the prototype pond during December 2007 to October 2008. About 500 fingerlings of 8 cm length, acclimatized in the IMFFS pond itself in nylon enclosures, were released into the farm in January 2008.



Source: M.S. Swaminathan Research Foundation

In October 2008, about 125 kg of sea bass was harvested along with about 161 kg of other fishes such as milk fish, mullets, tilapia. In the pilot testing ponds, experiments on different type of culture such as growing tiger prawn and mullet together and culturing of sea bass with bio-feed such as tilapia are going on to increase margin of profit from fish culture.

The important output is that a coastal aquaculture farming system wherein raising of mangrove trees and culturing of fish can be done in an integrated manner with the participation of stakeholders. More than 2000 fishing families, including men, women and youth are trained in this



Source: M.S. Swaminathan Research Foundation

system. Similarly, other stakeholders such as district and field level officials from the Forest, Fisheries and Revenue Departments have also visited the farm. In addition, leaders and members of local self government are also given exposure to IMFFS. Community and CBO representatives, development workers, officials, scientists and parliamentarians from Sri Lanka, Thailand, Cambodia and Sweden have visited this unique farming system. Such an exposure to different stakeholders will facilitate replication of this model in large scale.

Two important challenges are faced in replicating IMFFS in large scale. These include, replication of IMFFS by poor and marginal fishing families is severely affected by lack of ownership of saline land. Though saline affected common lands are available in large scale they are all owned mostly by the Revenue Department and no suitable policy exists to allot these lands to fishing families to take up IMFFS. Techniques to culture fish/prawn/crab in the IMFFS farm to provide income that would encourage self replication by coastal aquaculture farm owners need to be standardised through participatory experiments. Sharing of the model with community, prospective small scale shrimp farmers, NGOs and officials of the Fisheries and Forest Department has already been started. The participants are provided theoretical orientation to the model and then taken to field site for exposure. Feedback from them is used to standardize the model.

Attempts are being made to replicate the model by including them as one of the enterprises in Rural Development schemes. The Aquaculture Authority of India informed that this can be used to reduce carbon foot print in shrimp farming and shrimps grown in IMFFS can be sold at premium price. The Forest Department of Odisha and Gujarat is willing to replicate this model through their Integrated Coastal Zone Management programme.

The key lesson learned in using IMFFS is the misunderstanding that it is very difficult to integrate ecological security of coastal area and livelihood security of coastal community. IMFFS demonstrates how livelihood of coastal community can be integrated with conservation of mangrove diversity.

Seaweeds as livelihood provider: Example from Gulf of Mannar

Contributed By: International Collective of Small Fish Workers, Chennai

In India, seaweeds are exploited from the south east coast of Tamil Nadu, Gujarat coast, Lakshadweep islands and Andaman and Nicobar Islands. At present the red algae *Gelidiella acerosa*, *Gracilaria edulis* and *G. crassa* are used for extraction of agar-agar and species of *Sargassam* and *Turbinaria* for sodium alginate. Most of the seaweed based industries in India depend on the raw material being exploited in Tamil Nadu.

Seaweed collection has been carried out since the 1960s in Tamil Nadu. It gained commercial importance when seaweed processing was done on a large scale for extracting agar and agarose. The important seaweeds collected from the areas around the 21 islands in the Gulf of Mannar region in Tamil Nadu are Red algae->*Gracilaria edulis* (Kanchi pasi), *Gelidiella acerosa* (Marekozhudu), and Brown algae ->*Sargassam* (Kattakorai) and *Turbinaria* (Baagoda pasi). These seaweed resources are abundant only in the shallow areas around the islands. *G. acerosa* is available only around corals, while *G. edulis* can grow in any shallow waters.

Gulf of Mannar National Park and Biosphere Reserve: The Gulf of Mannar region has 21 islands, all currently uninhabited, bordering the districts of Tuticorin and Ramanathapuram, Tamil Nadu. The islands range in size from 0.25 to 230 hectares and are at a distance of one to 15 km from the coast. The four islands off the Tuticorin coast are Van, Kasuwar, Karaichalli and Villaguchalli. The remaining 17 islands—Upputhanni, Pulvinichalli, Nallathanni, Anaipar, Valimunnai, Appa, Poovarasampatti, Talairi, Valai, Mulli, Hare, Manoli, Manoliputti, Poomarichan, Pullivasal, Krusadai and Shingle—are off the Ramanathapuram coast. These islands are grouped into four clusters: Mandapam, Keezhakarai, Vembar and Tuticorin.



Source : Shilpi sharma, Dusty Foot Productions

The 21 islands and the waters surrounding them upto a depth of 3.5 fathoms on the bay side and 5 fathoms on the seaward side were declared as the Gulf of Mannar National Park in 1986 under the Wildlife (Protection) Act 1972 (WLPA). The National Park covers an area of almost 560 sq.km. A larger area of 10,500 sq km that includes the national park and parts of the coast was declared as the Gulf of Mannar Biosphere Reserve in 1989.

After the declaration of the national park extraction of natural resource was prohibited. However, strict implementation of the regulations started only in early 2000. People were prohibited from going near the islands, including for fishing and for collecting seaweeds. Though the initial notification for the National Park was brought out in 1986, the final notification is yet to be brought out, as per the requirements of the WLPA. The final notification can be brought out after approval from the Chief Naval Hydrographer's Office has been obtained and after rights of communities have been settled.

Seaweed collection has been done in an artisanal manner for long. Initially women/men collected seaweeds by standing in neck-deep water, and bending to collect seaweed using only their hands, with no protective gear for their eyes, hands and legs. It was later during the 1980s and early 1990s that women started using goggles to cover their eyes as well as a pair of aluminum plates on their legs (like paddles). It was also in late 1990s that some of the women started using metal scrappers to collect seaweeds. However, the use of metal scrappers was prohibited by the community from 2001 onwards as they felt that it was affecting the growth of seaweeds. The seaweed collected are dried and sold to traders who come to the village. The current price for seaweeds is not much—after drying *G. acerosa* fetches Rs 26/kg, *G. edulis*, Rs 10/ kg, *Sargassum*, Rs 6000/ton, and *Turbinaria* Rs 7000/ton.

Women go in groups of 5 to 10 early in the morning, renting a fishing boat to reach the islands. Once there, they wade through neck deep waters, diving to collect seaweeds. They do this for almost 6 -7 hrs. The women return home by 2 pm in the afternoon. Before 1986, women from some of the villages like Chinnapalayam and Thoopukadu used to stay on the islands and collect seaweeds for a week at a time. These women seaweed collectors are members of the Ramnad district Fishworkers Trade Union (RFTU). In some villages they are also part of the local village-level chank divers and seaweed labourers association.

Restrictions on collection of seaweed: Implications for livelihoods: As mentioned, after the declaration of the National Park, restrictions were placed on extraction of resources. For women seaweed collectors this has had severe implications for their livelihoods. Cases where their entire harvest has been confiscated, along with the boat, or fines of between Rs 5000 to 10,000 have had to be paid to the forest department officials, have been reported. In some cases, as women lack the resources, the fine demanded is paid by the boat owners or seaweed traders, thus making these women indebted towards them for the next few years. Data on the exact number of cases booked against seaweed collectors are difficult to segregate.

Is there a way forward?: Women seaweed collectors consider the prohibition on the collection of seaweed within the national Park to be unwarranted. They point out that, for a start, seaweed grows only around dead corals, and that, therefore, claims that their activity is affecting the corals in the area, is without basis. They further point out that they are fully aware of the importance of protecting corals and other forms of biodiversity in the areas, the basis of their livelihoods, and that they can, in fact, play a vital role in ensuring better conservation and management.

Efforts taken by the Gulf of Mannar Biosphere Reserve Trust, formed in 2002 to implement the United Nations Development Programme-Global Environment Fund (UNDP-GEF) funded project, also deserve mention. To deal with problems highlighted by the seaweed collectors, the Trust organized a series of meetings between the Forest Department, seaweed collectors, the RFTU and seaweed traders. Through this process of dialogue an unofficial agreement was reached in 2007 whereby it was agreed to ban seaweed collection for a period of 90 days, from 15 April to 15 June. This agreement, though unofficial, was useful and helped in regulating resource use.

The situation, however, remains tenuous. Women claim that despite their efforts at self-regulation they still face restrictions and harassment while collecting seaweed. In 2010, they, therefore, actively challenged, as part of the RFTU, the move by the Gulf of Mannar Biosphere Reserve Trust to demarcate the boundaries of the national park using buoys. Their fear was that demarcation of boundaries would further compound the problems and harassment they face, and restrict their livelihood activities. They point out that demarcating the waters up to 500mts from the boundary of the islands as the core zone had no legal basis; moreover, that the final notification declaring the National Park has yet to be issued.

To protect their livelihoods women are seeking legal recognition of their rights to collect seaweeds, including the right to stay overnight on the islands during periods of seaweed collection. This, they stress, was the practice in the past, and will help in reducing the time and money spent on travel to the islands. They are also seeking issuance of identity cards by the fisheries departments, similar to the ones provided to fishermen, as this would identify them as legitimate fishers. They are further seeking to be recognized as eligible—like the fishermen—to receive the “closed season amount” of Rs 800 during the period when seaweed collection is not allowed.

Rather than alternative livelihoods, which have not proved feasible to date, women are asking for a small-scale agar processing plant to be set up in the area. This would not only ensure better prices to local women collectors, it would also provide employment locally.

Women seaweed collectors stress that they would like to play a more important role in conservation and management of the biodiversity that sustains their livelihoods, including through self-regulation. They ask to be seen as custodians of the resource, not as thieves stealing from what they have traditionally seen as their own.



Source : Shilpi sharma, Dusty Foot Productions



Women, such as those from Chinnapalayam and Thoopukadu, highlight that they have already adopted certain measures to ensure sustainable extraction of seaweed. The number of days for collection has been reduced to 12 days in a month, every alternate day (6 before full moon, and 6 days after new moon). The use of metal scrappers to collect seaweeds, in the few villages where it was practiced, has been banned as it is feared that their use will affect seaweed regeneration. Women from other villages using scrappers have even been fined. Such measure, they stress, have helped in better seaweed regeneration in the Mandapam group of islands.

The challenge now is to ensure that the local community is seen as part of the solution, and that appropriate policies, processes and legislation are put in place for this. The challenge is to ensure that biodiversity and livelihoods are protected through sustainable use of resources.

Life, Livelihoods, Resources: Fisheries as a Base

Contributed By: International Collective of Small Fish Workers, Chennai

Maharashtra with a total fisher folk population of 386, 259, has 152 landing centers spread across the 720 km coastal length. There are 456 fishing villages (fourth largest number of fishing villages in India), with 74, 203 traditional fishermen families, of which 15,509 families are living below poverty line (BPL) (GOI 2012).

The marine fish landings of Maharashtra has shown a decline of 29 per cent from 2009 to 2010 (2.25 lakh tonnes in 2010), while the total number of units landed and actual fishing hours showed 33.5 per cent and 22.3 per cent decline respectively (CMFRI 2011). Central Marine Fisheries Research Institute (CMFRI) records also indicate that the maximum fish landing in Maharashtra in the last 15 years was in 2002 (4.15 lakh tonnes), after which there has been a steady decline in catch.

The optimum fleet size of Maharashtra is estimated to be 8,783 fishing boats for the sustainability of the exploited marine fisheries resources as the total potential yield is estimated to be only 5.18 lakh tonnes. However, the current fleet size in Maharashtra is over 20,000 fishing vessels (CMFRI 2011). According to the CMFRI Census in 2010, Maharashtra has the third largest mechanized fleet in India, with 5,613 trawlers, 2,961 gill netters, and 3,973 dol netters. Besides these, there are over 4200 motorised and non-motorised boats fishing in the waters off Maharashtra (GOI 2012).



Source: Shuddawati Peke, ICSF

Based on the records of the State Fisheries Department (2009-10), decrease in catch is clearly seen in the districts of Greater Mumbai and Ratnagiri. In terms of gear-wise catch, there has been drastic reduction in the catch of rampon nets (6430 tonnes in 2006-07 to 2025 tonnes in 2009-10).

Fishing Communities

The depletion in fish resources has threatened the lives and livelihoods of traditional and small-scale fishing communities in five coastal districts in Maharashtra—Mumbai, Thane, Raigad, Ratnagiri and Sindhudurg—for the past ten years. The leaders of the State level union of fishworkers—Maharashtra Macchimar Kriti Samiti, affiliated to the National Fishworkers' Forum (national union of fishworkers)—decided to sensitize the fishworkers to look into the needs for livelihood-sensitive conservation and responsible, sustainable development of fisheries resources.

Besides resource depletion, fishing communities in these districts also face contamination of coastal and marine waters by industrial effluents, pollution by oil and sewage, intensive aquaculture in wetlands, dredging and reclamation of coastal areas, unregulated fishing, overcapacity of fishing boats, and the destruction of mangrove forests. These have also contributed to the dwindling of fish stocks. One of the biggest problems due to dwindling of fish stocks has been the consequent reduction in fishing income that has affected the repayment capacity of fishers, especially those who have taken loans from banks for fishing-related activities. While Maharashtra government has given debt-relief measures to farmers, these are not extended to fishers.

The fishing communities feel that the conservation and management measures through the Maharashtra Marine Fishing Regulation Act (MMFRA), 1981 are not adequate to address their concerns. The failures in official conservation and management measures, made the fishing communities decide to come together and organize meetings and discussions to take it forward with the government. After constructive deliberations in 2009, the communities came up with a resolution that the State government should be asked to increase the period of the monsoon fishing ban in Thane District from 65 days to 91 days (from 10 June -15 August to 15 May -15 August), and that it should apply not only to territorial waters (upto 12 nm) but also to the exclusive economic zone (EEZ).

Studies undertaken by Central Marine Fisheries Research Institute (CMFRI) clearly indicate that the current monsoon ban of 45 days has helped in sustaining the catch per hour, which would have otherwise decreased by 89 per cent. Studies also indicate that there has been considerable decrease in fishing efforts during the years when the ban has been implemented (CMFRI 2010). The implementation of the seasonal fishing ban, along with other regulations such as minimum/maximum legal size at capture, mesh size regulation, licensing, regulation of operation of motorised boats and capping the number of mechanised boats, would help in sustaining the fishing stocks.

The communities suggested that similar ban should also be imposed in the neighbouring State of Gujarat as well. Such a ban would also lead to a decrease in the diesel consumption and would also allow the government of Maharashtra to reduce its reimbursement amount, admissible on account of exemption of excise duty on diesel. They felt that this amount could then be accordingly used to provide social security to fishworkers.

On 31 March 2009 the Kriti Samiti put forward this proposal for the extended ban to the State Fisheries Commissioner, who, on 15 May 2009, strongly recommended it to the Fisheries Department of the State Government. The Commissioner also issued instructions to its local officers to co-operate with the Kriti Samiti in organizing sensitization campaigns in Mumbai, Raigad, Ratnagiri and Sindhudurg during April 2009. During April and May 2009 the Kriti Samiti organized an intensive campaign in the *talukas* in all the five coastal districts of Maharashtra. The campaign, which kept in view both short-term and long-term objectives, was well received. Initially, the ban was intended to be confined to the 2009 monsoon season.

As an experimental basis for the next three years starting from 2009, fishworkers demanded that the ban be effective from 1 June to 31 August for Mumbai and Sindhudurg Districts, from 10 June to 15 August for Ratnagiri District, from 10 June to 15 August for Raigad District and from 15 May to 31 August for Thane District. Fishworkers from Sindhudurg District suggested the ban period be from 1 May to 31 August. However, this demand was not accepted by the Government, while there has only been an increase in the number of boats fishing closer to the inshore waters where normally only traditional small-scale fishers are fish.

Fishworkers from Raigad, Ratnagiri (Harne–Paj) and Sindhudurg Districts also demanded a total ban on the destructive fishing method of purse-seining. It is hoped that the State Government will respond positively to the advocacy- and community-based resource conservation and management proposal, and implement it under the provisions of the MMFRA. Other coastal States will hopefully emulate the Maharashtra example.

Encouraged by the response of the fishing community to the challenges posed by the depletion of fish resources, the leaders of the Kriti Samiti are turning their attention to saving the State's coastal mangrove ecosystem, which is not only the spawning and nursing habitat for fish and other marine life, but also protects coastal communities from natural disasters like tsunamis. In the name of so-called development, wanton destruction of mangroves continues unabated in Maharashtra's coastal areas. The Kriti Samiti proposes campaigns around the slogan "Save Mangroves, Save Life" in all the coastal districts of Maharashtra to sensitize the coastal communities and the public at large to the importance of mangroves in sustaining their livelihoods.



Source: Shuddawati Peke, ICSF

Since 2009, fishing communities continued their struggle against the increase in fishing effort. In 2011, the Maharashtra government finally constituted a committee to look at the reasons for decreasing fish production. The recommendations of the committee also highlight the need to increase the number of days for the season fishing ban, and banning of purse seines in the territorial waters.

However, one of the biggest challenges for the community is to convince the Maharashtra State government to impose the ban, and effectively implement it by developing monitoring, control and surveillance system with the help of communities. The fishing communities along the coast of Maharashtra feel the urgent need for conservation and management of coastal and marine resources, and hope that the Committee's recommendation would finally be taken seriously by the State government, and that the fishing regulations would be implemented and monitored to restore fishing resources, and save livelihoods of fishers.

Coastal Bioshields to Promote Resilient Communities

Contributed By: Seeds India, New Delhi

After four years of tsunami that devastated the coastal Tamil Nadu, during September 2008, was the context when the project 'Coastal bioshield to promote resilient communities' was initiated in the villages situated in the southern fringes of Pulicat lake. Pulicat lake is India's second largest coastal lagoon lies parallel to the Bay of Bengal in the states of Tamil Nadu (North) and Andhra Pradesh (south). Pulicat is home to 50,000 artisanal small scale fishermen, there are 52 villages surrounding Pulicat lake which have been classified as fishing villages. The flat topography and geographic location makes the villages prone to sea born natural disasters.

The coastal area of Bay of Bengal in India is situated in the most vulnerable zone V of tropical storms and cyclones. Thus it is one of the highly vulnerable ecosystems mainly due to the several natural disasters like cyclone, heavy rainfall, flooding and water stagnation, freshwater depletion, shore line erosion and sea water intrusion etc. Tamil Nadu lies in the southern part of Indian peninsula and has a coastline of about 1,076 kms which is about 15% of the coastal line of India. The data shows between 1891 to 1990 nearly 262 cyclones (92 severe) in a 50 km wide strip occurred on the East Coast, indicates that on average, a moderate



Source: SEEDS India

to severe cyclone hits the Tamil Nadu coast every two years. For example in the year 2005 alone, nine cyclonic storms crossed Tamil Nadu and Andhra coast in a three months period. The destruction of coastal forestry due to shrimp farming adds to the vulnerability to cyclones.

Bio-shields are looked into as both a climate change adaptability tool as well as disaster risk reduction mechanism - to balance and protect ecology of the coastal communities. The bioshield would provide multiple benefits to the coastal communities. The Coastal bioshields would help in reducing impact of disasters in terms of damage caused to life and property. They protect coastal areas from high velocity winds, entry of sea water during cyclones and tsunamis.

They serve as sand binders and prevent sand erosion. In the long run the bioshield could lead to the improvement of ground water condition, soil quality etc. The degree of protection and disaster risk reduction by bioshields could vary based on a number of variables such as the nature of the hazard, the biophysical features of the site and the characteristics of the bioshield itself like the type of vegetation, width and density of the vegetation area and height etc. It is very important to avoid exotics in the bioshield which could result in ecological damage. In the context of climate change the coastal bioshield could as a 'carbon sink' — absorbing emissions of the greenhouse gas carbon dioxide.

The coastal bioshield project aimed at strengthening the coping capacities of the coastal communities of five villages in the Pulicat region, viz. Koonan Kuppam, Thirumalai Nagar, Nadu kuppam, Arangem Kuppam and Vairavan kuppam located in lighthouse panchayat of Minjoor block, Tiruvallur district. The lighthouse panchayat comprises of eleven contiguous villages (*Oors*) that have their respective traditional administrative jurisdiction and control.

Patinavar the traditional fishing community and non fishing communities-Schedule Caste-*Parayar*; Other Backward Communities-*Mudaliar, Yadava, Muslims*; Scheduled Tribes – *Irula* are the major communities who are residing in these villages and depending fish catch as their main and only livelihood option. Due to increased dependency and unsustainable fishing practices the fishing community along the coast is facing severe problems to generate income to meet the basic requirements. Here a majority of the fishermen indulge in the fishing activities inside the lake, and there is a earmarked system to be followed called the *Padu* system. And there are few villages that do not have the right to fish inside the lake. The strong traditional controlling system existing in the fisher settlements make the decision making process easy and arrive consensus to work together in the development of bioshield. The villagers and the leaders of the traditional panchayat had assured their active and full participation, cooperation as well as the possible contribution to develop the bioshield. The *oor nivagam* (village management) comprising of five to ten village leaders of all the five villages took the responsibility to manage the activities for establishing of the bio-shield plots in their respective village.

In the selected villages the space located before the settlement up to the sea was identified for bioshield development. According to the community the land is a common property and they have been traditionally using the area to perform several social and economic activities. The selection of the site for bioshield development was done in consultation with the local communities. To draw micro plans for the bio-shields village level meetings were held and village wise participatory micro plans were developed. The village level microplans clearly indicated the role, responsibilities and contributions of resources such as fund and labour by the NGO and communities. Good vegetative growth, timber and canopy values are the parameters the communities consider for the species selection. Species selection was done in consultation with the village communities. *Savukku (Casurina sp)* is preferred to plant on the upfront in the bioshield, in the subsequent order *Poovarasu (Thespesia populneoides)* was placed in the next row followed by *Pungan (Pongamia pinnata)*, *Neem (Azadirachta indica)* and finally *Thennai (Cocos nucifera)*. SEEDS India organized the planting materials from the local nurseries, community labour was provided for jobs like digging the pits and planting the saplings. The total area covered to develop bioshield in all five village is 39,461 sq mts and number of trees that are existing are 9274.

To improve the soil quality compost and nutrients were added in addition to red soil which helped to have a good start. The manure application was decided based on the soil test results. Water management was identified by the team as a crucial aspect, in sandy soils due to the high porosity and less water holding capacity, water was applied twice a day to maintain the optimum root zone environment.

To meet the need shallow bore wells were dug in the bioshield plots in all settlements. Within a year in the villages of Koonan Kuppam and Thirumalai nagar owing to the salinity of the water during summer months, the borewells were shifted twice in search of good water for irrigating the sapling in the plantation plots. Fencing was done with the used fishing nets; the idea came from the community. The decisions with regard to man power and their wages required to the activities related to bioshield were decided by the village leaders. To carry out most of the jobs the village leaders hired the *Irula* tribal families. Later the community added a few more species, they feel relevant to the bioshield lik *Banyan, Othiyan (Octocarpus hirsutus)* etc.

In order to add economic value to the bioshield, following the principles of intercropping good soil that could facilitate the growth of vegetation is added from outside through Sand bar cultivation method. The fishing communities lack the facility and technology to produce vegetables to meet their domestic consumption and always depend on the market.

Sand bar cultivation method was introduced in the two bio-shield plots at Vairavan Kuppam. Hand holding training programmers were conducted for the women members involved by a trained agronomist on different agronomic practices of the crops cultivated. There were 20 pits inside the bio-shield plot, between Nov 2009 and Feb 2010, the community was able to harvest around 75 kgs of vegetable – Bendi, lap lap, tomato and greens, and between Aug and Oct 2010, they harvested another 50 kgs of cluster beans, Bendi and snake gourd. The vegetables were equally shared amongst all households in the village. Later sand bar cultivation method was started in three villages. The cultivation of vegetable crops continued for the subsequent seasons. Some of the women also dig pits and stuff with soil and manure and cultivated crops at the back yards of their houses.

To create awareness among the students on local environment and also to explore the scope to involve them in the bioshield activities eco clubs was formed in the middle school at Koonan Kuppam. Saplings of different tree species were planted inside the school premises which was taken care by the four eco clubs, this encouraged another private school in the village panchayat to approach SEEDS requesting for sapling.

Around fifteen economically weak *Irular* tribal families were benefitted in this process. They are regularly employed for pruning, pit preparation, fencing, repairing of fences, trenching of water storage pits, trenching around the trees etc.

A new method to cultivate vegetables in the sandy beach has been developed, first time the fisherwomen use the vegetables cultivated in their own land. Members of Self help groups are



Source: SEEDS India

already replicating this method as a group or individually at their backyards. With further support in the future by the agriculture department and NGOs, this practice can be further strengthened up.

The major Challenges during the process of the project that the project team underwent was the lack of consistency in spontaneity amongst the village leadership who often change due to internal conflict, and sometimes the change of leadership would occur within a span of one month.

The total Number of trees surviving as on data:

Village	Casuarinas	Pungamia	Thespecia	Neem	Coconut	Others	Total
Vairavan kuppam south	672	14	13	15	43	2	760
Vairavan kuppam north	2125	23	21	29	113	6	2317
Arangem kuppam	2668	50	57	62	89	10	2935
Nadu kuppam	808	19	20	20	45	0	912
TM nagar	1806	60	62	29	118	12	2087
Koonan Kuppam	263						263
Total	8342	166	173	155	408	30	9274

Cattle and goat menace was a major challenge, certain portion of the bioshield plots trees particularly the species remain shunted due to the invasion of goat and cattle. Hence, close monitoring of the fencing system and repairing the damages was done by the communities during the first two years. In a proactive case, in one of the villages the leaders issued an order, to fine the owners of the goats and rewards to the person bring the cattle and report to the leaders.

The 'all men' traditional panchayat, which played an active role in the development of bioshield is not sensitive to the participation of women, hence women's participation is limited in the whole process and identified a major drawback. But latter the women members were actively involved in the sand bar vegetable cultivation in the bioshield area.

During the few cyclones that crossed the Tamil Nadu coast in recent times had made a mark in the bio-shields of light house village panchayat. The salt water that intruded in the bioshield in one of the villages and caused some casualty for casuarina plantation that is at the first line facing the sea and at time of strong wind the salt spray would burn the leaves off causing an impact on all the species especially the Neem.

One of the villages in the same locality called Karimanal on looking at the plantation of the adjoining village, replicated the plantation on their own initiative in two plots at the sea front of their village. After witnessing the result a NGO working in the same region has supported the Irular tribal village -Pettai to develop bioshield with the active support of the entire community.

Lessons learned: Adoption of 'process' oriented approach and flexibility in planning and decision making ensures the high level participation of the local communities and develop ownership in the development of the bioshield. Transparency in sharing the budget and decision making is very crucial; this instills confidence in the community. There is a need to recognize that it is a long term community based programme and several years are required to develop a bioshield to a size and density that could offer protection against coastal hazards. A suitable technological intervention in the bioshield, like sand bar vegetable cultivation which provides economic benefits helps the community to increase the interest and ownership.

Chilika Lake Story : Success to be replicated

Contributed By: Chilika Development Authority

Chilika Lake, a brackish water coastal wetland situated in the Odisha State of India forms the base of livelihood security of more than 0.2 million fishers and 0.4 million farmers living in and around the wetland and its adjoining catchments. Over one million migratory birds commonly winter here. Chilika is one of only two lakes in the world that support Irrawaddy Dolphin populations. The diverse and dynamic assemblage of fish, invertebrate and crustacean species provide the basis of rich fishery which generates more than INR 1300 million annual revenues and contributes over 6% of the state's foreign exchange earnings and supporting livelihood of more than 0.2 million fishers. The tourism based on the rich biodiversity of the wetland system generates more than INR 2,300 million to various economic sectors. Based on its rich biodiversity and socioeconomic importance, Chilika was designated as a Wetland of International Importance (Ramsar Site under the Convention on Wetlands) by the Government of India in 1981.



Sustained provision of the wide range of ecosystem services of Chilika and maintenance of livelihoods of the dependent communities is associated with the coastal as well as freshwater hydrological processes.

The lake fisheries underwent a major decline, invasive weeds proliferated and there was shrinkage in area and volume. This had tremendous impact on the livelihood of communities, especially fishers who depended on lake for sustenance. Introduction of shrimp culture also led to pressures on lake ecology and significant disruption of community institutions, especially the traditional community governance of lake fisheries. Being concerned with this the Government of Odisha created Chilika Development Authority (CDA) in the year 1992, for the restoration of this coastal wetland with an ecosystem approach. CDA adopted a holistic approach of integration of coastal processes and Lake basin in the management planning that evolved by way of a wide scale consultations.

The objective of the intervention was to restore Chilika with an ecosystem approach to restore its ecosystem, biodiversity and to secure livelihoods of dependent communities. Chilika restoration is enabled by direct and indirect participation of 0.2 million fishers living in over 120 villages around its shoreline, and 0.4 million agriculture farmers living in the catchments.

Concerned over the rapid decline of the Chilika Lake ecosystem, the Government of Odisha created the Chilika Development Authority (CDA) in 1991 under the aegis of Department of Forests and Environment as a nodal agency to undertake measure for protection of the ecosystem through actual intervention, survey and research, collaboration and networking.



Source: Chilika Development Authority

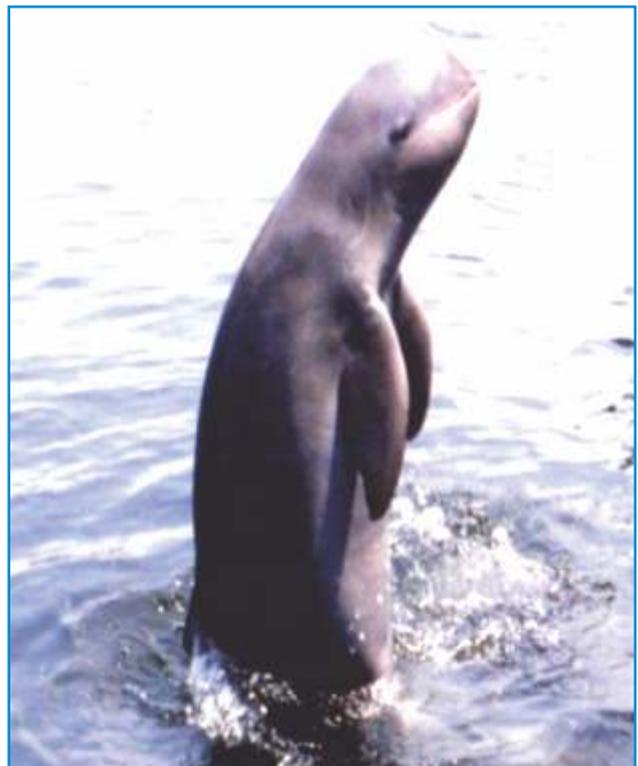
CDA, after extensive local consultations and inputs from scientific studies, opened a new inlet on 23rd September 2000. This intervention had a tremendous positive impact on wetland ecology, leading to increase in salinity and tidal flux, flushing out of sediments, rejuvenation of biodiversity and most importantly rapid increase in fish, prawn and crab catch. The restoration has been carried out based on the principles of wise use and integrated management, and with a major emphasis on the participation of the local population and their shared decision-making, as well as capacity building, linkages with various national and international institutions, and intensive monitoring and assessment systems.

An innovative participatory micro-watershed management concept was adopted with a “sustainable rural livelihood” approach for holistic management of natural resources. The drainage basin management program has been conceived as a long-term participatory process. The objective of this concept has been to facilitate the community through empowerment to take decisions and build capacity to work collectively.

One of the most successful initiatives has been a series of rainwater harvesting structures, which the local community design and install and maintain. They succeeded in recharging aquifers and transforming local ecosystems as well as their surrounding economies. After the rainwater harvesting structures had been constructed, the production of rain-fed paddy improved. Now the intricate link between vegetation water and livelihood is more apparent to the local communities. Notably, there have been increased earnings from land and non-land activities for the poor, reduced debt, and improved livelihood and food security leading to further poverty alleviation, reduced environmental degradation and reduction in the silt load into the lake. This has led to increase in overall forest cover, improvement in soil conditions, and rejuvenation of commons such as village ponds, grazing lands, and ultimately reduction in overall silt flow into Chilika.

CDA has launched an intensive CEPA campaigns on values and functions of the wetland system, particularly amongst the villages in and around and school children. A visitor centre at Satapada serves as the hub of these activities. This centre is open to local communities and visiting tourist round the year providing information on the wetland through exhibits, diagrams and models. An education kit for school children has also been developed. Newsletter 'Chilika' in English and 'Chilika Darpana' in Oriya published by CDA are important means of communicating programmes and policies to the stakeholders.

CDA has also strengthened fishing infrastructure through construction of landing centers and jetties. Woman SHG Groups have been organized and trained to undertake enterprises on production of dry fish and crab fattening. Fishing in Chilika was historically managed by community institutions with traditional regulatory mechanism. However, weak capacities and economic viability led to their gradual decline, with the fishers falling in debt trap



Source: Chilika Development Authority

in the hands of un-scrupulous moneylenders. In 2010, CDA formulated a Fisheries Resource Management plan (FRMP), the plan entails convergence in fisheries governance to ensure sustainable fish production through wise use of fisheries resources as well secure livelihoods of fishers. The plan recommends a co-management strategy with active participation of fishers.

Non maintenance of cold chain & lack of appropriate storage facilities force the fishers to sell their catch to the middlemen who exploit their vulnerability by paying lower prices and manipulating weights. CDA through support of Marine Products Export Development Authority (MPEDA) has launched an initiative to provide efficient insulated boxes to the fishers so that the catch could be maintained for longer time and fishers could choose their preferred point of sale. This scheme has been well received and so far 4,000 boxes have already been put to use by fishers reporting at least 30% increase in sale proceeds.

Building on the knowledgebase developed and interventions made so far, an integrated management planning process has been put in place since 2008 to guide conservation and wise use of Chilika. It may be considered as an exemplary good-practice local action to address complex issues with an ecosystem approach. The plan has been developed based on the Ramsar guidelines and in consultation with local communities as well as expert groups, and will be released in October 2012. To support systematic management, an intensive hydrological and ecological monitoring programme has been put in place.

Results and Impacts

Revival of lake ecology: As a response to the hydrological intervention and restoration efforts within the lake basin, several positive changes in the lake system have taken place as indicated by the following:

Reappearance of 6 species of fish and in addition to this 43 fish, 4 prawn, 7 crab and 2 Indian spiny lobster have been the new record for the Lake.

Regularly supports 0.7-0.95 million waterbirds annually.

Decrease in freshwater weeds *Eichhornia crassipes* (water hyacinth).

Expansion of sea grass meadows and species diversity.

Increase in population of Irrawaddy dolphin from 70 in 2003 to 145 in 2012.

Recovery of livelihood resource base: Building on recovery of ecosystem, the lake fisheries have revived significantly from 1,747 MT in 2000 to 14,228 MT in 2012. The tourist inflow to Chilika has also increased substantially from 0.2 million during 1994-2000 to 0.43 million during 2000-08.

Establishment of a community based adaptive management: The recovery of livelihoods coupled with awareness generation and capacity building programmes has enabled a community based adaptive management within the wetland system. The communities' engagement into wetland management has greatly increased over the years.

Recognitions: Restoration of Chilika has been recognized by Ramsar Convention's Wetland Conservation Award 2002 along with Evian Special Prize, in recognition of outstanding contribution for conservation and wise use of the wetlands with the active involvement of all stakeholders. The Indira Gandhi Paryavaran Puraskar was also conferred to the CDA.

Establishment of knowledgebase: With systematic and continuous investment into wetland monitoring and research, an impressive and consistent knowledgebase on hydrological, ecological, socioeconomic and institutional aspects has been

CFCCS the apex institution has 104 Primary Fishermen Co-operative Society. Availability of credit at equitable terms plays an important role in economic viability of the PFCS. Under this initiative CFCCS, is providing Rs. 10 lakh at 4% interest to PFCSs to revive the institution and ensure fair access to credit to the member fishers. The results have so far been encouraging. Jayantipur PFCS is one of the early cooperative societies to stop depending on middlemen for credit. It currently receives around Rs. 20,000 monthly through loan repayment from fishers, which is being used to build back the seed capital for second cycle of loans.

The following key challenges are faced in management of Chilika Lake:

Communities living in and around the wetland and dependant on wetland resources for livelihoods are its real stewards. A critical challenge has been to ensure their participation from mere resource harvest to building effective science and contributing to management and their engagement in decisions and enforcing sustainability principles.

Not all knowledgebase that underpins management of Chilika is based on systematic monitoring using scientific apparatus. A critical part is the traditional knowledge which the communities have evolved over generations of interactions with the wetland system. The current wetland management strives to use all forms of knowledge as input to management decisions.

CDA, the nodal agency for wetland management, has limited manpower. However, it has worked on a model of strategic partnerships involving various specialist organizations and agencies to support research and engagement. This has helped CDA to function effectively and operate at multiple scales.

Long term sustainability of Chilika restoration is linked to its integration in river basin and coastal zone management. The basic approach adopted has been to facilitate and create an enabling environment, through capacity building and empowerment of the community, community based organisations and NGOs. The ecosystem based management demonstrates how restoration of Chilika with active community participation not only can have positive impact on the biodiversity but can significantly improve the livelihood of the local communities. CDA is working on climate scenarios and related ecosystem and livelihood vulnerabilities to develop a response strategy. A State Wetlands Authority has also been constituted to bring management of all wetlands of the state under the ambit of single management authority, and to benefit from the experiences of Chilika restoration.

This case study demonstrates how restoration of the ecological characters of a site can result not only in increased biodiversity, but also in a spectacular increase in lake productivity (e.g. increase in fish catches including the reappearance of some economic species) and other socio-economic benefits to the local population.

Lessons Learned : Wetland management needs adaptive institutions with ability to work at multiple scales and engage with diverse stakeholders. Effective decision making structures play a crucial role in successful restoration. Investing into multiple knowledge base systems to benefit from cutting edge science as well as traditional knowledge has an important role in the process. Institutional collaborations and partnerships strengthen adaptive management. Participatory research (informed stake holders translating scientific findings into practice), helps in connecting ecosystem to the communities and facilitate resource efficient and inclusive management. Diversity and resilience are essential for maintaining ecological integrity and sustainable livelihood. Investment in restoration of ecosystem can lead to enhancement of ecosystem services; ameliorate biodiversity making the system resilient, leading to livelihood security.

Biodiversity and community based eco-tourism:

The tourist interest in Chilika has been consistently on an increase with improvement in lake aesthetics, amelioration of biodiversity by way of increase in dolphin and water bird population. CDA has undertaken specific initiatives for promoting community based sustainable eco-tourism by building capacity of the local community. A code of conduct for dolphin watching has also been developed. In Manglajodi and adjoining villages of the northern sector, a perceptible change in community behaviour is apparent. These villages, once known for poaching of birds, are now protector of these winged visitors. Equipped with binoculars and watchtowers, these communities are now local guides to birdwatchers, and also CDA's para-scientists assessing habitat and populations. Fishers from more than 17 villages along the outer channel are engaged in dolphin watching as a viable source of alternate livelihood.

Forest Biodiversity



The Mountain Story: Sustainable Tourism in Ladakh

Contributed By: WWF-India, New Delhi

Himalayan high altitude wetlands are crucial for biodiversity and sustainable economic growth not only locally but also at the river basin and regional levels. In addition they regulate micro-climates and have immense livelihood, cultural and spiritual significance for the communities living around them. Yet, despite their importance, they are under increasing threats from climate change, tourism and unsustainable exploitation not only of the wetlands themselves but also of the catchments draining into them. There is also a risk that these threats could lead to negative impacts right down to the river systems to which they supply water.

The project area lies in the eastern part of Ladakh, a trans-himalayan area, falling under the Jammu and Kashmir state. The area is commonly known as Changthang, which covers around 22,000 Km². The area was declared as Changthang Cold Desert Wildlife Sanctuary in 1987 by the State Government of Jammu and Kashmir.

There is a serious issue of climate change, impacting the ecologically fragile high altitude areas where water levels of some lakes continue to rise submerging thereby some crucial breeding grounds of rare and endangered migratory birds. Yet at the same time other high altitude wetlands are shrinking.

Increasing population pressure and unregulated as well as uncoordinated development is putting tremendous pressure on the Himalayan wetlands. Thus the main objective of this project was to conserve the high altitude wetlands of Ladakh and to ensure direct economic benefits to the locals through various community based tourism activities.

The Changthang region has wide open valleys surrounded by rolling hills and creates a network of self drain areas, which forms a series of lakes. These lakes are of diverse origin and are mostly situated at very high altitudes ranging from 4000m to above 5000m. Though these areas have remained unnoticed due to inaccessibility of the region, in recent past most of the areas around these lakes have become accessible to vehicular traffic and are open for tourism. Tourists from different parts of the world now travel to these lakes to admire the beauty of this unexplored region. This has also brought in its own set of threats which require urgent attention from all stakeholders be it forest department, tourism department, local communities, travel agents and tourists themselves. The high altitude Tsomoriri and Tsokar wetlands of the Rupshu basin in the Trans-Himalayan biogeographical region of Ladakh, traditionally used by the nomadic Changpas for their livelihoods, are one of the most unique ecosystems of the world. These are repository of ancient culture and religious practices, holding strong bond between nature and culture. Tsomoriri had also been designated as a "Ramsar Site" in November 2002.

The community traditionally practiced nomadic lifestyle mainly due to sparse distribution of natural resources particularly the pasturelands on which their livelihood was based. The said practice was in consonance with the ecological principles of partitioning resources to avoid competition and over utilization. Traditionally, several related families of Changpa used to have a Goba or headman and their movement was coordinated in search of pastures and their utilization. They used to establish a temporary settlement or hamlet in the vicinity of a pasture. Sometimes several hamlets are established at a place which used to take shape of bigger settlement and would then be called a village. Korzok was one such village that comprised of several hamlets with some permanent structure. Changpa used to spend summers at Korzok and move to other locations during winters in temporary hamlets. At that point of time the main sources of livelihood for Changpa was selling Pashmina wool extracted from Changra goats, (a local breed of goat producing Pashmina wool) and ordinary sheep wool, yak for transportation and making Rebo tents.

The livestock was also used to satisfy the communities' protein requirements. Therefore it was necessary for Changpa to maintain large herds of livestock so that their livelihood needs could be fulfilled.

During the last 50 to 60 years, the community is witnessing transformation from its century old practices in response to the socio-economic and political changes around it. Today, the Changpa community in Changthang can be regarded as semi nomadic instead of nomadic. There are 28 permanent villages where Changpa stay throughout the year. Only a few people of a village take the livestock of the village to other pastures. The sources of livelihood are also changing with increasing population of the area. They now include agriculture, tourism, labour work, renting of pack animals to armed forces and opportunities of establishing small business such as tea stalls, restaurants, grocery stores etc. Signs of overcrowding and over utilization of natural resources have already started appearing, which calls for an urgent in depth scientific investigation and development of a sound conservation strategy.

Beside the local community and district administration, the other major stakeholders involved are Ladakh Autonomous Hill Development Council (LAHDC), the Department of Wildlife Protection (Leh Division) and association of all the tour operators running tourism business through various travel agencies. WWF INDIA initiated the project of High Altitude Wetlands of Ladakh in 1999 with support from the global WWF network. Three of the largest and more vulnerable wetlands of Ladakh – Tsomoriri, Tsokar and Pangong Tso – were chosen for focused conservation efforts.

The wetlands are rich repository of biodiversity and contain more than 58% of the endemic species. They are believed to be the most important breeding site for waterfowl and represent the only breeding ground of bar-headed geese (*Anser indicus*) in India and the globally threatened Black-necked crane (*Grus nigricollis*) outside China. In addition, this region also supports some of the most endangered species of mammals such as Kiang, Snow Leopard, Lynx, Tibetan Wolf, Himalayan Blue Sheep etc.



Source : WWF-India

Key actions as part of this conservation project as under:

In the initial phases of the project the PRA (Participatory Rural Appraisal) exercises were conducted. These exercises helped WWF to build close relationship with the local communities. At the same time an understanding about the issues and concerns of local communities was also gained. Accordingly the conservation strategies with a special focus on providing livelihoods to the local communities were also planned and implemented. One key impact of these education and awareness activities was that the local communities realized the huge importance of their own natural resources and need for their conservation. As a result of it the local people at present have started to take action to minimize the negative impacts of tourism caused by irresponsible tourists. At present there are identified camping sites in the area which are specially managed by locals and no one is allowed to come close to the breeding and feeding sites of the birds.

As part of this project many capacity building programmes in the form of special trainings were organized. These training programmes contributed to the confidence of the local communities especially the womenfolk who were earlier of the view that they can only do jobs like cleaning the utensils of the tourists. With these training programmes the local women are actively engaged in running their own home stays and tea cafes.

These activities are providing direct and good income to the local communities. The local youth have been trained to identify the birds and mammals of the area and are now acting as wildlife guides for the tourists. These activities especially community based tourism are directly benefiting the environment as well as the people of the area.

In order to ensure the long term conservation actions and Community Based Tourism (CBT) activities by local communities, two community conservation trusts were also formed. The local community initially formed conservation committees which was later registered as Trusts under the Jammu and Kashmir Trust Act. Thus two Community Conservation Trusts, the Tsomoriri Conservation Trust and the Tsokar Conservation Trust, were formed in 2002 and 2004 respectively. This enabled them to function independently and have more institutional power.



Source : WWF-India

The Conservation Trusts main responsibilities and roles include, Conservation and monitoring of the high altitude lake ecosystem-the Trusts regulate the camping and parking areas around the lake; Managing flow of tourists to the area: the Trusts regulate and supervise the Ladakh home stays initiative; Organizing regular garbage cleanliness programmes during summer months; Facilitating the ecotourism initiatives by providing tourist information facilities; Supporting the traditional industries like shawl making; Management of the tourists staying in the home stays. This is done on a rotational basis which is regulated by the Trust. This ensures equal distribution of money to all the home stays. For this management the Trust charges 10% of the income from each home stay which is a source of income for the Trust.

This is a long term institutional mechanism through which conservation actions in the area will continue even after WWF exits from the area. The income to the local trusts from the community based tourism activities will financially sustain these village level community institutions.

The initiatives like home stays and women cafes are giving direct economic benefit to the local communities. With this initiative the local people have realized the potential of CBT activities and are now taking the same as an alternate source of livelihood. Such initiatives are very vital as the population of the area is increasing and natural resources on which these communities depend are very scarce and limited.

At present there are about 30 home stays in Korzok village near lake Tsomoriri and 15 in the village Thukjay near lake Tsokar. On an average, the occupancy in these home stays is 80% during the tourist season (June to September). Presently each home stay charges Rs. 800 per room and the camping fee is Rs. 50 per tent. Many village youth have found jobs as porters, cooks and guides for the tourists who trek in the area. There are two parachute café's at Tsomoriri and one at Tsokar which are run by the local women. The women have received a lot of confidence and financial independence from the activity.

Communication material in the form of posters, brochures and leaflets were also produced and published. This has also encouraged the local people to work for their conservation as at present the economy of the local people depends on the tourists visiting the area who come to visit these places to see the rare and unique wildlife of the area.

Economic benefits of the tourism activities in remote areas should go to the local communities. This provides an incentive for the communities to conserve their resources. Local communities should regulate tourism activities as they can use their traditional knowledge and manage their resources in the best possible manner.

Working with the communities need a sustained effort with long term vision and should not be seen as a project.

The First Story: Community REDD+ initiative

Contributed By: Community Forestry International, Inc.

The Khasi Hills of Meghalaya was chosen as project area to demonstrate how community based REDD+ action can be realized on the ground. Such action was possible due to the existence of long established traditions of community forest management, the resurgence of community interest in strengthening protection of sacred groves and communal forests, and the unique flora and fauna of this region. The ecosystems of the Khasi Hills are unique; with torrential monsoon rains make the Khasi Hills one of the Earth's rainiest places. The wet, subtropical forests represent a unique habitat with impressive biodiversity, including 400 tree species, unusual and unique orchids, mushrooms, amphibians, and birds. Ancient stone megaliths dedicated to fallen warriors stand sentry throughout the dense forests. The project area is situated at an elevation that varies from 150 m to 1961 m above the mean sea level. The main river Uiam is running through the area, which is an important source of water for the state capital city of Shillong.

Indigenous communities control approximately 90% of the forests of Meghalaya. Growing political, economic and demographic pressure on traditional institutions and customary management systems have eroded their capacity to sustainably manage natural resources. Discussions with community members and leaders identified a number of resource management problems such as stone quarrying, coal mining, uncontrolled grazing, forest fires, forest clearance for agriculture, and unsustainable fuel wood collection. Climate change is an underlying force exacerbating key drivers of deforestation and forest degradation as well in this area. Finding ways for the communities to address problems of deforestation and degradation while enhancing household income required a multi-faceted approach. The program approach assumed that financial and employment incentives for communities to implement forest conservation and restoration could be achieved through linking a system of payments for services in the form of carbon storage and sequestration with Government of India programs including Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). Support from National Bank for Agriculture and Rural Development (NABARD) and local basin development initiatives was also possible. These investments would be guided by community driven natural resource management plans and income generating activities supported through micro finance groups – Self Help Groups (SHGs). The approach provided start-up support to participating



Source: Community Forestry International, Inc.

NGOs, communities, and technical support partners to work collaboratively to design the program, after which it will come under the sole management of the community-based Federation.

The landscape has changed dramatically; the East Khasi Hills have experienced heavy land use pressures for over 150 years. Analysis of SPOT satellite imagery between 2006 and 2011 indicates annual forest loss of over 2% per year.

The Uiam watershed Federation (*Ka Synjuk Ki Hima Arliang Wah Umaim*) is an alliance of ten indigenous governments (*Hima*) and 62 villages in the project area are the main

stakeholders of the project. The ten indigenous Khasi tribal governments possess legal control of the 27,000 hectare Uiam sub-watershed under the Sixth Schedule of the Indian Constitution. Community Forestry International (CFI) is the facilitator of the project. The project was approved by the Khasi Hills Autonomous District Council, with the support from the Chief Secretary of the state of Meghalaya.

This REDD+ project was initiated in 2010, mobilizes indigenous communities to address local drivers of deforestation and designed to establish a 30 – year income stream to support the community. The project's goals include conserving carbon sinks in the sacred forests and old growth forests, while regenerating degraded forests. Together ten Khasi tribal governments formed a sub-watershed federation that will guide a participatory process. Created capacity within the Umiam Sub-Watershed Forestry Federation (USWFF) or Synjuk to plan and implement a thirty-year climate adaptation strategy for their upper watershed. Each of the 62 villages prepares a community micro watershed management and livelihood plan. CFI provides technical and financial support to this new community institution, providing training in resource management including designing, certifying and marketing carbon credits on private voluntary markets.

Through project fund natural regeneration of the forest area was supported. The fund is channeled through Village local Working Committee (VWC) and covers the costs of fire line creation, forest watchers, silvicultural operations, and forest monitoring. These activities target degraded forests and have shown extremely effective in stimulating rapid natural restoration of forest cover as well as improving stream flows and the presence of biodiversity.

The other support provided to the community is the Payment for Environmental Services (PES), given to the LWC and SHGs at the end of each monsoon season for small enterprises, to build pens for pig and chicken raising, allowing them to shift away from low grade grazing animals such as cattle and goats. The project aimed to increase incomes among the 5,000 households in the project areas in ways that reduce pressure on the natural resource base and provide incentives for conservation.

During the early demonstration period, forest monitoring was largely done through annual photos of a small number of forest plots and watershed landscapes, walkthrough at the end of the fire season, and post monsoon assessments of regrowth. While these activities indicated rapid regrowth, the changes in forest stock were difficult to quantify. In 2011, 40 forest inventory plots measuring 20x20 meters were established to monitor forest conditions and carbon stocks during the REDD+ project.



Source: Community Forestry International, Inc.

The project's REDD+ certification will be secured under Plan Vivo standards, a U.K. based carbon registry. Key variables such as carbon stocks, forest condition, as well as other environmental indicators including changes in biodiversity and hydrology will be monitored. Socio-economic performance will also monitored and assessed by the community including changes in household income, micro-finance support, repayment rates, participation in additional income generating activities, energy use and adoption of sustainable farming practices.

The carbon revenues will be used to improve the livelihoods of the 25,411 forest dependent people. One hundred percent of all carbon revenues would be used to support project implementation develop alternatively income generating activities for households who income lost due to restoration or conservation work, and capitalize women-administered micro-finance institutions.

The process of consultation has reassured the communities that they can map the forests themselves and control their own maps. Based on these agreements, the project area was surveyed by community using GPS units under the guidance of the project support team. The mapping process not only identified boundaries of forest areas, but also the tenure status and bio-physical condition of each forest block and convinced the communities to extend support for the project implementation.

This REDD+ project model estimates that over 300,000 tons of Carbon di oxide offsets will be generated over ten years (see the table given below), plus additional benefits including biodiversity and cultural conservation of unique forest ecosystems with 500 year old sacred groves with ancient megaliths that characterize Khasi indigenous culture. Depending on the effectiveness of community efforts to regenerate 5,000 hectares of degraded (open) forests, the volume of carbon offsets could be substantially lower or higher.

Type of REDD+ Activity	2012- 2013 (CO2)	2014- 2015 (CO2)	2016- 2017 (CO2)	2018- 2019 (CO2)	2002- 2021 (CO2)	2012- 2021 (CO2)
Emissions Reductions from Denser forests	40.131	42.312	44.130	45.666	46.990	219.229
ANR Annual benefit	6114	14,266	21,547	26,212	30,878	99,017
Total	46,245	56,578	65,677	71,878	77,868	318,246

The project is designed to establish a 30-year income stream to support the Federation. The Federation will initially seek to market its carbon offset credits on European voluntary markets. Overtime, the Federation will attempt to build market interest among India's private sector in off-setting carbon emissions. The Federation is also seeking support from Shillong Municipality, as the Umiam River is an important source of domestic water supply and the project is improving the hydrology of the surrounding watershed representing another form of payment for environmental services.

The project is significant as it is one of the first REDD+ initiatives in Asia to be developed by indigenous tribal governments on communal and clan land. Through this REDD+ Project 10 Khasi indigenous governments with 62 villages are creating, restoring, and protecting a forest wildlife corridor along the Umiam River, connecting sacred forests and regenerating forest fragments at the landscape level. It is building resource management capacity of ten indigenous Khasi kingdoms that includes 62 local communities. It demonstrates how indigenous governance institutions, coordinated through their own federation, can implement REDD+ initiatives that controls drivers of deforestation by restoring forest cover and hydrological function. If successful, the project has potential for broad-based replication among northeast India's 240 ethno-linguistic, tribal communities. The success of any community-based resource management systems ultimately depends on the communities themselves and their commitment to sustaining the land, forest and water they depend upon. REDD, PES, or any other project support will facilitate this process, but it is simply a means, not an end.

Carbon Benefits

According to project estimates this REDD activity would yield approximately 318,000 tCO₂ over the first ten years of the project between 2012 and 2021. Of the total carbon credits projected, approximately 69% would be from avoided deforestation and forest degradation while an additional 31% would be generated through sequestration as degraded forests are restored through assisted natural regeneration. Additional carbon credits may be created through the fuel efficient stove programs and other initiatives. The actual levels of CO₂ emission reductions will depend on the effectiveness of forest protection and restoration activities implemented by the community.

Investing in the Future: Restoration as an Option

Contributed By: SRUJAN, Maharashtra

Worldwide small and forest dependent communities are experiencing threat for their survival under the onslaught of development and unresponsive policies. In India such communities are categorized as Primitive tribes. These tribes reside on some of the prime and ecologically sensitive areas. They have evolved their lifestyle in such a way that they are completely dependent upon forests, dwindling forest cover affects their livelihoods the most. Therefore they are the first amongst the local inhabitants to call for restoring forest cover of the region on a long term basis.

Ensuring survival of primitive tribes essentially ensures survival of forests and is seen as sure pathway towards sustainable forest management and biodiversity conservation.

The project is based at four villages of Zari-Jamni Taluka of Yavatmal district and four villages in Kinwat Taluka (Block) of Nanded district in the state of Maharashtra, India. This place houses one of the primitive tribal groups named Kolam.

The main objective of the project is to evolve a model for restoration of forests for food and nutritional security of Kolam tribe. By protection and restoring the biodiversity there would be food and nutritional security which will ensure the survival of this tribal community. It was aimed to protect 1,000 hectares of forest and plant 60,000 saplings on 100 hectares of land which includes forest, farms and village common lands.

This region belongs to Indian semi arid eco zone of Deccan Peninsula. Cotton and wheat are the predominant crops grown in the district. The Wardha is the only river flowing through the district which is partly navigable. The Bembla and the Nirguda are the main perennial tributaries of the Wardha which flow through the district. Adan is other important river in this area.

The Kolam tribe consists of 244 numbers of females and 171 males and nearly 352 children. They are spread seven project villages. The livelihoods of the communities are stretched over a range of actions, including collecting, processing the NTFP like amla, mahua, karanj seeds etc, rearing of small ruminants-sheep and goat in particular; keeping poultry; and small scale farming.

Officials of the Forest Department, Maharashtra; local banks; IUCN - The Netherlands, Department for Rural Development (DRDA). Tribal Development Department of Maharashtra and OXFAM India were the other partners in the project that focused on securing the livelihoods of the Kolam tribe.

Key Activities

The Non Governmental Organization SRUJAN approached the GEF/UNDP SGP at CEE and a formal grant agreement was made in taking forward a people's partnership in the project areas. Constant dialogues with the communities and related stakeholders and discussion at Jan Panchayat led to Identification of eight village level volunteers. A more hands on participatory training was imparted to them, their roles and responsibilities were made clear in the activities.



Source : SRUJAN

The volunteers were involved with a team from SRUJAN in setting the vision and values for the protection and use of local biodiversity. The local plants that were of concern, their herbarium sheets were made and photo documentation was done with the locals sharing the local knowledge and building a shared vision for protection. Forest restoration plans were prepared and liaison with National Rural Employment Guarantee Scheme (NREGS) implementing authorities for technical and budgetary help was made. Actions to provide protection to approximately 1,000 hectares of forest were jointly agreed between stakeholders in 8 villages. To start three Forest Protection Committees (FPCs) were formed, regular meetings and documentation happened at each of these committees.

SRUJAN with the support from DRDA, organized 4 village food-festivals for promotion of traditional food. Mahua and Jaggary based products, minor millets like *kodo kuttki*, *palash*, and *charoli* based products were made. Five neem based medicinal formulations were prepared for treating minor ailments. 16 health workers were selected and 4 trainings on livestock management were organized covering on the following topics fodder mapping, livestock and cattle shed management, identification of diseases and treatment of minor ailments, and vaccination, preparation and administration of medicines from locally available herbs. The trainings were built on local knowledge, skills and practices and modern methods of animal husbandry practices. Local breeds of goats, sheep and poultry birds were provided to the members of women Self Help Groups (SHGs). All agreements were based to encourage community cost sharing and the defined problems.

Results/Impacts: A new source of vision and empowerment was created in the tribal's through a range of actions. Around 12 SHGs were formed with 180 women members and 29 male members. Regular savings, in the SHGs have led to savings of Rs 1.10 lacs and some of the SHGs have been able to access grants from the banks and timely access to credit with reasonable rate of interest.



Source : SRUJAN

Meetings with elders, knowledgeable persons have been regularly organized and volunteers in consultation with Jan Panchayat were identified. Two nurseries redeemed the commitment of the locals towards biodiversity conservation.

To store the NTFPs, minor millets *kodo kuttki*, *palash*, mahua and *charoli* and food grains 16 appropriate storage structures were build. These efforts have been scaled up to nearly 52 similar structures at the community level were building using local materials.

Five Mahua based NTFP banks have been established, where the locals put their produce and then when the prices are on a rise they trade the same in the markets, enabling them to earn better income. They are involved in making 12 different non alcoholic food products from mahua, timru, silwat, munga, local jaggery, rice, and palas eg. Chikki, chocolate, toffees, juice, jam, pickles, squash, palas dried tea and chips etc.

In order to plant 60,000 saplings two nurseries were established and plantations were carried out. 50 families of the Kolams planted local species both on timber and fruit species of mahua, bamboo, jamun, mango, sal, plas (*buitus monesperma*), *acacia ketchu* and teak etc in 10 hectares of forest land, 80 hectares on village common lands and 10 hectares on own lands. 80 families were identified and involved to take up kitchen gardening and imparted trainings on the low cost organic farming methods.

This new innovative approach has led to better conservation, and use of the local biodiversity resources and more gainfully led to additional incomes and livelihood security for the poor. SRUJAN has institutionalized a producer company in the name of Adivasi Udyog and which is engaged in the production and marketing of products such as hill brooms and bamboo baskets from local resources. The company also markets non-alcoholic food products made by the tribal households.

In collaboration with the SNDT women's university in Mumbai, 13 graduate volunteers have undergone a yearlong experiential learning course on forest dependent livelihoods issues of primitive tribes.

Training of trainers on non alcoholic food product development was held at Food Technology Division of Laxminarayan Institute of technology, Nagpur. Training to SHG members for the same was held at SRUJAN's training centre at Mangurda. For funding, IUCN was approached and a project titled "Eco-restoration for Survival of Primitive Tribe Kolam" has been sanctioned and received funding to the extent of Rs 12 lacs. Moreover 20 other villages were included apart from the SGP project villages. In pursuance of the recognition of forest rights act, discussions have been initiated in the villages for formation of committees to invite rights over mahua forests, enabling the locals to harvest the mahua and then process and add value to have better product range for sales.



Source: SRUJAN

Institutionalizing the communities into the producer company was more of a process, the approach allowed more time for mutual discussions between members, develop trust as to be aware what benefits will this lead to the locals. Therefore it is important that all such issues are kept flexible, and encourage community decision making, implementation and documentation.

The Spirit of Community Ownership: Managing Landscapes

Contributed By: Khangchendzonga Conservation Committee, Sikkim

Sustainable Bio Diversity Conservation and Use in Khangchendzonga Biosphere Reserve

Since early eighties when Khangchendzonga Biosphere Reserve (KBR) was opened for visitors, increasing human pressures such as extensive grazing and firewood extraction, bio piracy, poaching, exploitation of medicinal herbs and unplanned tourism resulted in the degradation of the rich biodiversity of the region. To improve the situation and control the negative impacts the Khangchendzonga Conservation Committee (KCC) a local NGO approached the GEF SGP/UNDP, CEE to have a more community led approach to conservation management and a sustainable livelihood to support the local communities.

The project aimed to conserve and sustainable use of natural resources of the Khangchendzonga Biosphere Reserve through awareness building, capacity enhancement, information dissemination on flora, fauna, cultural values, code for conservation, Zero Waste management, and community run home stays. This not only led to conservation of biodiversity resource but also enhanced the economic standard of the local communities living adjacent to the Biosphere Reserve thus ensuring better adaptive capacities and raising their living standard. The project also led to many good policies like the designation of campsite, trekking trails, zonation of eco-tourism promotion area, wildlife hotspots, and revision of service providers' rate, Sikkim Trekking rules and Himal Rakshak (mountain guardians) in the State. The project area is a part of the Khangchendzonga National Park, a Biosphere Reserve covering an area of 2619.92 sq km of which 900.78 falls under West Sikkim, a state of North Eastern India

The region falls within the temperate and sub-alpine zone making it one of the rich biodiversity hotspot and famous trekking corridor in West Sikkim. The whole corridor extends from temperate to alpine zones with rich flora, fauna and medicinal herbs. The diverse tropical mixed broad leaved forest, sub alpine conifer Rhododendron forest, alpine meadows with rich medicinal herbs, sacred lakes and caves, wide varieties of birds, animal and flowering plants.

Agriculture and animal husbandry are the primary livelihood in which more than 80 % of the households are engaged. However tourism acts an important alternative livelihood for people living in the fringe villages. Some are associated with tourism enterprise in the form of lodge operators, porters, pack animal operators, cooks and naturalist guides. Tourism despite being a secondary but substantial source of income for the local community puts extensive burden on the natural resources of the area.

The different tribal groups which include Bhutia, Limboos, Lepcha among the indigenous tribe and nepali are primary participants in the project. The other stakeholders include Tourism, Forest, Environment and Wildlife Management department, Government of Sikkim, The Mountain Institute – India (TMI-India), WWF-India. These partners have played vital role in both implementing and disseminating the conservation message to their respective villages. Some activities were also implemented in convergence with the partnes organizations, and government programs.

The Major activities include village level community formation and consultation, formulation of village action plan, capacity building of eco-tourism service providers, awareness, institutional strengthening and setting up the Visitor Information Centre (VIC) and Eco-tourism Resource Centre. VIC is located right at the base of Khangchendzonga trek and is easily accessible to the visitors. The VIC provides support to various trekking groups, research and training institutions. All information related to biodiversity, code for conservation, local supports are facilitated by the VIC. The centre have been conducting regular awareness camps; slide shows etc. for the tourists and the community since last 5 years.

The financial return from the VIC is ploughed back into the conservation and community centered program like eco tourism activities, waste management, capacity building, awareness and environmental education etc. One of the major obstacle was to find an ideal place (centrally located) for the construction of VIC. Members of KCC had to lobby the local elders and Panchyats to get centrally located area. After many number of meetings a seller was identified and his land was bought.

Eco Tourism Service Providers Association Yuksum (ESPAY) was started for the tourism support staff, like the local porters, guides, animal pack operators, cooks, etc which helps the staff to get equal opportunity, access to welfare programs and social security. It has 390 members. After the formation of the Association, the minimum wage of the service providers have also been revised with more than 60% hike in 2006, this has now been adopted by all trekking operators in the state.

Sikkim Eco tourism and Conservation Federation (SECF) was formed among the active community based organization from in and around Khangchendzonga Biosphere Reserve. The federation started with 9 members who mostly included village based Community Based Organizations like, eco-tourism committees and service providers associations. This number has now grown to 19 in 2011, an annual convention of the federation is held every year to exchange learning amongst the members. More than 50 awareness drives were conducted among the visitors, staff and the community to reduce littering and garbage accumulation in the KBR. A total of 27 youth from all over Sikkim have been undergoing 6 months certificate Course on tour guiding skill at KCC.

Established and supported 30 home stay in 5 villages. Some of these home stay have been recognized by State tourism department for assistance to improve their infrastructure facilities. This home stay provides an annual income close to 1000 USD per year to the family at Yuksam and close to 15000 USD for last 3 years. The home stay have adopted all measures to ensure biodiversity conservation, reduced firewood consumption, use renewal source of energy.



Source: KCC

KCC with its partner organization initiated the first zero waste project in the state. A standard garbage monitoring form (www.sikenvis.nic.in) has been designed and got it approved by Department of Forest. Each group entering KBR are strictly monitored at the check post at the entry and exit to ensure that all the garbage from the trek are brought back to the base camp where KCC manages a resource recovery centre facility (RRC). At the RRC the waste is segregated into 21 chambers, recovered, sold and reused.

The constant scaling up efforts through the GEF SGP support also helped the NGO KCC to institutionalize the effects through the women SHGs model and later the community institutions. This in fact was first time that women were seen as economic providers in 2004 in the region when the partnership between the two stakeholders emerged. Women seeing the women workers in the NGO further encouraged them in sharing costs, decision making and roles and responsibilities in all activities in the project.

KCC thrived to build networks and get co-funding support from the untapped support such as visitors, government departments, Community based organizations and tour operators to achieve the objective.



Source: KCC

NGO for the trekking routes by the Government of Sikkim, and recognizes tourism model of KCC as a sustainable approach. KCC has leveraged nearly 16,000 USD as co-financing from various stakeholders.

19 village based institutions and CBOs working on conservation and eco tourism have been federated into SECF (Sikkim ECO Tourism and Conservation Federation) for increase their strength and mutual learning and also to support and facilitate the replication of such institution in and around KBR.

The standard garbage monitory system introduced helped over the last 3 year to reduce the garbage accumulation in KBR by more than 70%. Similar efforts are being replicated by Government of Sikkim in other trekking destination with help of KCC.

Tourism being an important source for livelihood for many household in and around KBR, it was time consuming and difficult to convince the service provider on eco-friendly practices and the negative impacts. While about 90% of the business is run and managed by private player whose primary goal is to maximize profit did not cooperate with KCC in the beginning. Many pro-poor policies like the revision of rate, code for conservation were perceived as threat to their business. However this is over come through constant dialogue, awareness and confidence building measures.

The efforts have led to Gazette Notification, (a major policy change) through the Forest Departments, in recognizing the 4 trekking sites in the remote village close to KBR and Barsey Rhododendron Sanctuary.

Lessons Learned: During the project, the project team relied on a process approach and a constant vision and values building of stakeholders. This helped to broadened gradually the focus from just conservation and sustainable garbage management in KBR area to training and capacity building in other area, promotion of Community based tourism (CBT), institutional strengthening of the CBOs.

Results/Impacts:

A village information centre set up in Yuksam, Sikkim for the tourists. VIC was designed in traditional architecture with stone chisel dressed wall. This has encouraged local people to construct their house in a traditional style which leads to increased employment of local craftsmen. The VIC is sustainable in itself as it is managed through membership fees, corporate sponsorship, cafeteria, and cyber-café, donations from individual, groups, presentations and travel agencies. The model created is being replicated in other degraded mountain eco-systems in LEH, other NE States of India and Nepal.

The Eco Tourism Service Provider's Association of Yuksam" (ESPAY) the CBO formed provides a platform all service providers, results in the increase of the members income at least 3 times in last 5 years.

The Government of Sikkim (GoS) has recognized two trekking routes and the conservation efforts of KCC. The Gazette notifications issued at the facilitation of the



Source: KCC

Community Based Tourism – An Endeavor for Conservation and Inclusive Growth

Contributed By: Alaknanda Ghaati Shilpi Federation, Uttarakhand

Although district Chamoli in the state of Uttarakhand witnessed a diverse range of development programs earlier, the programs were focused on certain case specific interventions. Since the programs were too focused on one or two issues, the community found it difficult to identify with them and as such, the level of participation was often low or showed a gradual downward trend. The Alaknanda Ghaati Shilpi Federation (AAGAAS) a Community Based Organization approached the GEF SGP/UNDP, CEE for developing an innovative, integrated project. The project is based in Pipalkoti, Chamoli Garhwal in and around Nandadevi Biosphere and Valley of Flowers, and Kedarnath Wildlife Sanctuary. Pipalkoti is located around 280 Km. from State Capital Dehradun on the way to Sri Badrinath.

The main objective of the project is to conserve and develop local bio-diversity around the Nandadevi Biosphere Reserve (NDBR) area with people's active participation and employment generation through activities like community based eco tourism, eco friendly handicrafts, conservation of medicinal plants and livestock mangement.

The Bhutia tribal community and other weaker sections across 45 villages are the major participants, nearly 75% families who were below poverty line and landless. The organization also partnered with a range of organizations, under Mahatma Gandhi National Rural Employment Gurantee Scheme (MGNREGA) initiated Integrated Fodder and Livestock Development Program in 17 village Panchayats under which Fodder grasses, Shrubs and trees were transplanted in more than 50 hectares of common land with the support of village panchayats. This activity brought huge employment opportunity to the village men and women.



Source: AAGAAS

Codes of Conduct for community based tourism developed through the project

- Don't wear bright coloured clothes
- Keep your eyes and ears open and be alert. Type to observe animals and birds and their behavior in natural habitat
- Read and observe the panels carefully
- Listen to the sounds of the wild. Do not play music or talk loudly
- You are guest of the forest and its denizens. Keep their home clean. Please don't litter
- Herbivoures can eat platic items. Please donot through plastic in the forest
- Patient observation for wild life may reveal many secrets. Do not light fire or smoke
- A small negligence could result in a serious fire that could casuse irreparable damage to plants and animals
- Do not go off the trail- that is dangerous
- Always carry drinking water
- Report illicit felling and any other offence immediately to forest personnel

Two bio tourism parks with five tourist huts and a information centre in each park were established with communities' participation for the promotion of eco tourism, adventure tourism and pilgrimage based activities. Two Eco Tourism committees were created to manage the parks, codes of conduct for community based tourism were developed (see box). Several lesser known trek routes and destinations around bio park tourism were identified with the support of local forest department and used to attract the tourists.

The following are the trek routes now in operation- Pipalkoti- Banasinarayan; Pipalkoti-Menwakhal; Pipalkoti-Ghiyavinayak; and Pipalkoti-Okhimat; Pipalkoti - Panchula - 40 kms - 7 days; Pipalkoti - Rudranath - 72 kms - 10 days; Pipalkoti - Lord Curzon Pass -90 kms-12 days; Pipalkoti-Saat Tal and Roopkund Trek-160 Km-15Days; Pipalkoti – Roop Kund- Bedani Bugyal Trek – 123 Km- 12 days and Pipalkoti – Bansi Narayan – Kalpnath Trek – 70 Km. - 10 days.

Facilities like rock climbing kit, tents, sleeping bags, carry mats, first aid, qualified instructors and organic food and fresh fruit juices etc were rented or sold through SHGs to the tourists. Awareness meetings were conducted on issues like cleaner environment, solid waste management in trekking routes and a sense of ownership in mountain tourism activities. Around 96 colleges located in the region have been linked in this activity.

For the first time in the area AAGAAS has facilitated 42 Self help Groups of women to promote thrift and credit activities. The groups are linked with the local commercial banks and credit support was provided to the members to do activities like bamboo based handicrafts, bio-dynamic composting and weaving were supported. Trainings were imparted to 720 people on Ringal bamboo handicrafts, carpet and natural fibre based crafts. The Alkananda Ghaati Shilipi Federation (AGFS), the registered federation of SHGs is providing the need based support to the members to improve their livelihoods and in the last 3 years it has made a sale of handicraft items nearly Rs 13 lacs. More than 40 artisans have been awarded at the national Level.

AAGAAS negotiated and entered an agreement with temple committees for supply of small Ringaal bamboo based baskets. These baskets replaced the plastic bags which were being used by the locals in the temples. This led to the opening of the shop at Pipalkoti. Now the federation is organizing marketing at the next level in partnership with Alakananda self reliant cooperatives and Himalayan Self Reliant cooperative in many other neighboring Indian states and abroad. The World Bank under its Market Based program has adjudged the Federation and awarded the prize of USD 20,000. The funds are being used to create and further the income generation and links to the markets. Uttarakhand Bamboo and Fiber Development Board have helped to establish eight Bamboo and Ringaal nurseries at village level and Ajeevika Vatika (Livelihood Garden) in Pipalkoti. More than 275 craftspeople have been trained out of which 19 Master Trainers training members in the other parts of the state.



Source: AAGAAS

Integrated Fodder and Livestock Development Program was implemented with the support of Himmatthan Society helped in under which five nurseries of temperate grasses, different broad leaf tree species have established and managed by 38 Self Help Groups. Trainings on different aspects, exposure visits and genetic material in the form of seeds, rhizomes and tubers were contributed by GB Pant University of Agriculture and Technology and G.B. Pant Institute of Himalyan Environment Development.

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Source: AAGAAS

A herbal garden was established for rare and endangered flora & fauna of the area with the objective of cultivation, conservation and income generation. A few new mountain friendly and economically viable plant species were introduced. The community manages the nurseries. The forest Department provided the necessary technical support and guidance for plantation activities. Himmotthan Society / SRTT supported the local communities for the cultivation of Himalayan Nettle (*Girardinea heterophylla*, *Girardinea diversifolia*), seeds were sown in 65 hectares of land.

Around 1, 18,500 plantations have been taken up in the areas in the last nine years. This includes In-situ and ex-situ conservation of extinct medicinal species i.e. *i.e- Dactylorhiza hatagirea (Salam Panja)*, *Nardostachys Nardostachys Jatamansi(Spikenard)*, *Saussurea lappa.(Kuth)* and *Picrorhiza Kurroa (Kutki)* in the peripheral zone of NDBR, VOF & KWLS(*Kedarnath wildlife sanctuary*). Apart from this the organization have established the rhizome bank of hill bamboo species it includes broad leaf fodder tree and temperate grasses.

Lessons Learned:

Faced with the complexity, diversity and dynamism of the people mistakes do take place and one needs to move on with a lesson that *learning by doing* approach.

The communities required hand holding and community peer conviction in taking forward all these range of actions is the major challenge faced by the organization.

Locals have recognized the project's tourism activity as a source of inclusive growth, because of livelihood benefits to the communities at local levels.

In community based projects it is important to link with the local government departments e.g. the partnerships of Uttarakhand Forest Department and Uttarakhand Tourist Department led to discover new trail routes in and around the NDBR areas. Discussion with other stakeholders like temple committee helped the to take a policy decision to ban plastics in the temple premises and replace with eco friendly bamboo baskets.

There has been marked growth in local capacities/empowerment by adopting simple need based trainings and capacity building programmes.

Role of Van Utthan Sangha in Biodiversity and Livelihoods

Contributed By: Van Utthan Sansthan, Jhadol & Seva Mandir, Udaipur

The geographical work area of Van Utthan Sangha (VUS) interventions covers five tribal blocks, Jhadol, Kotra, Kherwara, Gogunda and Girwa of Udaipur district located in the hilly terrains of Aravali mountain-range in the state of Rajasthan. 42% of the total landmass in the district is forestland comprising of northern tropical dry deciduous forests. VUS has been working for the past fifteen years for conservation, protection and management of the common forest resources in its working area spread across tribal dominated Udaipur district. Formation of VUS was a part of Seva Mandir's intervention with required support from Forest Department for conserving and developing the natural resource base for the community. VUS is a network of Village Forest Protection Committees (FPC) that are formed for protection and management of local forestland and for spreading the Joint Forest Management (JFM) programme. The VUS started in 1997 as an informal network of 22 FPCs and gradually expanded its current membership to 84 FPCs from Jhadol block of Udaipur district. The organisation was registered as a society in 2003 (no. 281/2002-03) and. The current outreach of VUS is 249 FPCs with the responsibility of protecting over 67,000 hectares of forestland. This is about 16% of total forestlands of Udaipur district.

The General Body of VUS comprises of all FPCs and individuals who are members of the society. An Executive Committee (EC) comprising of 17 members is formed. The members of EC are elected every two years by the General Body. Currently, the EC has 3 women members. The members of EC select 5 functionaries – President, Vice President, Secretary, Assistant Secretary and Treasurer. A Management Committee (MC) comprising of 6 members has been recently formed whose members include representatives of EC, office coordinator, and a representative from Seva Mandir.

Forestland is about half of the total land mass of the area and forms primary livelihood source as well as source of identity for tribal communities in VUS's working area. These lands have got severely degraded over the years as a result of over-exploitation, mining, droughts, and illicit privatisation. Ecologically, most of the pristine forests until a few decades ago today, lie degraded. This has brought a severe threat for sustaining the productivity of lower hills and arable patches in valleys that ensure fodder and food security of families.

The work region of VUS comprises of tribal community that involves small and marginal farmers whose primary livelihood options are – subsistence agriculture which mostly depends on monsoons, animal husbandry, NTFP (Non Timber Forest Produce) and wage labour. The private landholdings are less than one hectare and dependency is very high on common lands like forests for fodder, fuel wood and NTFPs. The major partners of VUS are the associated FPCs, their communities, Seva Mandir and other local NGOs, and State Forest Department. VUS has played a vital role in addressing the challenges in protection and development of forests as common resource and make the implementation of JFM effective. One of the major focus of VUS is inter and intra village conflict resolution regarding boundary disputes, grazing and other traditional usufruct rights. In many cases, VUS helps in negotiation with encroachers and supports Forest Department (FD) in reducing illegal privatization of the forestlands. As the members of VUS are all local leaders, the organisation has developed a strong edge towards resolving conflicts.

Through their interventions, VUS till now has influenced protection and management of over 67,000 hectares of forestlands in about 249 villages. This has led to both ecological improvement of the area and increased livelihoods benefit to communities. Substantive vegetative growth could be seen in these areas resulting from plantations of new saplings as well as natural regeneration of root-stocks.

Increased vegetation has also contributed in enhancing faunal population. Also, the treatment of forestlands on the upper ridges has helped in ecological benefits by controlling surface run-off, checking soil erosion and groundwater recharge.

In terms of wage labour, the intervention of VUS in accordance till now has contributed in generating works of nearly 100,000 person-days through JFM by providing direct employment. Various NTFPs, such as fodder, fuelwood, tendu leaves, mahua flowers and fruits, gum, honey, etc., are being procured by the community from the forests. Better access and availability of fodder and fuel wood is viewed as a major benefit.



Source: Seva Mandir

Assessments show that availability of fodder from forestlands has risen to 1,000 to 1,200 kilogram per hectare by third year of JFM and protection. Every year, on an average households get about 500 bundles of fodder from the managed lands, which is worth of about Rs.10,000 to Rs.25,000 as per the local price. Currently, total harvest by the families in the region, from the developed JFM sites is about 40 to 45 lac bundles of fodder that has economic value of more than Rs.1.5 to 2 crore. Likewise, nearly 51.25% of fuelwood demand of the villagers in Udaipur district is fulfilled from JFM areas. Also, data collected by VUS indicates that annually mahua flower of about Rs.15 lac and dolma of around Rs.10 lac are traded from their villages. Similarly, the annual business of tendu leaves, gum and honey collected from the area is Rs. 15 lac, Rs.5 lac and Rs.1.5 lac respectively.

The improved availability of fodder and fuelwood from forestlands has reduced the drudgery of women and girl children considerably. Better recharge of groundwater augmented the availability of drinking and irrigation water. Enhanced livelihood status has resulted into restricting migration, particularly of women and children.



Source: Seva Mandir

VUS got actively involved with the implementation of Forest Rights Act (FRA) in 2008. It took up the task of raising awareness about the Act and its implementation procedures among its member communities. The activities carried out are by the VUS include awareness building through regular meetings of individual FPCs and clusters. VUS also facilitates formation of and registering new

FPCs and training them on JFM and forest protection.

Communities were brought into the development and management of their village forests in 1991 under JFM programme. However, there is reluctance within the FD towards forming a working partnership with communities. The desired support by the FD is often not available in vacation of the illegal encroachments. This has poses a serious challenge for developing forests as a common resource. Similarly, due to boundary disputes of forest areas in adjoining villages, conflicts turn violent. Conflicts also arise due to forest boundaries carved out after land settlement and traditional rights of villages over forestland.

The VUS works primarily on removal of the illegal private encroachments made by local communities on the forestland other commons. The VUS has decolonised several hectares of such encroached forestlands in Jhadol and other blocks from the encroachers.

However, due to complex nexus between the politicians and local government functionaries, the negotiation with encroachers become much difficult and impossible in certain cases.

The Forest Rights Act, 2006 (FRA) that was enacted to enable forest dwellers to regularize their historic settlements on forestlands has also posed a newer and greater challenge for towards protection and management of biodiversity in the region as it has paved way for increasing fresh encroachments which is further leading to destruction of common forestland.

The Act has provisions for both individual and collective claims, but only individual claims are being settled on priority by the government. Community claims, which could contribute in conserving the ecology of forests, are not being entertained for which VUS has started preparing communities to file claims on CFR. In 2009-10, applications for over 90 CFR claims (largest number of CFR cases submitted in the region) were filed under the leadership of VUS which are still awaiting decisions due to bureaucratic hurdles.

In the absence of an institutional set up for marketing of NTFPs, entire such produce goes to private vendors and middlemen who earn huge profit while dwellers are left with meagre returns. Therefore, devising an appropriate marketing mechanism is extremely important to ensure proper and organised marketing of NTFPs in the state.

VUS has succeeded in opening channels of communication on forest and biodiversity conservation at all levels starting from community to FD. It has been able to make local communities accept and comply with the idea of protection of forests and their effective management. Earlier, communities wanted to participate in JFM or related works only because of the short-term benefits of wage labour whereas now they look upon these measures as means to secure access to forests and are themselves responsible for repair and maintenance works in JFM sites through voluntary labour contribution or common village funds developed by the villagers' contribution.



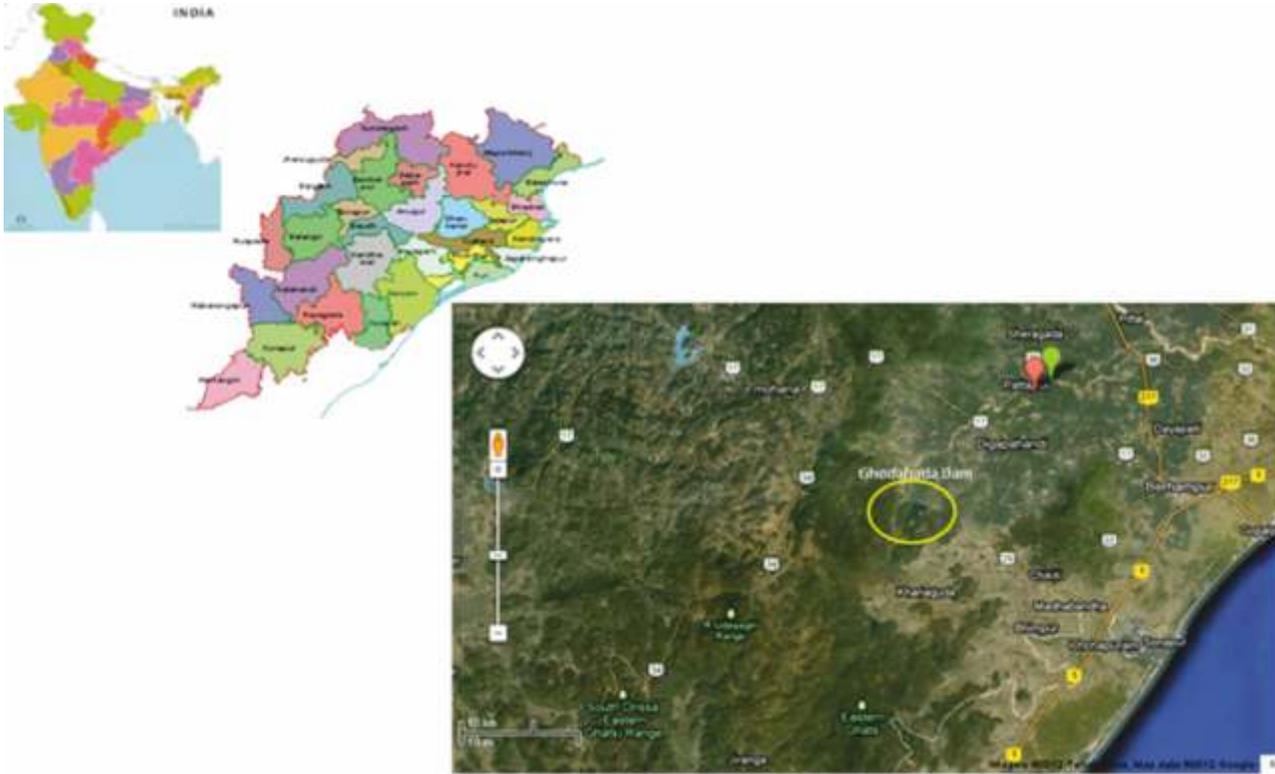
Source: Seva Mandir

Lessons learned: The realisation that villages sharing resource boundaries need to deliberate collectively on management of their resource was the genesis of networking among the forest protection groups. The interventions on forestlands have served as a locus for nurturing individual and community leadership at grassroots along with increasing the social cohesion and empowerment in villages. VUS's existence shows that ordinary people are capable of moving beyond narrow self interests to work for a common benefit, but they need time, handholding and an enabling environment. It is widely accepted that on ground, the interventions on community resources like forestlands depend on the willingness and strength of village community for taking up such activities. Even within the context of low awareness and willingness, the VUS network has certainly achieved a considerable success in spreading a concern for commons across the community.

Conserving Mugger Populations (*Crocodylus palustris*)

Contributed By: Regional Plant Resource Centre ,Bhubneshwar

A cluster of five villages selected around Ghadahada dam situated on Ghodahada river originating from Mahendragiri Reserve forest of Berhampur Forest Division and comes under administrative jurisdiction of of Ganjam District in Odisha. This dam intercepting catchment area of 138 sq km, added a wetland of about 5 sq. km with exceptionally rich biodiversity of plants and animals belonging to both aquatic and terrestrial ecosystems.



Odisha is the only state in the country, where all the three Indian species of crocodylians - gharial (*Gavialis gangeticus*), mugger (*Crocodylus palustris*) and saltwater crocodile (*Crocodylus porosus*) are found in their natural habitats. The Ghodahada Dam is home to one of the last few natural fresh water mugger crocodiles population in Odisha .

The mugger crocodile (*Crocodylus palustris*) is one of the threatened reptile species in India and legally protected under schedule-I of the Indian Wildlife (Protection) Act, 1972. Now, it has been considered as nationally 'Vulnerable' species under 'IUCN Red List of Threatened Species' and also protected under Appendix-I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The project activities were planned and carried out in such a way that will help to conserve the mugger population with active participation of local communities in the Ghodahada dam area. While on the one hand, the intervention has focused on conservation of mugger population, at the same time, it has attempted to address the livelihood needs of the local tribal communities dependent on the common resources.

Ministry of Environment and Forests, Government of India is the executing agency for this project. United Nations Development Programme (UNDP) supports the project The Regional Plant Resource Centre (RPRC), Bhubaneswar is coordinating the project, while State Forest department with the help of local NGOs is implementing the project activities.

The peoples living around Ghodahada dam are a mixed of tribal and non tribals. Fishing is mostly done by non-tribals belonging to Scheduled Caste of fishermen community, though some tribals also have adopted fishing as their source of livelihood. The tribals belong to 'Kondhs', are primitive agriculturist (*Podu* cultivation or shifting cultivation) produce small quantity of cash crops like turmeric, ginger, mustard, niger, black gram, arrowroot etc. Both the tribal and non tribal population in these villages also resort to collection of fire wood from the forest and sell it in the nearby villages and town.

Reservoir fishing is mainly carried out by canoeing and netting. The fishermen have formed 'Maa Bankeshwari Primary Fishing cooperative society', which have the fishing right in the reservoir and mainly facilitate the fish marketing, rate regulation etc. They were earlier practicing crude fishing and over the years, their fishing canoes have been badly damaged. Inefficient fishing methods also adversely affect their income. Moreover, round the year fishing, also pose threat to fish population in the dam, which is also habitat of riverine mugger crocodiles. Although no direct conflict between fishermen and mugger has been noticed, but depleting feed stock was a constant worry both for fishermen and forest officials. To continue this harmony between man-animal and to obviate the possibility of conflict in future, it was decided to involve the fishing community in participatory conservation without dislocating them from their age old avocation. After a long discussion, it was decided that the best option is mutual cohabitation for which fish stock in the reservoir has to be increased and regulation on fishing during breeding season is to be ensured through the provision of other sustainable livelihood options.



Source: Seva Mandir

To promote sustainable fishery for the locals, six improved country boats have been provided to the fishermen community, which has fishing rights in Ghodahada reservoir. To ensure the constant fish catch and availability of fish fingerlings, a spawning unit was constructed near the reservoir. Per year, more than a lakh fish fingerlings of two local varieties were reared in this spawning unit for 2 months, after which, those were released in the reservoir with the technical support of Fishery department. A 25 seater motor driven country boat has been made and thatched sheds have been constructed on a small island in the reservoir with plantation of 5000 Medicinal

plants with a aim to boost local economy through tourism. To provide the fishermen with alternative income earning opportunity during lean catch season and to ensure availability of feed for mugger population, a rice -puff making machine having a capacity to 200-250 kgs of rice puff/ hr has been installed in Padmanavpur village of Berhampur Forest Division. During planning exercise, it was viewed that increased availability of water is likely to make new opportunities for farmers of Balighai and Burudanga project villages in Berhampur, who are mostly dependent on dry-land paddy monoculture. While interacting with project staff and NGOs, farmers of these villages expressed their willingness to try their hand on vegetable farming and intensive rice cultivation. About 500 meter long water channel is irrigating about 200 acres of agricultural land of more than 80 families in Berhampur. In spite of low rain fall during this monsoon, the farmers have been able to protect their Kharif crop. The women based SHGs were strengthened and supported to run poultry farms with the technical support of Animal Resource Development Department. Women members of SHGs also undergone training on tailoring, sewing machine with accessories have been supplied to undertake tailoring enterprise in the project villages. A documentary film in English and Odiya on 'Conserving Ghodahada Biodiversity' has also been prepared by Berhampur Forest Division to disseminate information on project interventions and generate awareness among villagers and other stakeholders.

Under this project, fishermen of five panchayats living on the banks have formed clusters for crocodile conservation work and for securing their livelihood based on some additional and / alternate approaches like poultry, Goatry, horticulture, tailoring and agro-forestry related activities. While the project ushered in number of land based livelihood programmes for local communities to reduce their dependency on fish catch, all possible efforts were also made to ensure that fish landing for locals remain constant. The local communities were provided boats, fishing nets and every year, over about 2 lakhs fish fingerlings are released to ensure that the crocodiles don't eat into the share of the fishermen, The villagers, on their part, started Maa Bankeshwari Crocodile conservation committee under which fishermen were sensitized for mugger conservation. To minimize the casualty due to entanglement of mugger population, an initiative has been taken with the technical support of Fishery department to compensate the destroyed fishing net with new fine nylon fishing nets, which causes less injury to the mugger and ultimately avoid the death during any entanglement.

It was not until 2008, that locals spotted the crocodiles in the reservoir. It may be noted that 29 adult crocodiles were found in this reservoir during enumeration in 2008. During the recent enumeration of crocodiles in this reservoir, 48 adult mature mugger crocodiles (4 ft or above) were sighted. Apart from them 16 young crocodiles around one foot in length were also found in a tank on the banks of the large reservoir. The mugger population is flourishing in the Ghodahada dam due to active participation of local communities, improvement of habitat, constant monitoring and provision of alternate livelihood approaches made under the project.

Although, the project interventions have shown promising results during the project period, but the issues of continuity of financial support and sustainability of local institution of 'Village cluster committee (VCC)' and creation of linkages and convergences with other ongoing State funded schemes is a big concern. To address these issues, the VCC has been registered under Society Act and the members of the VCC were trained through various skill strengthening and capacity building programme. Efforts have also being taken to link this local institution with National Bank for Agriculture and Rural Development (NABARD) for future financial assistance.



Source: Seva Mandir

As a result of 3 year of implementation of the project activities in the area, it has been noted that the mugger juveniles are often caught in the fishing nets but not once has anyone harmed them and these distressed juveniles are released back into the reservoir. In case of bigger muggers are entangled in nets, the forest officials are informed immediately. As a result of joint efforts of local communities and forest dept, more than 40 juveniles and adolescents have been rescued and released in last two years. Today the dam boasts over 60 crocodiles, while more are seen in nullahs and water bodies abutting the villages around the reservoir and both human and mugger population are living together with harmony.

Conserving Forests and Securing Livelihoods: The story of Kadar Community

Contributed By: WWF-India, New Delhi

The Vazhachal Forest Division (VFD) falls in Mukundapuram Taluk of Thrissur District and Aluva Taluk of Ernakulam District. It contains nine tribal settlements of Kadar and Malayans. These settlements fall under the Athirapally Gram Panchayat, Thrissur district of Kerala. The tropical moist deciduous and evergreen forests are also home to many unique flora and fauna. The Forest Division acts as a crucial buffer for Parambikulam and Annamalai Tiger Reserves. The area also acts as a "sink" area for the tiger populations of both the reserves. The VFD serves as a habitat for over 200 species, in addition it is also a home for Kadars, a "primitive tribal group" found mainly in Vazhachal, Parambikulam and Anamalai Forests.

There are around 850 Kadars reside in the Vazhachal Division in eight settlements. These people have been resettled into colonies over 50 years back due to construction of dams and timber and forestry operations. The Kadars are entirely dependent on collection of forest and river resources, especially Non Timber Forest Produce (NTFP) like honey, wax, tubers for their sustenance. Depletion of the resources they are dependent on due to construction of dams, exploitation by outsiders and tourism is increasingly threatening their livelihood security. They sell the collected NTFP as raw materials to the Girijan Society run by SC/ST Department.



Source: WWF-India

The Department has been engaging them for management works like planting, weeding, thinning, etc. They are also engaged as firewatchers during the fire season. Such employment opportunities are seasonal and available to limited families. Hence they are keen to initiate some alternative livelihoods or carry out value addition of NTFPs which are abundant and can be collected sustainably. This will also help in regulating collection of threatened NTFPs while increased incomes would be an incentive to sustainably manage their resources.

The intervention was launched with the following objectives:

- ❖ Collection of resource use information and developing participatory resource use plans
- ❖ Identifying appropriate NTFPS for value addition and developing monitoring protocols
- ❖ Introducing sustainable harvesting practices for NTFP collection and value addition
- ❖ Strengthening existing local institutions like VSS for actively managing the area
- ❖ Capacity building of Kadars to carry out effective ecological monitoring

Key stakeholders in the intervention include local communities and community based organizations, district administration departments and Kerala Forest Department. WWF-India has been working in Vazhachal since 2007. Consultations were held with the State Forest Department and they expressed willingness to support the concept. The Forest Department has formed a Van Samrakshan Samiti (VSS) in the Kadar settlements. All the tribal families are members of the VSS. From the variety of NTFPs collected by Kadars, honey is collected and sold for cash income. After assessing feasibility a honey filtration unit was set up by the Forest Department to help the Kadars value add the product and get a better price for the honey. The marketing of products is also being done through the Forest Development Agency under the brand 'Vanashree'.

Following activities were undertaken to understand and build upon the existing livelihood patterns of Kadars in the Vazhachal Forest Division: Baseline studies on existing livelihood patterns and resource use: Community consultations, PRA exercises and household surveys were conducted in all the settlements to assess the existing livelihood patterns and the dependency of the people on the forests. Kadars have been trained to carry out assessment of the NTFP collection. Detailed consultations have been held at settlement levels to agree upon the areas of resource collection and also identification of NTFPs which are used for self consumption and for cash income. Based on these, NTFPs which are can be value added have been identified.

Kerala has a lot of Ayurveda Shalas which were surveyed to look at the quantum of procurement of NTFPs and also to understand what the demand pattern is. Similarly a few markets were also studied to look at what is being sold, its pricing and its demand throughout the year. A feasibility assessment of honey value addition was also done to assess its viability. Capacity building workshops for the community on understand what an enterprise is, how one can value add, understand value addition options was taken up. Training and technical inputs on value addition steps including harvesting, extraction, filtration, bottling, packaging, labeling and marketing were given by Keystone Foundation, an NGO working in the Nilgiris.

A benefit sharing mechanism has been devised among the VSS. Currently,

- The two VSS providing the honey get 20% of the profit
- The VSS processing the honey gets 20% of the profit
- The two VSS selling the honey get 20% of the profit
- The persons from two VSS who are providing honey also get Rs 100 per Kg of honey plus 20% profit.
- Forest department also takes 20% to recover their costs

WWF India facilitated the consultation with Forest Department helped to set up the value addition unit at Pokallapara. The department through its Vana Samrakshana Samithis aided the collection, processing and packaging of the honey, and marketing the product through eco shops. Around 1500 kgs of honey has been procured, processed, bottled at Pokalapara from April to December 09. These have been sold at Athirapalli and Vazhachal eco shops at a rate of Rs 300/kg. The total potential of honey availability in a year is around 20 tonnes. A total 314 tribal families are benefiting from the honey processing unit. Other than selling out of the eco shops, honey is also sold during three major fairs, Onam fair, Wildlife Week fair and Bamboo Festival.



Source: WWF-India

The intervention has been a step forward in achieving the broader objective of conserving forests and ensuring livelihood security.

- ❖ Sustainable resource use plans has enabled the controlled harvesting of NTFPs from the forest
- ❖ Capacity Building of VSS and Kadar communities on resource use mapping, ecological monitoring
- ❖ Income augmentation through value addition and marketing of honey
- ❖ Better coordination amongst various settlements on resource collection and use

Erratic rain and poor flowering does lead to less availability of some resources especially honey. This could impact the income augmentation. The market demand is constantly changing and also has a bearing on extraction of resources. This does provide a temptation to over extract especially if the pricing is such. Thus one needs to continuously study the market, review and agree with the resource use plans through community consultations

Value addition of honey has been the only major activity introduced under the intervention. As much as this has enhanced household incomes, there remains the challenge of the activity hitting a low in years of extended summers or poor rainfall. The challenge is to diversify the livelihood basket for Kaders in a manner that imparts alternate employment generating skills to them and are in sync with their lifestyles.

It is not a good strategy to focus only on value addition of a single abundant NTFP like honey. It is important that a diverse group of NTFPs are value added looking at seasonality so that in case the availability of one species is affected in a season, there are still some others to depend upon.

Kerala has a lot of Ayurvedashalas who source their material locally. It is thus important that the community is also able to understand the market demands, trends and fluctuations so as to ensure that they sell their product at the right time and price.