

Sustainable Development

Stories from those Making it Possible



Editors

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The Editors wish to thank all the authors of the case studies presented in this publication for taking time to write up the inspiring stories related to how sustainable development is put in practice at local level in India. The publication is dedicated to the millions of local communities who have shown us how to put action on the ground rather than doling out policies on development.

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Preface

The race towards deciding on a set of Sustainable Development Goals (SDGs) is on under the auspices of the United Nations where a set of SDGs are expected to be adopted during the United Nations General Assembly in September 2015. In preparation for shaping up the SDGs, a large number of initiatives, dialogues, workshops and publications are being made with an aim to make the SDGs simple and achievable supported by a set of measurable targets and user-friendly indicators.

While a large amount of time and energy is spent on deciding the future of sustainability using the Rio+20 outcome document 'The Future We Want', limited space is available for local communities to tell their stories on how simple, on-the-ground initiatives are being pursued enabling them to secure their livelihoods. In the absence of our ability to listen to the experiences from the ground, informed policy making and setting the agendas related to SDGs would be weakened.

In the process of looking out for the case studies and experiences on how community based interventions could provide long-term solutions for sustainable development, we came across a number of inspirational stories that range from simple interventions to secure income for local people through value-addition to biodiversity to house-hold actions to secure food and nutrition.

In this publication, we have made an attempt to collate the experiences of a range of communities in using biological resources as basis for securing livelihoods and moving towards the path of local level development, supported by a number of spirited Non-Governmental Organizations in India.

One important undercurrent to the compilation is that for development to happen one needs to innovate but innovate according to the needs of the local people.

We hope that this publication will inspire those working on designing the SDGs to consider the importance of learning from practitioners rather than focusing on academic inputs and indulging in simple word-smithing for political correctness in the run up to the UNGA session in 2015.

It is our hope that this small contribution from FLEDGE (Forum for Law, Environment, Development and Governance) would help better articulate the needs of communities and how they handle opportunities and innovate so that the 'Future We Want' will be inclusive and practicable.

The launch of this publication on 22 May 2015 – the International Day for Biodiversity – as decided by the United Nations with the focal theme 'Biodiversity and Sustainable Development' is aimed to support integrating the contributions of biodiversity and ecosystem services for development at local and national levels.

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Food and Environmental Security of Tribals and Small Farmers

Introduction

Over 150 million Indians representing 250 different tribal communities have been traditionally dependent on various forest products for their livelihood. Rapid denudation of forest resources over the last 8 to 10 decades has severely affected their food security, forcing them to take up shifting cultivation and to migrate to near by villages, towns and cities for six to eight months, every year in search of wages as farm labour, construction workers or as casual laborers. Their quality of life is adversely affected due to scarcity of food, lack of clean drinking water, medical care, education, and communication and information facilities. Thus, the vicious cycle of starvation, malnutrition, migration, high rate of birth and child mortality, illiteracy and exploitation forces them to live in chronic poverty.

While implementing various social forestry schemes sponsored by the National Wastelands Development Board in the early 80's in South Gujarat, it was observed by BAIF Development Research Foundation, a voluntary organization committed to sustainable development of the rural communities through natural resource management, that small farmers were not keen to plant trees for meeting their fodder and fuel wood needs, particularly because of poor returns and a long gestation period. Hence, BAIF approached the tribal families living in Vansda taluka of Valsad district of South Gujarat in 1982, to develop their wastelands. A comprehensive Tribal Rehabilitation Programme was launched, focusing on sustainable development, while conserving the natural resources.

Key Activities

Agri-Horti-Forestry - *Wadi* Model

The main activity was establishment of fruit orchards on 0.4 ha of degraded land by each family. The steps involved shaping of hilly terrains into small plots through contour bunds to facilitate soil and moisture conservation, establishment of drought tolerant fruit crops like mango, cashew, Indian gooseberry, custard apple, etc. as main crops, cultivation of seasonal food crops in the interspace between fruit plants and fencing of orchard by establishing saplings of various plant species useful as food, fodder, timber, fuel, medicinal herbs, on the boundary. The participating families were encouraged to establish live fence on the field boundary by planting useful thorny plants like agave, cacti, Euphorbia, etc. for protection from wild animals and trespassers. Farmers were advised to adopt green

manuring, composting, vermicomposting and mulching to improve soil productivity. Farmers called this unit *Wadi* or orchard. To overcome the problems of pests and diseases, Integrated Pest Management practices (IPM) were introduced, while utilizing the traditional knowledge.



Water Conservation

As these crops promoted under the agri-horti-forestry system needed water for ensuring higher growth and yield, water resources were developed from various sources such as revival of natural springs, open wells and bore wells, lift irrigation and by digging farm ponds, gully plugging and nalha bunding. With a view

to save time and cost on water conservation, temporary bunds were installed by stacking sandbags across the seasonal rivulets. Such nalhas, which generally dried out in November, could retain water up to February–March months. The beneficiaries were able



to carry head loads of water or pump it into their farm ponds and then water the fruit plants by hand. Diffuser based system was used to conserve water in areas of water shortage.

Women Empowerment

As women were the major contributors to agricultural development contributing over 70% of the labour, it was felt necessary to empower them to take active part in the programme. Hence women were organized to generate additional income through individual and group activities. *Wavli* is a unique tribal tradition in Gujarat, wherein women enjoy exclusive rights over their income generated from certain activities such as backyard vegetable cultivation. It is their privilege to use this money as per their wish and priorities and men cannot demand their share in this earning. Appreciating this wisdom and custom, women were encouraged to grow vegetable crops in the interspace. This ensured regular maintenance of the orchard, while women earned handsome money which they spent on food and clothing for their children, purchase of ornaments and household utensils.

Self Help Groups of women and men were formed to plan and implement the programme with mutual understanding and support. Experiencing the impact of *Wavli*, several new activities were promoted through groups of women. They were trained in fruit (Mango grafting) and forest nursery management of species like Bamboo, teak, subabul, eucalyptus, glyricidia, mushroom production, vermicomposting, share cropping on barren lands owned by non-participating families, oilseed collection, etc. Women groups also took the responsibility of organizing micro-credit and development of various non-farm enterprises, procuring inputs and to organise marketing of their produce as well. Easy access to safe drinking water, cultivation of fodder, fuelwood and installation of grain grinding mills reduced their hardship. Joint bank accounts of both husband and wife were established to facilitate women to take up financial transactions independently. Initially the transactions mainly involved payments of activities undertaken in the *Wadis* and other receivables under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). These payments ranged from Rs. 500 to Rs. check is it per month or per annum. Later on payments receivable from cooperatives involve payment for the fruit produce sold which range from Rs. 10000 to Rs. 25000 per *Wadi* per annum. These payments are made partly in cash and partly throughcheque.

With the development of their own land under tree based farming system, the beneficiaries were able to take up various community based development activities such as Joint Forest Protection and collection of forest products like Mahuva (*Madhuca indica*) seeds in the adjoining pastures and forests. In a village which had over 200 grown up Mahuva trees, only a few old people collected some seeds and sold them in the local market. However, this was not a remunerative activity due to very low price paid by the traders. Thus, BAIF after discussing with the local community helped to establish an oil expeller and encouraged the villagers to collect seeds for extracting oil. With edible oil and cake for cattle, the activity became economically viable. As a result, the value of the seeds collected from one village alone increased from Rs.10,000 to Rs. 200,000 within two years.

Development of People's Organisations

In the process of promoting agri-horti-forestry, people's participation was critical for the success of the programme. This could be done effectively through People's Organisations at various levels. Self Help Groups and village Planning Committees Known as Gram Vikas Mandalis (GVM), one



GVM per village were formed. The number of GVMs increased as the spread of the programme increased, more than 330 GVMs are formed so far. Similarly 450 SHGs are formed at various stages, helped in developing better understanding and mutual co-operation among the villagers. These groups played a significant role in motivating all the members to take active part and assist each other whenever needed. Hence, creation of awareness, transfer of techniques like plantation and aftercare of orchards, pest and disease management, soil and moisture conservation, grafting, vermicomposting, vegetable cultivation, etc. and programme monitoring were undertaken very effectively. These groups also took the responsibility of procuring necessary inputs from the market and distributing among the members. As these activities were linked with micro-financing, all the participating families could procure the inputs well in time and the repayment was also effective.

The Conservation – Development Links

The agri-horti-forestry programme (*Wadi*) was initiated in Gujarat during early 1980s. After seeing the benefits, the programme was replicated in several states by BAIF and other agencies through support from agencies such as KfW, NABARD and other Government schemes. The *Wadi* programme is spread over tribal clusters in Gujarat, Maharashtra, Karnataka, Rajasthan, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Bihar and Andhra Pradesh, has enabled over 3.3 lakh deprived families to come out of poverty, contributing Rs. 1000 crores to the GDP, while mitigating

global warming- the *Wadi* plantations – around 60 Fruit plants and 300 forestry plants per acre, are established on sloping and barren lands. This has helped in establishing tree cover on more than 1.32 lac Ha. of barren land accompanied with soil and moisture conservation measures.



Value chain development for mango, cashew, amla, strawberry, custard apple and hi-tech vegetable crops has been ensured through formation of the tribal producer company Vasundhura Agri-Horti Producer Company Limited (VAPCOL) formed by members of various tribal cooperatives promoted by BAIF.

Various water conservation measures have improved crop growth and yield, while ensuring safe drinking water throughout the year. The programme generated year round employment for the participant families. These families who were earning Rs. 6000 – Rs. 8000, are now able to earn Rs. 35,000 – Rs. 50,000 per annum. With tree-based farming, these families are now able to meet their fuel needs from their orchards and hence, do not have to go to forests to fell trees. On the contrary, they have realised the impact of green cover on productivity of their orchards and water supply.

Consultative Meets and Concept Appreciation Events were organized for policy makers. The consultative meets comprised of field visits, interactions with participants and staff followed by presentations and discussions on impact of the programme. Similarly Orientation Events were organized for NGO staff and others involved in implementation of Tribal Development programmes. The *Wadi* concept and its impacts were shared in various forums. Various state Governments have promoted *Wadi* programme under TSP and other schemes.

Impact: The *wadi* programme has ensured food security. This model has demonstrated a unique approach to rehabilitate the poor while reducing the ill-effects of global warming as drought tolerant, hardy fruit trees are the main source of income. Increase in green cover has improved the micro-climate and accelerated the process of carbon sequestration. The cooperatives of *wadi*

owners have taken the responsibility of procurement, grading, processing and marketing of the produce, through the producer company promoted by BAIF. This has not only prevented their exploitation, but also generated additional employment particularly for the landless and enhanced their confidence. With easy availability of fuel, fodder and timber, the dependency of the *Wadi* owners on forest was reduced significantly. This resulted in regeneration of denuded natural forests which in turn improved the micro-climate and recharged the ground water table. As the beneficial effects of forest conservation were realised by the local people, the village committees took more interest in motivating their members to protect the forest by not allowing outsiders to cut the trees. Safe drinking water, women empowerment with focus on drudgery reduction, gender sensitisation and capacity building, ensured good health and better quality of life. Increasing income and employment opportunities motivated the families, particularly women to stay on the farm. NABARD has introduced “Tribal Development Fund” for replication of *Wadi* concept in other Tribal regions of the country. BAIF is been entrusted the role of Resource Centre for Tribal Development by NABARD under which BAIF is facilitating *Wadi* Development Programmes implemented by various voluntary organizations throughout the country.

While recognizing BAIF as a Centre of Excellence for Tribal Development, the Ministry of Tribal Affairs, Government of India has launched a *Wadi* scheme for implementation by State Governments and various voluntary organisations, based on the BAIF *Wadi* Model.

Challenges

While initiating the project, BAIF’s team had observed that the tribals in the project areas were addicted to alcohol produced locally or bought from outside. Surprisingly, a large number of women were also found to consume alcohol. Under such a situation, it was extremely difficult to involve them in the programme. Hence, a condition was imposed to refrain from alcohol. Although essential inputs to the extent of Rs. 5000 to Rs. 6000 were to be provided to each family, they were reluctant to take part in the programme as the expected returns were low. During the initial meetings, they demanded mango instead of fuelwood species.

They also wanted to reserve a part of their holdings for food crops. It was feasible to grow mango, but the funding agency insisted on fuel species. Hence, BAIF prepared a revised plan, with fruit plants in the main field and fuelwood and fodder species on field bunds.

There was difficulty in procuring grafted mango plants in the surrounding villages and the cost ranged from Rs. 30 to Rs. 45 per graft. BAIF procured these plants from various nurseries in Gujarat, Maharashtra and Goa during the initial 1-2 years. Meanwhile, local

youth, particularly the women were trained in nursery management, grafting and budding. Subsequently, they were able to raise fruit and forestry plants in their backyards for expanding their orchards and for sale.

Lessons Learnt

The *Wadi* programme can be implemented throughout the country, where the rainfall is above 750 mm or in other areas having assured source of water. A family with 0.4 ha under orchard with reliable market outlet will be able to earn more than Rs.25,000 per annum, after 4-5 years when the trees start bearing.

In the process of development, the tribals realised the importance of forests and natural resources in directly influencing their agricultural production. Fruit orchards which did not require intensive tillage operations, ensured soil and water conservation and bio-diversity improvement.

During the initial period, BAIF officers discussed about the protection of natural forests surrounding their villages, but the villagers did not respond positively. With development of their lands which directly contributed to their livelihood, they were considerate enough to protect the forest as well. This brings out an important message that while working with the poor communities, blending income generation of individual target families with promotion of community based development programmes such as conservation of natural forests and village commons, is necessary.

The *Wadi* experience further suggests that preference should be given to fruits, nuts and non-wood forest product species while developing community lands to boost the income and to sustain the interest of the local community.

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Tapping Eternity for Posterity: Ecological restoration and landscape management of degraded Sacred Groves

Introduction

Sacred groves are relicts of forests that have been protected on religious grounds and taboos that the deities reside in them and protect the villagers from different calamities. Due to urbanization and other developmental activities, these forest patches are degrading at an alarming rate. So, in order to restore such patches, BAIF Development Research Foundation has identified two degraded sacred grove sites for piloting work. One site is located in the tribal block of Jawhar, Thane district and the other site is located in Junnar block of Pune district of Maharashtra. Both the sacred groves form a part of the Tropical Deciduous Forest ecosystem.

Kalamvihira is a village situated on the western side of Jawhar Taluka, approximately 18 kms from the main Jawhar town. Once a big sacred grove (around 5 acres in area), has now got fragmented into four different patches over the years. The area of each patch is around 1 to 1.5 acres. For the current study, 2 patches have been taken into consideration. The sacred grove of Anjanavale is situated in Junnar Taluka of Pune district. The sacred grove lies to the north-west of Junnar and lies in the catchment area of Manikdoha Dam.

The Intervention

Considering the current degradation levels, restoration of sacred groves is a long process. Hence, the process of restoration has been initiated with active participation of the local community. A suitable program approach and strategy for participatory restoration of sacred grove sites to make it a replicable and scalable model was attempted. Documentation, dissemination and creating awareness amongst different stakeholders on the restoration theme was conducted

Kalamvihira village (Jawhar)

The village shows presence of 4 kinds of tribes namely Warli, Konkana, Katkari and Mahadeokoli. The population of this village is around 450 with 90 families. These people are mainly involved in agriculture-related activities. Annually, two rituals are performed in the temple of the sacred grove, one is during Diwali (after rice harvesting), while the second is after Holi festival. Whenever major decisions regarding the villages have to be taken, they are taken in front of the local deity in the sacred grove. 'Waghjai' is the local deity worshipped here. Ecological survey conducted in Patch 1 and Patch 2 of the sacred grove has the following observations:

Birds recorded in the sacred grove

FOREST BIRD SPECIES

No.	Common Name	Scientific Name
1	Forest Wagtail	<i>Dendronanthus indicus</i>
2	Puff throated Babbler	<i>Pellorneum ruficeps</i>
3	Brown Cheeked Fulvetta	<i>Alcippe poioicephala</i>
4	Golden Fronted Leaf bird	<i>Chloropsis aurifrons</i>
5	Black hooded oriole	<i>Oriolus xanthornus</i>
6	White Cheeked Barbet	<i>Megalaima viridis</i>

Bird species endemic to Western Ghats: Crimson Backed Sunbird has been recorded in this area.

Vegetation recorded for the first time in sacred grove

Dalbergia volubilis, *Ventilago bombayensis* and *Gloriosa superba* were recorded for the first time in the sacred grove. *Dioscorea bulbifera*, a climber observed very commonly everywhere, was observed to be dominant last year (2012) in one patch of the sacred grove. This year, *Pueraria tuberosa* (Ran kohala), another wild climber shows the dominance. These changes show the improved or next level of succession.

RARE PLANTS OF THE SACRED GROVE

No.	Common Name	Scientific Name	Habit
1	Ran ala	<i>Zingiber nissanum</i>	Herb
2	Chota Terda	<i>Impatiens minor</i>	Herb
3	Manjista	<i>Rubia cordifolia</i>	Climber
4	Bedkicha pala	<i>Gymnema sylvestre</i>	Herb

Anjanavale village (Junnar)

The village shows presence of Mahadeokoli tribe and consists of approximately 90 families. These people are mainly dependent on the forest for their source of livelihood. Ecological survey conducted in the core zone (1 acre) of sacred grove has the following observations: As per the survey, *Balanophora abbreviata* (a rare root parasite) has been observed on *Memecylon umbellatum* plant in the core area. There are several reports of the host plant, but in Junnar area it is the first ever report on *Memecylon umbellatum*. Giant Wood Spider (*Nephila pilipes*) which is a forest dwelling species was also seen in the core area of the sacred grove. Total 40 different types of fungi have been identified. Most of the fungi belong to Ascomycetes, Basidiomycetes and Deuteromycetes. Xylaria on *Cassia fistula* and *Phyllachora* sp. on *Ixora brachiata* have been observed

Birds recorded in the sacred grove

No.	Common Name	Scientific Name
1	Large Billed Crow	<i>Corvus macrorhynchos</i>
2	Scimitar Babbler	<i>Pomatorhinus horsfieldii</i>
3	Purple Sunbird	<i>Cinnyris asiaticus</i>
4	Purple Rumped Sunbird	<i>Leptocoma zeylonica</i>
5	Black Drongo	<i>Dicrurus macrocercus</i>
6	Greater Coucal	<i>Centropus sinensis</i>
7	Rufous Treepie	<i>Dendrocitta vagabunda</i>
8	Black Lored Tit	<i>Parus aplonotus</i>
9	Orange Headed Ground Thrush	<i>Geokichla citrina</i>
10	Red Throated Flycatcher	<i>Ficedula albicilla</i>
11	Asian Paradise Flycatcher	<i>Terpsiphone paradisi</i>
12	Large Green Barbet	<i>Megalaima zeylanica</i>
13	Golden Fronted Leaf Bird	<i>Chloropsis aurifrons</i>
14	Pied Bush Chat	<i>Saxicola caprata</i>
15	Coppersmith Barbet	<i>Megalaima haemacephala</i>
16	Black shouldered Kite	<i>Elanus caeruleus</i>
17	Rufous tailed Lark	<i>Ammomanes phoenicura</i>
18	Green Bee-eater	<i>Merops orientalis</i>
19	Spotted Dove	<i>Streptopelia chinensis</i>
20	Common Chiffchaff	<i>Phylloscopus collybita</i>
21	Long Tailed Shrike	<i>Lanius schach</i>
22	Common Woodshrike	<i>Tephrodornis pondicerianus</i>

Floral species recorded in Anjanavale sacred grove (Junnar)

No.	Local Name	Scientific Name	Habit
1	Shindal Makadi	<i>Olax psittacorum</i> (Willd.) Vahl.	Climber
2	Bhang	<i>Desmodium laxiflorum</i> DC.	Herb
3	Shilem	<i>Zingiber neesanum</i> (Grah.) Ramam.	Herb
4	(Not known)	<i>Impatiens oppositifolia</i> L.	Herb
5	Ambri	<i>Hoya wightii</i> Hook.f.	Climber
6	Kavali	<i>Tylophora dalzellii</i> Hook. f.	Climber
7	Madhu malti	<i>Hiptage benghalensis</i> (L.) Kurz.	Climber
8	Amrut vel	<i>Tinospora sinensis</i> (Lour.) Merr.	Climber
9	Shirad	<i>Hymenodictyon obovatum</i> Wall.	Tree
10	Chilar	<i>Acacia caesia</i> Willd.	Climber

Economically important plants

No.	Local Name	Scientific Name	Habit
1	Hirda	<i>Terminalia chebula Retz.</i>	Tree
2	Khokali/Tirphal	<i>Zanthoxylum rhesta (Roxb.) DC.</i>	Tree

Indigenous plant species

No.	Local Name	Scientific Name	Habit
1	Anjan	<i>Memecylon umbellatum</i>	Tree
2	Kurra	<i>Ixora brachiata Roxb.</i>	Tree
3	Parjambhul	<i>Olea dioica Roxb.</i>	Tree
4	Arsul/Tupa	<i>Canthium dicoccum Teys & Binn.</i>	Tree

Causes and practices for the degradation of sacred groves

Urbanization and other developmental activities have led to degradation of these groves. Forest land is getting converted into agriculture land. Also, since the forest lands are getting degraded, it has led to an increase in biotic pressure on the sacred groves. Traditional agricultural practices like 'Rab' have led to reduction in biomass layer of the sacred groves. People collect leaf litter from the groves and use it for 'Rab'. Loss of belief in deity especially among the youth is also one of the reasons for the degradation of the sacred Groves.



Ecological Restoration

Ecologists and Anthropologists have been identified to conduct ecological surveys and to provide inputs about religious beliefs and their ecological relevance. Concept sharing with the Self Help Groups and Villagers has been achieved with a positive response and assurance for their participation.



Involvement of Local Schools for sensitization through activities like seed collection and conducting nature trails. Forest Department officials have been kept updated about the ongoing project by conducting meetings and site visits. Short term internships have been offered to

interested candidates from different Universities and Colleges. Journalists and media personnel have been invited for creating awareness regarding the project in newspapers and magazines.

Key activities

The implementation methodology for ecological restoration of these sacred grove sites includes the following three main components

1. Ecological survey

This survey basically gives us an idea about the existing biotic (trees, herbs, birds, etc.) and abiotic parameters (soil and water quality, temperature and humidity), obtained at regular intervals to compare the changes in site after the restorative activities. Soil parameters are analyzed at regular intervals and seasonal surveys of flora and fauna are conducted

2. Ecological restoration

This broadly includes ecological restoration activities like protection of the site, plantation of native species and its conservation, soil and water conservation activities, zoning etc. Villagers were sensitized about the importance of conservation of sacred grove through a few capacity building sessions. They were convinced that with the help of soil water conservation measures, they will be able to fetch more water from the nearby well.

The first step taken was to build a dry and live fence around the sacred grove so as to prevent the cattle and other animals from grazing on that land and allow natural regeneration of plants. Seeds of



economically important and medicinally important plants were collected and their nursery has been raised for biodiversity conservation and incentive generation. With the help of local villagers; trenches, ponds, pits were dug so as to retain the rain water. Stone pitching,

slope stabilization and stone lines were made so as to prevent soil erosion. With the villagers' consent, pathways were built inside the sacred grove so that people could walk up to the temple, perform the rituals and come out without disturbing the surrounding flora and fauna. Utilization zone has been demarcated where people perform the rituals. Corridor of Nirgudi cuttings has been established between the two patches of Kalamvihira sacred grove so as to join them. Microbial reserve has been created in one of the patches of the sacred grove to enhance the soil quality. In order to retain the stream water, desiltation was done to increase its water holding capacity; cascade bund and check dam were built on the stream. Plantation of native species like Ain (*Terminalia alata*), Behada (*Terminalia bellierica*), Tetu (*Oroxylum indicum* (L.) Vent.), Kanchan (*Bauhinia purpurea*), Moha (*Madhuca longifolia* (Koen.) Mac. Var. *latifolia*), Katesavar (*Bombax ceiba* L), Tirphal (*Zanthoxylum rhesta* (Roxb.) DC.), Bhokar (*Cordia dichotoma* Forst.f.) etc. on degraded lands has been done. Around 3-5 plants each were given to the villagers to grow them in their backyard. Mulching of the plants has been done to reduce the soil temperature. Zoning and micro-habitats were identified as below



Community mobilization

This basically aims at sensitizing the community about the importance of sacred groves with respect to various ecological services through orientation sessions, meetings, exposure visits and workshops. A good rapport has been established with the villagers at both the sites. Activities like Recipe competition for SHGs were conducted to collect data on local wild food resources. Sacred grove conservation committee (Devrai samvardhan samiti) of both the sacred groves has been formed. Exposure visits to different sacred grove sites, learning centers are organized for these people, so that they get inspired to conserve these forest patches. Various cross learning programs, workshops and environmental awareness sessions are conducted for *Vaidus*, school children and villagers.

Results/Impacts

It was possible to have participatory zoning of sacred grove sites and defining core zone, utility zone and buffer zones for better management of landscape; dry and live fencing of sites thereby minimizing damage due to free grazing of cattle thus allowing natural regeneration of flora Resource assessment through floristic surveys and identifying species of importance from conservation point of view (species which are indigenous, endemic, economically important, rare, endangered and threatened etc.) were also made. Identification of micro habitats for restoration and gap filling with indigenous tree species, implementing soil water conservation measures like stone pitching on exposed slope surface, slope stabilization, digging trenches, ponds, small gully plugs etc was suggested by local people during the intervention;

Participatory processes and actions for conservation with stakeholders such as traditional healers (*vaidus*), barefoot botanists, SHGs, school children, forest departments etc. Workshops are conducted for *vaidus* where they share their knowledge with other *vaidus* and trained staff; and in return learn new healing techniques. Activities like recipe competition are conducted for SHGs from where the data of wild food resources is collected. Environmental awareness sessions for school children are conducted by showing them documentaries, organizing games and visits etc. Forest officials are well informed about all the activities conducted. Periodical assessment of diversity of flora, fauna and microclimate to understand various ecosystem services has demonstrated that this process has allowed natural regeneration of endemic flora and attracted useful faunal species. Bird survey is done by using Point count method, Insect survey is done by using Insect trap method and floral survey is done by using quadrat method. Physical parameters of soil like temperature, pH, and moisture are monitored regularly. Direct impact at the site level through better managed

landscape, setting in process of ecological restoration and natural regeneration, soil and water conservation and creation of long term asset for the village communities. The interactions with villagers have also thrown light on the availability of wild vegetables, fodder, medicinal plants, raw material, water, micro climate, fruits etc. that are available in the forests and sacred groves for the local communities.

Lessons Learned

There is scope to leverage useful tribal traditions for environmentally sound livelihood generation work. However, with the changing context, there is a need to improvise these practices to make them relevant in the local context. For example, it is believed that nothing can be collected from sacred groves without incurring the wrath of the deity. However, today one can think of creating some incentives for associated communities by allowing them judicious and scientific collection of fruits, bamboos, grasses and wild vegetables from these sites. This will help in maintaining such forests. Thus while planning restoration measures, one can also think of planting economically important native tree species in a particular zone. The ecological restoration process can be seen as a practice having potential to become integrated in all landscape management and forest management actions. Thus, success of this program does not depend only on conservation of a sacred grove site but, will be effective only when the community is able to integrate these useful principles of resource management into the management of surrounding forests and private landscapes.

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Food Security through Seed Sovereignty: BAIF's Community-led initiative for Agribiodiversity Conservation in Maharashtra

Introduction

Seed is the soul of agriculture. It has taken hundreds of years of dedicated efforts of our farmers to develop and conserve crop landraces suitable for local agro-climatic conditions. However, in recent years, agriculture is practiced with external inputs; farmers are dependent on external



sources such as seeds, chemical fertilizers and insecticides which result in steep escalation of cost of inputs, environmental degradation and rapid biodiversity erosion.

The hill ranges in India are known for their native crop diversity and interior hilly regions are beyond modernization of agriculture, these areas have retained traditional crop cultivars and knowledge of their specific qualities and agronomic practices. This rich biodiversity and heritage, has desirable qualities like tolerance to biotic and abiotic stresses, nutritional characteristics and taste.

Location

Two such locations in focus are Jawhar block in Thane district and Dhadgaon block in Nandurbar district of Maharashtra. Jawhar block is a hilly region, which includes a part of the Western Ghats, considered to be a biodiversity 'hot spot'. The average rainfall in this area is above 2500 mm. The area is a host to an amazing diversity of rice and other food crops. The typical lateritic soils are poor in nutrients, and agriculture is largely rain fed. The topography of this area is very sloppy. The tribal communities in jawhar block are Varli, Koli Malhar, Thakur, Kathkaris, Kokana and Mahadev Koli and they are small and marginal holders. The main crops cultivated in this area are paddy, Finger millet, sorghum, Pigeon pea and Black gram.

Nandurbar is one of the North districts of Khandesi region of Maharashtra and includes a part of the Satpura valley. Soil is sandy loam type. Agriculture is largely rain-fed. Soil erosion affects the soil fertility to a considerable extent. Dhadgaon cluster is situated in the Narmada valley 671305 m above sea level. Out of the total population in Dhadgaon cluster, 96% comprises of tribal communities of which Pawara and Bhilla are the two major communities. Most of them are small and marginal farmers. The average rainfall is 767 mm. Soil erosion affects agricultural practices. Maize and sorghum are the major crops meant for food and fodder requirements of the communities.

Rational of the Intervention

The modern 'high yielding varieties' did not have any significant effect on these regions during the first 2-3 decades of the Green Revolution; hence, genetic diversity remains high, however in the last 2 decades, there has been a gradual erosion of indigenous biodiversity with most of the indigenous rice varieties being replaced by



high yielding varieties such as Ratna and Jaya, which are considered to be the most responsive varieties in this area. These high yielding varieties have not resulted in any spectacular increase in yield in this region. The majority of farmers, especially the resource-poor tribal farmers could not afford to purchase fertilizers which are normally recommended along with these varieties. In Thane district, the tribal people have traditionally cultivated over 300 diverse rice varieties for food security, instant energy provision during peak workload and medicinal use. This rich diversity of rice has formed the basis of a nutritious and secure diet for the tribal population.

Recently hybrid varieties of maize and sorghum were also introduced for improving the crop productivity which also causes of erosion of genetic diversity. In the remote areas of Dhadgaon block, a few farmers continue to cultivate traditional varieties on a small portion of their land, mainly for household consumption. Thus, many of these crops still have their presence despite

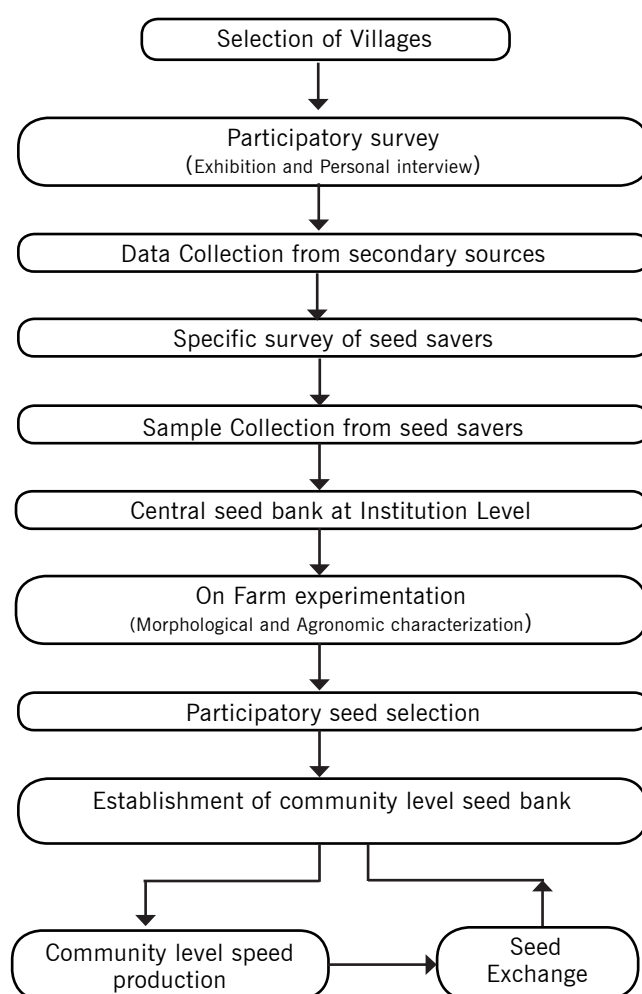
negligence over the last 2 decades. This is indicative of their potential role in the cropping systems of India, especially in small landholdings. Jawhar and Dhadgaon blocks have a number of landraces of food crops that are resistant to pests, can grow on poor soils and can sustain under changed climatic conditions with high nutritive values. Hence, it is necessary to conserve these landraces.

Objectives and Methodology of the work Initiated

BAIF Development Research Foundation has initiated community-led conservation and revival of crop landraces in Thane and Nandurbar districts since January 2007 through the establishment of the Green and Appropriate Technology Resource Centre (GATRC) at Jawhar, with the following objectives:

- To revive and conserve diversity of landraces and local knowledge associated with it, with special focus on food security, risk mitigation and livelihood development.
- To undertake agronomical and morphological characterization of crop landraces along with trials for productivity enhancement of worthy cultivars under organic agriculture practices.
- To encourage establishment of community-managed seed banks and village level seed production and multiplication.

Community-level crop germplasm conservation model is a unique approach for conservation, revival and sustainable use of crop diversity. Capacity building of seed savers and farmer groups for participatory seed selection, production and exchange, is a critical aspect of the programme.



Participatory survey for Crop diversity documentation

Through seed exhibitions and fairs, personal interview, valuable data on the reasons behind extinction and still existence of crop landraces, factors affecting crop diversity, present status of

crop landraces, people's perception about its use and specific properties and farmers who have kept these landraces under cultivation presently etc. were collected. This has been done in 7 blocks of Thane district and 2 blocks in Nandurbar district. More than 4000 farmers were contacted in the process.

Area specific Focus crops for Conservation & Revival

Through Participatory survey, field visits, interactions with Farming communities and the present and past crop diversity in study area it has been decided to focus on following crops

Sl.No	Identified Crops	Reason for selection of the crop for Conservation & Revival
Jawhar, Thane District		
1	Paddy	<i>Paddy is the main crop in Thane district with amazing diversity of landraces. But now large number of landraces have disappeared, still there are potential landraces in terms of nutrition, fodder, drought resistant, speciality rices, need to conserve along with measures for yield improvement. it will fetch good market value for surplus production</i>
2	Parjambhul	Hilly and sloppy lands in Jawhar block of Thane district has rich millet diversity which is reducing because of low yield and pest and disease attacks. Millets are nutri cereals and also in changing climate situation they adapt even if there is a prolonged draught. By Improving cultivation practices possible to improve yield.
3	Proso millet	
4	Tubers	Tubers are important resource for food and nutritional security in Tribal areas, tubers are one of the staple food items.
Dhadgaon, Nandurbar District		
5	Maize	Maiz is the main crop in project area and specific landraces with features of fodder and food quality, low external input requirement. But now diversity is under threat because of spreading of Hybrid maize so the amazing diversity in maize need to be conserved.
6	Sorghum	Sorghum diversity in Study area has unique value in terms of Food, fodder, nutritional aspects.

On farm seed Collection of crop landraces

Through seed exhibitions and seed fairs organized at village and block levels, data on existing crop diversity along with people's knowledge has been collected and with this base line information, organized field visits to seed keeper's field, during crop maturity stage for sample collection along with specific data.

This work has been done in participatory manner by involving old age and knowledgeable farmers, women's in the villages. This approach helped to validate the authenticity of crop landrace conserved by seed keeper, specific trait in it and to know more about farmers practices and methods of seed selection and upgradation.

Establishment of Central Seed Bank

A central seed bank has been established at Jawhar for storage, cataloguing and maintaining a database of crop landraces collected from various locations. The objective is to ensure easy access of seeds for farmers and researchers. Demonstration plots developed for maintaining purity of landraces. A permanent accession code has been provided to each landrace collected.



The samples collected in the central seed bank have gone through a series of experiments to check morphological and agronomical characters for scientific validation and preparing a detailed database of individual landraces.

The seed bank has a collection of 377 landraces which includes paddy (225), Finger Millet(27), Proso Millet(10), Foxtail Millet(02), Maize (06), Sorghum(06), Pulses(32), Cowpea(20), Pigeon pea(10), Vegetables(44), Tubers(05) etc .

Knowledge and capacity building

Field training programmes on participatory seed selection have been conducted to educate farmers about maintaining seed purity in paddy, finger millet, proso millet, maize and sorghum. Community-level seed exhibition was an important tool for increasing awareness of the farming communities about crop diversity in their area and the need for conservation. It is also helpful in ensuring community participation in field programmes. As 'seeing is believing', field exposures and field days were conducted regularly. Field training programmes on various topics such as seed treatment, nursery raising, paddy transplantation by single seedling method, ridges and furrows method for finger millet and proso millet cultivation etc has been conducted for 360 participants. For improving Crop yield, enriching soil fertility, Pest and disease management, reducing labour and cost of cultivation different methods are adopted. , field trainings and Practical demonstrations were done in 11 villages with the help of community seed banks.

Other Benefits

Labour required for plantation has been gets reduced as there is single seedling transplantation so saves Labour cost by 30-40 %. All inputs for Soil fertility management, Plant protection etc has been prepared at farmers field itself so there is a negligible external input requirement. So there is about 80 % cost saving for external inputs. Quality seed production at farmers level with participatory selection. Tillering ability has been increased because of single seedling transplantation and proper spacing.

Community reach

724 farmers from 11 villages of Thane and Nandurbar districts are directly involved in conservation, seed production and community level seed bank programme.

The seed saver Farmers group involved in Conservation and revival of crop genetic resources in jawhar block of Thane district has been awarded by **“Plant genome savior community award 2011-12** by Protection of Plant varieties and Farmers Rights Authority (PPV & FRA), Ministry of Agriculture, Govt. of India which is the prestigious award for Conservation of crop genetic resources. Two innovative farmers **Mr.Mavanji Pawar**, Chowk village and **Mr. Sunil Kamadi**, Kamadipada village, in Jawhar block of Thane district are recipient of Plant **Genome savior farmer Recognition 2011-12** for their valuable contribution in conservation of crop genetic resources.

Challenges

Searching for crop diversity along with its traditional wisdom is a challenging task as this amazing diversity is at the verge of extinction and proper secondary data is not available. Also people who know the traditional Knowledge about specific traits are also difficult to find out, this requires considerable amount of time and manpower. Seed storage without disturbing seed viability is of major concern because seed viability for crops like paddy will not be more than 2 years. Now climate change increases the risk. So on farm conservation of crop germplasm without proper risk mechanism is very difficult.

Lessons learned and way ahead

Farmers are willing to maintain crop diversity, Farmers' views about seed and varietal selection are important. Crop demonstration centres play a vital role in conservation. Fodder value is a major aspect from the point of view of farmers. Conservation of Crop landraces suitable in changing climatic conditions and having Nutritional importance is major areas of concern. Further strengthening farmer's knowledge about seed production and developing network of community seed banks for reaching more number of farmers in the rural areas. It is vital to work on yield improvement of these crop landraces by changing cultivation practices, soil fertility management and pest and disease management by organic inputs for reducing cost of production and production of healthy food is of major focus in future. It is planned to focus on conservation and revival of traditional varieties of pulses, local vegetables and wild food resources to achieve food and nutritional security. Proper seed storage systems at community level for securing seed viability by developing medium term storage facilities. As these amazing crop diversity has been under conservation, Revival and sustainable use since years by farming communities, it need to safeguard these resources, so registration of farmer's varieties under PPV & FR Act is of prime importance. Further studies at chemical and molecular level are needful for validation of people's knowledge about nutritional values and for DNA Finger printing and bar coding of crop Landraces.

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Marine turtle conservation and awareness through community participation

A new wave of community participation and ownerships

Project background

The project was implemented in the Western Coast in five coastal villages in Chiplun block of the Ratnagiri district of Maharashtra in the villages Velas, Kelshi, Anjarla, Kolthare and Dabhol. Marine turtles are endangered species throughout the world and the population is rapidly declining. Out of seven species of marine turtles, five are found in Indian Ocean and all are declared endangered by Wildlife Protection Act, 1972. Among the five species, four breed in the selected areas along the western and eastern coasts. The marine turtle plays a crucial role in the marine ecosystem and contributes to keep the sea clean. The turtles are endemic to the area and therefore have become endangered due to the increase in human activity and exploitation of the resources. It was found there is threat to marine turtles from the local communities due to poaching, meat and selling of eggs collected from the coast. People from coastal villages regularly poach the turtle eggs. Uncontrolled tourism is another threat to the marine turtles and their nests.

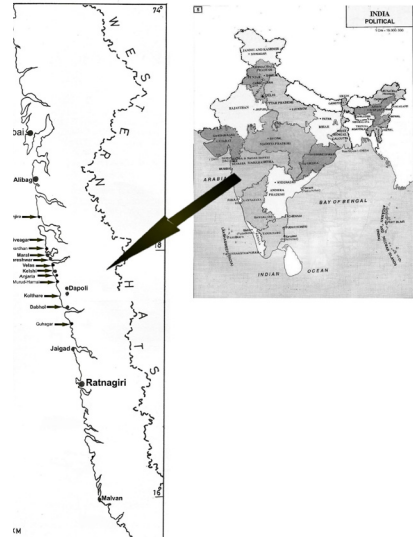
The Sahayadri Nisarga Mitra (SNM), the NGO working in the region adopted community based approach and targeted the strategically important area on the west coast for turtle conservation through Global Environment Facility/United Nations Development Programme Small Grants Programme (GEF/UNDP SGP) India. The targeted project area lies under coastal ecosystem a part of Konkan division and connected with the Western Ghats, the biodiversity hotspot. The area is ecologically sensitive, nearly 8,208Sq. km with tropical climate. The annual rainfall in the area is high nearly 2000 mms plus, but most of it is within a span of 90 days.

Project strategy

The project developed aimed for in-situ and ex-situ protection of endangered Olive Ridley turtles (*Lepidochelys olivacea*) on Maharashtra Coastlines; and also promotes alternate sustainable livelihood activities in the area for the local communities to avoid poaching and killing of the turtles. In the process the community based groups were made functional to support and sustain the activities by the NGO. Three Self Help Groups (SHGs) were formed to promote the protection of endangered species of marine turtles. These also acted as means of sustenance by building the skills and capacity of locals by creating the alternative means of livelihoods. Friends of Turtle group

locally called *Kasav Mitra* Mandal disseminated the knowledge of turtles' habits and habitats among the local communities and the visiting tourists along with fostering turtle habitats. Marine Turtle Knowledge Information Centre (MTKIC) was created to exhibit the life cycle of the marine turtles for the visitors, this small interpretation generated lot of interest among the local schools and colleges, students started visiting the area.

The local communities in the five targeted villages are the primary stakeholders. These involved Koli tribal community as major group residing in the project area, a marginalized



community whose members are mainly engaged in fishing and subsistence level farming activities. Most of their colonies are found close to the seashore and called as Koliwad. Konkani Muslims also forms a large part of community in Ratnagiri district involved in the merchant navy, shipbuilding, and textile industries in India.

Activities and results

The project started the operations in five villages along the coast covering a stretch of 218 Kms as the most endemic turtle sites. After the impressive results achieved in 3 years time the NGO identified 38 more villages to expand the project activities. In the year 2002 only 50 nesting sites existed in the area. Over the years a total of 1981 nests have been protected.

Five fully functioning turtle hatcheries were set up in five project villages. In addition 40 villages (50,000 people) in the region have been provided with the materials to set up such hatcheries. In the year 2011-12 around 9,000 eggs were collected from the five project villages for ex-situ protection. Marine Turtle Knowledge Information Centre (MTKIC) has been established at Velas

in Mandangad block of Ratnagiri with exhibition materials having the entire life cycle of Marine Turtles, current status and threats to the species.

Awareness creation and capacity building involved 2163 females, 2918 males and 4241 children through regular exposure visits and trainings over the years. 199 awareness generation campaigns have been conducted which included lecture and slide shows, public rally, turtle festival etc over the last five years. Youth group and women SHG – orientation programmes on eco tourism and good practices were conducted. Different resource materials such as the turtle booklet and DVD on life cycle of Olive Ridley turtle were developed and distributed among the volunteers.

20 *Kasav Mitra Mandal* (KMM) - Friends of Turtle group, around 20 families in the project are have been identified as KMM. A KMM stands for the protection and conservation of marine turtles by training the tourists on the conservation of the turtles.

Kasav Mitra Mandal

Kasav Mitra Mandal (KMM) supports local people who are willing to work for the conservation of the Marine Turtle. The KMM provides lodging and boarding facilities, guides, film-shows etc. on demand by the tourists and the visitors arriving at Velas, especially during our Turtle festivals. Each KMM contributes 10 per cent of its income to the Turtle Conservation Fund. This fund is utilized exclusively for the conservation of Marine Turtles at Velas. Many volunteers, local youths, SHGs, Mahila Bachat Gats etc. have joined the KMM as members. There are 20 KMMs established so far. Thus livelihood and the conservation go hand-in-hand. The institutionalization has empowered the locals in taking their own decisions, sharing of responsibilities and roles and more so share financial contributions as required. Kasav Mitra Mandal, Velas is seen as a unique effort in India for marine turtles by a range of stakeholders. The average annual turnover of KMM is 3, 00, 000 (INR) as on today.

During the hatching period, Turtle Festival is hosted as a symbolic measure of the turtle conservation activities. Around 5000 metro-tourists from major Indian cities New Delhi, Gujarat, Bangalore, Nagpur, Mumbai, Pune, Thane, and Kolhapur visit to witness the hatchlings being released in the sea. A Turtle Festival is also celebrated as an annual occasion by SNM to create livelihoods for the local people through promotion of eco-tourism and spread the awareness among metro tourist. The festival has created the feeling of joint ownership of the turtle conservation among local population which has proved vital for diverting them from poaching and selling turtle eggs.

A total of 7884 hatchlings were released in 2008-09 and nearly 3,555 in 2011-12 with the protection of 155 and 68 nests in respective years. Manual protection of the hatcheries and their monitoring were done. 217 nests for ex-situ and 229 nests for in-situ conservation were distributed in five villages.

Activities	03-04	04-05	05-06	06-07	07-08	08-09	10-11	11-12	12-13	13-14
No. Villages	04	06	07	15	20	30	32	36	38	40
No. of Nests Protected	35	31	36	62	167	155	71	81	68	75
No. of Hatchlings	1687	1565	1624	1890	5517	7884	2851	3482	3555	3125

To make the local population self-sufficient and generate income other than agriculture and labour, the people were trained to use the locally available resources like coir, coconut shells to create different gift articles. This training came handy for the families as they could make ropes to meet their own requirements and sell in the market. The gift articles were sold by the local people during the turtle festivals. Shops and hotels were installed during the turtle festival by the locals to meet the needs of the visitors from urban areas. Every year SNM undertakes such trainings and explore different income generation avenues for the local population.

More than 1000 visitors visited the Marine Turtle Knowledge Information Centre (MTKIC) facilitated by SNM, where all were explained about conservation activities on charts, through photos and films, nominal fees is also collected from the visitors, leading to build the fund for the management of the program.

Daily screenings of the film Kasava Tuzhyacha Sathi (based on marine turtle conservation in Maharashtra) and 'Ghartyatil Pakshi' (Birds in the nest) was held at the Marine Turtle Knowledge and Information Center for the visitors and the consecutive discussions provided the visitors with valuable information on the marine turtles. Many visitors express their interests to involve themselves as volunteers into the project or help in any way possible. Others help through donations or through membership fees. The visitors buy Turtle Information Books, DVDs, photo frames, bags and eco-friendly turtle hatchlings made of paper as memento.

Table: Details of the Turtle Festival from 2006-2013

Particulars	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
No. of visitors	50	250	687 (both phases)	459	800	1120	5000
No. of students	50	-	-	110	100	270	470
Self Help Groups	2	3	3	9	12	14	12
Youth Clubs	1	2	3	4	4	5	5
No. of stalls	1	5	7	9	8	11	-
Approx. local income (Rs)	10,000	50,000	120,500	145,000	172,000	230,000	750000

Challenges faced

Several challenges keep re emerging in the program. Due to excessive sand erosion, drenching of nests by high tide water was observed at the beginning which was then overcome by moving the hatchery to sufficiently high ground. Deposit of sand due to winds was also problematic for the hatchlings. The hatchery managers (local community persons) were then trained to maintain the sand level on regular basis by removing the excess sand deposit. The tourism activities were progressing in the project area, but the various shipping actions by the Gas Authority of India Limited at Dabhol are hindering the breeding activities of the marine turtles. Threats to eggs and hatchlings from the predators, natural calamities



like rainfall and high tides affect the incubating time reduces the rate of the eggs hatchlings. Innovations were locally improvised to protect the core area of the hatchery; the lower portion of the hatchery net was then covered by metal sheet. Also empty bottles and cans were hung by the hatchery which would make noise by the wind to keep the natural predators away at night.

It took time for the locals to understand the importance of the turtle conservation, and why we need to protect them. The constant dialogues, involvement of the locals by the NGO with a range of stakeholders led to a common vision and mutual respect for the turtles, the role they play in the rich biodiversity.

Replication of the project

The project was replicated in three more villages with the help of Pokarna Trust. The project is easily replicable in similar breeding sites in and around the area with the active support the villagers implemented and already gained experience. Today the NGO has outreached the program into 45 villages along the coast. Conservation was achieved on new turtle nesting areas identified in last few years. Regular dialogues are made with the governments, national biodiversity authority (NBA) to access resource and influence so as to initiate the conservation activities in other villages in the region for marine turtles in partnership with SNM's actions.

Lessons Learnt

It is important to have community ownerships in the program from the start up of the project, through a range of simple tools e.g. by building vision, exposure visits and awareness campaigns. They were very useful in the implementation of the project activities.

Ecotourism component was linked as an additional benefit to the community and institutionalized locally and which impressed the locals as they saw visible impacts of increasing tourists visiting and increased incomes. The financial benefits from ecotourism activities in the village helped in enhancing the community interest in the project activities.

Integrated approach is necessary to conserve biodiversity. Community needs to be made aware along with the provisions of additional tools required to complement the local knowledge. Roles and responsibilities once agreed with communities although time consuming process initially; get the local people to act in the ecosystem and strengthen the linkages between its components both with local governments and the state.

Impact and dissemination

The project has been more process driven than a targeted approach and it has set examples of mutual trust, respect and confidence building for the locals. In the beginning, SNM provided the local people with all the requirements for the festival and amenities for the tourists. SNM collected all information regarding the tourists, did the booking, collected the money etc, and provided it to the locals. CEE helped to agree the systems for Kasav Mandals. Since the establishment of KMM, now it organizes the festival. The SNM website posts information regarding the list of KMM members, their phone numbers, and amenities available, for people's perusal. This helps the tourists to liaison with the KMM members directly. Turtle Excluder Devices (TEDs) need to be introduced to fishing community in the 210 kms stretch with the active support of the local communities.

The project developed the status report of Olive Ridley Turtles on Maharashtra Coast which was submitted to the Maharashtra Wild Life Board so as to influence the pro active community policies to the state/central governments. Bhau Katdhare was given a state level award by the State Chief Minister, Government of Goa in 2009 as the best NGO involved in conservation efforts.

Networking partners and funds leveraged

Many institutions came forward to support this innovative program. Major support for the conservation effort both in cash and kind came from a range of organizations, State Forest Department, Shri Shankarlal Pokarna Charitable Trust's Marine Turtle Conservation; Bombay Natural History Society; Raleigh's Adventure Tourism India Program; TATA Consultancy Services; Orchid Green Hotels, Local Banks and communities. Moreover SNM have received funding and technical support from ATREE, Bangalore.

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Organic indigenous rice varieties and value added products as a conservation strategy and livelihoods enhancement

Nagapattinam is a coastal district located in the state of Tamil Nadu, bounded by the Bay of Bengal on the East the Palk Strait on the South, Tiruvarur and Thanjavur District on the West and Northwest and Cuddalore District on the North. The District is known for its historical and cultural significance. Tourism, agriculture and marine fishery provide the major livelihood opportunities in the District. The major crops cultivated in the district are rice, blackgram, green gram, sugarcane, groundnut, coconut, gingelly, vegetables and cotton in the order of acreage cultivated.

Currently most of the biodiversity conservation by national and international organisations is done ex-situ in cold storage gene banks, while most of the in-situ conservation is done by farmers in their fields, basically to meet their own requirements. However, one can see a decline in such practices, as many farmers are switching to market demand based farming. In order to conserve and revive the cultivation of indigenous varieties, a demand for the same has to be simultaneously created at the consumer level. In addition to the above, a systemic approach and mechanisms for sustainable ways of conservation of not just few indigenous varieties but also to include the not so commonly cultivated indigenous varieties have to be undertaken.

Currently as there are limited programmes which look at the biodiversity conservation focus linked to livelihoods. Centre for Indian Knowledge Systems (CIKS), a NGO working in the area of organic agriculture, biodiversity conservation and livelihood security, approached GEF UNDP/SGP, CEE to address these issues along with the farming communities in the districts of Kancheepuram, Thiruvannamalai, Dindigul and Nagapattinam in the state of Tamil Nadu India. The idea was to start on the staple crops of paddy, seasonal vegetables and millets. To start with, the focus would be on farmer's preferred choices for seed, based on crop duration, taste, tillering, post harvest residues and preparation of value added products among other factors. Later, seed evaluation, characterization and multiplication of varieties would be carried out in farmer's fields, while addressing the broader issues of conservation of indigenous varieties.

Promotion of tradition paddy varieties

Currently 15 different paddy varieties: Kappakar, Kullakar, Salem Samba, Sembalai, Neelamsamba, Kallundai, Koomvazhai, Periya Seenghini, Perukoomvazhai, Soorankuruvai, Kattuyanam, Malainel, Poonkar, Arubathamsamba, Kudaivazhai are being promoted and 300 acres are under organic cultivation.

The major goal of the project was to link agro biodiversity conservation and reduction in the use of persistent organic pollutants in agriculture, including vegetables towards enhancing the livelihoods of farmers, while linking biodiversity conservation efforts with marketing aspects for better and sustained incomes.

The project is located in the deltaic region of Kaveri River, which drains into the Bay of Bengal. The major crop cultivated is paddy under irrigated conditions and under rainfed condition its blackgram and green gram. The climate is tropical in nature. The average temperature ranges between 20o C to 35o C and the average rainfall is about 1000 mm. The region experiences frequent cyclones and had experienced a devastating tsunami in 2004.

The project had targeted men and women from the farming community for participating in this programme. Along with the participating individuals, the programme also created awareness among the farming community on organic cultivation and conservation of indigenous paddy varieties through field demonstration. Technical inputs were sought from the officials from the Department of Agriculture, who were supportive. Linkages were established with the financial institutions for credit support for the members of women SHGs formed and National Bank for Agriculture and Rural Development (NABARD) provided support for undertaking activities through the Farmers' Clubs. Concurrently funding and credit support from various other donor agencies and government schemes were availed for supporting allied activities.

A detailed survey of indigenous varieties in Nagapattinam district, covering more than 50 villages was undertaken. The varieties that were identified during the survey were cultivated in farmers' fields and their characteristics were evaluated. The reasons as to why indigenous varieties are still conserved by the farmers in spite of all odds, is due to the fact that high yielding varieties are not suited to all farming conditions and many are also cultivated for their unique agronomic and nutritional properties and cultural significance. Awareness programs in building sensitivity for local biodiversity were undertaken for the farming community, followed by the demonstration of organic cultivation practices for both indigenous as well as hybrid paddy varieties were done. Capacity building of the farming community conducted included experience sharing, crop production through use on non chemical pesticides, improving soil fertility through bio-fertilizers, certified seed production, and certified organic cultivation. One of the major achievements of this project is in getting third party certification for both the parameters of certified seeds as well as certified organic product simultaneously for the same crop. Common infrastructures and other facilities were provided through the project for supporting organic cultivation, by way setting up units for production of bio-fertilizers, such as, Rhizobium, Azospirillum and Phosphobacteria and plant growth promoters from plant extracts such as *Panchagavyam* and *Amirthakaraisal* among others.

These units are managed by the women SHGs. The SHGs were trained and provided a livelihood opportunity through preparation of value added products from organic indigenous rice varieties. Value added products from organic rice, targeting local markets included, flour, flakes, vermicelli, *appalam/papads*, *vadagams*, puttu powder and *idappam/ idly/dosa* mix. Marketing support for bio diverse products was also provided through *Sirkazhi Organic Farmers Association (SOFA)* with market linkages and networking with organic product outlets.

Through the programme 16 organic farmers groups were established having a total of 211 men and 53 women farmers from the region. A value chain system for conservation of indigenous paddy varieties, which includes seed storage, multiplication/cultivation and marketing, was established. The intervention links the farmers with the markets to get better prices and encourage the sustainability of the practice, this support the objectives of local biodiversity conservation and livelihoods enhancement. Starting with an informal marketing, CIKS facilitated the establishment of a registered entity, the *Sirkazhi Organic Farmers Association (SOFA)* a formal institution for promoting the farmers in taking up cultivation of traditional varieties, organic cultivation and marketing, all these efforts have created a demand for these varieties and encouraged more farmers to cultivate traditional varieties. The NGO has facilitated the participation of the community to participate with the range of value added products in many local, state and national level fairs and market programs. Also propagated the products and practices through various media like calendars, posters and special pamphlets have been developed.

Sirkazhi Organic Farmers Association (SOFA)

SOFA was formed in April 2005 with the support of CIKS and is registered as a Society under the Tamil Nadu Societies Registration Act, 1975. SOFA is managed by the local farmers and actively involved in the promotion of organic cultivation, procurement, processing, value addition and marketing. A few of the members of the association are also trained as internal inspectors to ensure quality control. Some of its members also are certified organic seed producers. Over the years, the procurement of organic paddy by SOFA has steadily increased and is currently around 150 tonnes/year. Since 2010, SOFA has also started procuring other crops like black gram, ground nut and bengal gram from their own farmers. The women members of the SOFA are managing the village level organic input production units, they produce vermicompost and five different kinds of plant extracts for soil fertility and pest and disease control. They also manage and produce the value addition products for organic rice products. SOFA addresses a complete Organic Value Chain activity for its members and is also expanding its activities in the neighboring areas.

The major challenge faced during the implementation of the programme was in convincing the farming community and agriculture extension officials on organic farming systems approach with local indigenous rice varieties. Among the farming community, the lack of awareness, coupled with low motivation in adopting the low cost and non chemical based pest management systems of pheromone traps, sticky traps, NPV etc had to be addressed. Demonstration and constant exposure visits and discussions with farming community have helped in overcoming the above issues. Future challenges include increasing the pool of indigenous paddy varieties for in situ conservation coupled with increasing market facilities and ensured premium prices. These issues are going to be addressed by improving the market reach and product range.

CIKS plans to strength SOFA through increasing the numbers and area of cultivation under traditional organic paddy varieties, replicate similar programmes in other districts of the state with the establishment of community based institutional mechanisms. CIKS would continue to expand the in situ conservation of indigenous paddy varieties with suitable market linkages, standardise and expand its product range. CIKS also plans to share experiences with other NGOs and stakeholders working in other regions.

One of the important lessons learnt was that technical support needs to be translated into local and simple language for adoption by farmers for preparation of value added products. Even for standardizing simple value added products quality control is extremely important. In certain cases technologies are available but, methods to evolve quality control are not in place. More simple measures for seed storage to be planned within the community systems for sustainable practices. The farmers have gained new confidence as they learned Participatory Guarantee System (PGS) rules and laws regarding the organic farming.

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Putting people first – sustainable practices in conservation

The tribal communities of Kondhs, the Jodias and Parajas in the districts of Koraput (undivided) and Kalahandi were once self-reliant, and independent. Their forests provided them to some extent with security and safety nets even in the times of extreme droughts and famines, and they had over the years developed livelihood systems, food security and resilience through cultivation of a wide range of drought tolerant local varieties of cereals, minor millets, pulses, and oil seeds.

The communities supplemented food crops with non timber produce collected from the forests which included wild roots and tubers, fruits, firewood and fodder. However colonial laws restricted the use of forests by tribal communities; and post independence a series of ill-planned interventions, economic pressures depleted the productive resource base of the tribal communities, grabbed by outsiders, and finally the alienation of the tribal community from their traditional territories. The practice of shifting cultivation which was once a form of cultivation that harmonized with the ecosystems in its steady rhythm of cropping and fallow cycles further worsened the new situation. The tribes today are stretched into the poverty cycle due to the lack of access to resources and timely credit, which is leading them to be more vulnerable and insecure.

The objective of the project is to help to improve the tribal livelihood systems, strengthen rebuilding of degraded tribal ecosystems enabling the tribal communities and especially tribal women preserve their crop bio diversity, strengthening traditional practices for conservation and agriculture.

The Kondhs, the Jodias and Parajas tribal communities are also members of scheduled castes are the participants in the project, and most of them are small holders. They have been deprived from access to the development opportunities for years and are among the least benefited classes in the region. Around 3268 females and 3104 males are the direct participants in the project activities.

Small scale agriculture is the vital source of economic assistance to these tribal communities. Presently agriculture is based on traditional farming system with use of minimum inputs. The topography and land type creates problems of farm management. The agriculture is mostly rain fed. The water holding capacity of the soil is very poor which creates problem in crop production. Yield fluctuations are very high, mainly due to vagaries of weather, erratic and uncertain rainfall, the undulating topography, low moisture retention capacity of the soil etc. Major portion of rain water is lost through run off causing erosion. After rains, very little moisture is left in the soil to support plant growth and production. The soil is mostly red type and light texture. Major crops grown are paddy, different types of millets, niger (Oil Seeds), arhar and black gram (Pulse), maize and vegetables.

The farmers choose the type of crops suited to the land type, depending on their food habits and cropping seasons.

Kharif season: - (rain fed)

- **High land:** Ragi, maize, high land paddy (Local indigenous) like Matidhan, Paradhan, Bodidhan and millets like Finger Millet (Mandia), Fox tail millet (kangu), Pearl millet (koya), Sorghum (Khet Janha), Niger and some pulses like Blackgram, Arhar, Kating, Bailo, runner bean, Cowpea, Jhudanga etc.
- **Medium land:** Vegetables like Brinjal, Chilli, Soya bean, Beans, Ladies Finger, Guanar, Tomato, Onion, Garlic, Sweet Patato, Pumpkin, Ridge Gourd, Bottle Gourd, Bitter Gourd, Snake Gourd, Radish, Gajar, Greens HARbs, & Peas etc., Medium land paddy like Paikani, Kanchi, Tippadhan , Mazie etc
- **Low land:** Only paddy like Tulsibas, Mirlo, Sunapaikani, Laiseri.

Rabi season (With Irrigation)

- **Medium Land:** Local indigenous Paddy, Maize, wide ranges of winter vegetables, potatoes, mustard, black gram.
- **Low Land:** Paddy

The local farming system is different. Small millets seeds, maize of different durations are mixed together and sown during June and continue harvest from September till November. The other system followed for crop production is shifting cultivation, on the hill tops in which they grow millets, maize paddy and few oil seeds for 2 to 3 years and abandon the land.

Technical inputs through training programmes on agronomic practices like techniques on collection of seeds, sowing of seeds (broadcasting, line sowing, transplanting), preservation of seeds, weeding, manuring, , preparation of vermi compost, mixed cropping, preparation of organic pesticides like neem oil cake, bio inputs like trichoderma, and mixture of cow dung, urine & leaves , recycling of bio-wastes etc were provided by the government departments. Suitable resource persons from other agencies were hired for biodiversity mapping, collection and identification of local elite variety, preparation of biodiversity registers and promotion of market linkages. M S Swaminathan Foundation provided training on Biodiversity register preparation and maintenance. Horticulture department provided subsidized instruments like sprayer and seeds too. Soil Conservation department provided the technical knowhow for the organic farming.

The project had adopted participatory approach for conservation and support the livelihoods, as a first step participatory research was planned to record the rice genetic diversity in more than 50-80 rice varieties, and to see farmer's choices and perception on traits for the selection of the cultivars, ie. fodder, seed type, drought resistance, taste, harvesting ease, seed preservation and weeding etc. After the completion of the research work the results were compiled and communicated GEF/ UNDP SGP, CEE. Training programmes were conducted about the agro biodiversity conservation. Importance was also given on traditional resource use and conservation practices for Local elite variety, Indigenous methods of seed and grain preservation like type of storage material used, pre-storage treatment, duration of drying.

Crop husbandry is one of the key components of the training programme held during different seasons. Regular meetings were held with the women self help groups (SHGs) in the tribal villages at

Experiments of mixed cropping for yield improvement

The experiments were tried in different locations of the project areas with different local varieties in a mixed cropping system. The combinations are:

1. Early paddy and Pulse
2. Finger millet and Pulse
3. Maize and Pulse
4. Combination of different vegetables mixed with Pulse.

In the first combination, the increase in the yield of paddy and pulse was 30%. In the 2nd combination the increase of yield in finger millet and pulse was 25%. In the 3rd combination the increase in yield in Maize and pulse was 42% and in the last combination the increase in the yield of vegetable and pulse was 34% on an average.

different cropping seasons of different crops. They were also trained on improved crop technologies such as seed priming through participatory field demonstrations. Collection of seed samples and recordings were done.

Production of farm level vermin compost was introduced to large number of farmers. Biofertilisers such as Azotobactor and Rhizobium were used; Neem oil cake and bone meal were introduced. Interventions to the land development actions such as check dams, water structures and stone weirs were also covered in the project.

Home gardens in promoting the cultivation of vegetables e.g. bitter gourd, 2-3 varieties of beans, egg plants, okra and tomatoes was taken up during the off season, mixed cropping between nitrogen fixing legumes crops e.g. green gram, black gram, pigeon pea etc (Pulses) was introduced, to promote diversification. Moreover there was effort to share the learning of other communities

with regard to indigenous crops through Information, Education and Communication approach - such as booklets, pamphlets, leaflets, posters, video movies etc.

Seeds of different paddy, pulses, oil seeds, millets, vegetable varieties have been collected, preserved and their performances were recorded from field trials which have been taken up during the ensuing *Kharif* season.

The training on agrobiodiversity helped the farmers to clearly understand the benefits of conservation of different Biodiversities existing in agriculture and forest sectors in their areas. There are visible food security and livelihood generation in the project site with communities keeping these legumes crops and also selling excess in markets. The farmers applied the techniques that they were demonstrated in training programmes in their field and obtained more yield. 64 vermi compost tanks for all the 64 participant farmers of eight villages were made. Use of bio fertilizer and vermin compost helped to increase the yield by two folds. Previously they used to eat non edibles like Mango kernel, Tamarind seeds, wild root & tubers, mushrooms etc. inviting diseases or starving during the period of June, July, August and September. Now, due to the preservation techniques of grains and fruits, the food security is ensured. The increase in crop yield and food security has contributed to livelihood generation. Soil conservation has also resulted in crop from the earlier undulated terrain lands.

Introduction of cultivation of off season vegetable crops has been widely accepted by all the farmers which supported to meet the domestic needs, meet the nutritional requirement of the family members and add additional income to the households.

The sloppy and undulated lands have been bunded for taking up field trials to make small plots for conservation of soil and moisture and make them fit for cultivation of different crops, so that after harvest of the crops a second crop could also be taken in the residual moisture. Agricultural production was increased through adoption of improved techniques e.g. seed management, mulching, green manuring, bio pesticides resulting in increased fertility of soil through vermin compost, nitrogen fixation. The increase in crop productivity has been seen across 10-32%. Nearly 375 hectares of land area benefitted through these measures.

Previously the farmers were confined to only mono crop; in some places they kept the land fallow. Now they are accustomed to mixed cropping, intercropping and vegetable cultivation throughout the year. Previously, a period of four months from June to September was critical period for food shortage. But now after adoption of diversified cropping system and improved agricultural technology, they are regularly getting food all the year round.

Earlier no risk factor or challenges were perceived except weather abnormalities. Concern was about the drought or water logging conditions which could lead to the crop failure. In order to overcome now the farmers practice two cropping seasons.

Motivation of the tribal women is a difficult task and therefore it becomes difficult to bring the groups for a regular income generation process through which they could earn a regular income. Around 36 SHGs formed in 24 villages (867 women members) and have saved around Rs 9500/13,000 per month. A total savings of Rs 250,000 has been made in the project over three years. This has been linked with the banks for additional credit of Rs 100,000. To tackle this, trainings were provided by the well functioning SHGs to motivate and perform well. This lesson helped to adopt a systematic approach and more processes when new groups were formed in other villages.

In the future, collection and multiplication of the elite varieties will continue and seed banks will be developed managed by the village level institutions like Mahila mandals. Continue to promote mixed cropping system to guarantee the food and nutritional security of the tribal households and promote farm level agro-biodiversity. Value addition and marketing linkages will be further strengthened through introducing organic certification method.

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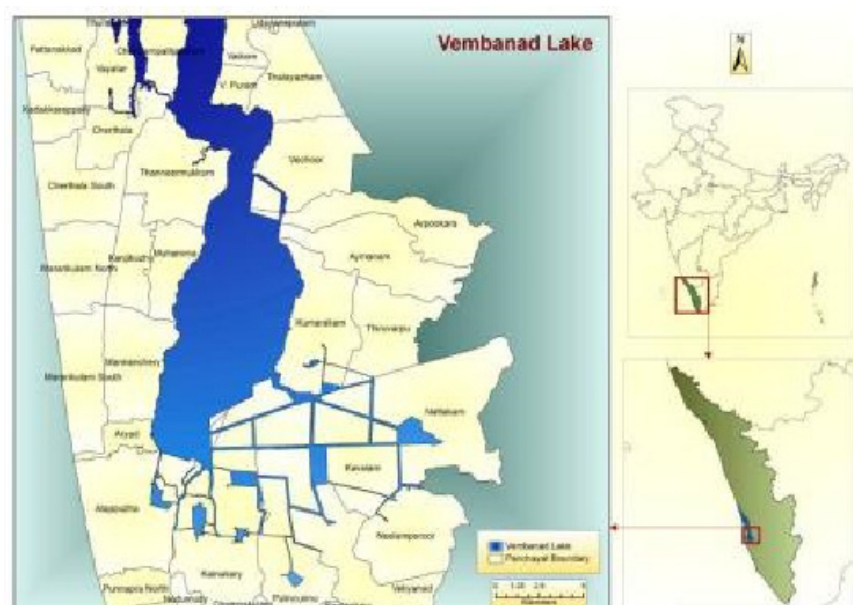
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Lake Protection Forum: A Bottom-up Approach for Conservation and Sustainable Use of the Heavily Used Vembanad Socio-Ecological System (Kerala)

Introduction

Coastal backwaters, estuaries and inland water bodies of the tropics are economically important and biodiversity rich systems, now fast declining due to lack of care, improper management, over exploitation and lack of awareness. The sustainability of such heavily used ecosystems lies in the active involvement of the dependent communities in its governance. This can be made possible only by institutionalizing community rights over protection and harvest of the natural resources. Unfortunately the conventional conservation paradigms hardly recognizes community rights, largely top-down in approaches and has proven to be ill suited to the current day conservation needs especially for the heavily used ecosystems in the tropics. Even the much celebrated participatory/joint conservation efforts are not different. To ensure the participation of the communities in conservation, it is necessary to cultivate the ownership through strengthening capacities and empowering them in resource management. Grass root democratic institutions are suitable instruments to cultivate ownership and ensure equity participation of the stakeholders for the sustainable management of the natural resources. Lake Protection Forum (LPF) is an attempt to capacitate, engage and cultivate ownership in local communities and ensure equity participation for the adaptive management of the heavily used Vembanad Socio Ecological System (SES) in Kerala.

Vembanad SES is a unique backwater based system lies on the south west coast of India, consisting of southern half of Vembanad Lake and the villages around. Major portion of this wetland system lies in the Ambalappuzha, Chertala and Kuttanad Taluks of Alappuzha district and Kottayam and Vaikom Taluks of Kottayam district in Kerala.



Location map of Vembanad SES

The veritable presence of numerous canals and streams along with the legendary back waters and the never-ending panorama of lush green paddy fields and towering coconut trees make it a delightful destination for tourism. The shimmering waters of Vembanad Lake make it the most exotic backwater destination in Kerala. Around 1.5 million people directly or indirectly depend on this SES for their livelihood. Being an Important Bird Area and considering its other biodiversity support functions, Vembanad lake, along with the adjoining Kol has been designated as a Ramsar site, a wetland of global importance.

Vembanad livelihood resources and crisis

Around 75000 families are directly dependent on the fishery resources of the Vembanad and the fisher-folk are the primary stakeholders of SES. The mixing up of fresh water drained to it by four rivers and influx of saline waters during the high tide makes the lake a favourable environment for both marine and freshwater fishes. Early studies have reported 150 species of fishes from the southern side of the Vembanad Lake. But the recent Vembanad Fish Count (2008-2013) - the annual participatory fishery monitoring program being conducted by ATREE and LPF in association with leading academic institutions could record only 67 species of fin fishes and 14 species of shell fishes from this part of the lake. The annual landing of fish has been reduced from about 16,000 tonnes a year in the late seventies to about 7,200 tonnes in 2001.

Vembanad SES is highly stressed due to growing anthropogenic pressures. All the major livelihood activities of Alappuzha are water-based and depend largely on the Lake. Reclamations for agricultural purposes and human settlements have resulted to the horizontal shrinkage of the backwaters. It is estimated that almost two-thirds of total area of Vembanad Lake has been reclaimed or converted for agriculture and other purposes in the last two centuries. Most part of Kuttanad region, popularly called as the 'rice bowl of Kerala', which surrounds the Vembanad Lake is such reclaimed area where now paddy is being cultivated below mean sea level. Still the farmers have to restrict to single crop, as for the rest of the period the paddy fields are submerged under brackish water. To meet the ever increasing demand for rice, a barrier was constructed at Thanneermukkom in 1975 (Fig. 2), to prevent the salt water intrusion and to increase the paddy cultivation in these low lying fields. The barrier remains closed for most of the summer and stops the tidal effects and flow of water from the saline north to the south of the barrier. The stoppage of regular flushing causes the accumulation of agro-chemical effluents from the surrounding farmlands and the sewage from nearby towns into the lake and converting it to a pollution sink. This caused heavy eutrophication and the lake has been infested with the invasive water hyacinth blocking the labyrinthine waterways and networks of canal systems. The menace has now spread over almost the entire shoreline stretch of the

Vembanad Lake, forming a green carpet obstructing the movement of fishery vessels and houseboats. Reduced flow also lead to siltation; thereby reducing the depth and water carrying capacity of the lake. The construction of the barrier is now recognised as an ecological disaster which has caused the decline of ecological health of the lake, adversely



Thannermukkom - Salt water barrier

affecting the fishery resources and increasing the conflicts between fishermen and farmers.

Just before the turn of this millennium Vembanad became the hotspot of backwater tourism. Even though the growth rate of this industry is exponential, it has opened up a new arena of livelihood opportunities, unregulated proliferation of motorised houseboats and uncontrolled discharges from the resorts, placed tourism industry on top of the list of polluters. The pollution from diesel engines and outboard motors of the tourist boats are posing serious threats to this fragile ecosystem. The banks of the lake, although privately owned, were open for the community for livelihood activities such as fish-landing, extracting meat and sorting of collected clams and domestic purposes such as bathing, washing etc. There was a buffer of riparian and mangrove vegetation around the lake providing shelter and breeding ground for the fishes. The tourist resorts which came up on the banks of the lake cordoned off the lake from the community, taking away their traditional rights and clearing the buffer vegetation. Thus, the lake once the means of all their requirements turned to a matter of constant worry for the fisher-folk.

Conservation efforts

Concerned by the deteriorating ecological health and the livelihood challenges faced by the community, a collective of fisher-folk and local people decided to carry out some useful activities to protect and conserve the lake's natural resources and the livelihood of the fisher folk. Meantime, in 2006, Ashoka Trust for Research in Ecology and the Environment (ATREE) also has started its Vembanad Wetland Conservation Programme and established 'Community Environmental Resource Centre (CERC)' at Alappuzha for capacitating and engaging the local communities for the conservation of the lake. CERC helped the fisher community to revive *Ayilyam-Makom*, a traditional ritual with

conservation significance which brought community closer to CERC. Subsequent dialogues lead to the formation of the first Lake Protection Forum (LPF) in Srayithode (Muhamma, Alappuzha). Setting up of *matsyathavalam* (fish sanctuary) on an experimental basis and conservation activities shot this LPF to media limelight. Delighted by the success of the first LPF, more and more village collectives came forward and 13 such LPFs are now registered around the Vembanad Lake. Each LPF consists of 50 members of the local community, of which almost 40% are women.

Lake protection forums are now emerging as well organised grass root democratic institutions of the primary stakeholders committed for the conservation and sustainable management of the Vembanad SES. These are registered under Travancore-Cochin Literary, Scientific and Charitable Societies Registration Act, 1955. All LPFs are federated under the *Samyutka Vembanad Kayal Samrakshana Samithy* (Federation of Vembanad Lake Protection Forums), an apex body to which all LPFs are members with equal stakes. The executive committee of the Federation consists of two representatives from each of the 13 Lake Protection Forums. The Federation provides leadership and guidance and coordinates the activities of the LPFs. Federation also helps in planning and raising necessary supports for the activities of the LPFs and liaisons and negotiates with the government and other institutions.

Today, the LPFs and the Federation are actively engaged in various activities to sustain and improve the fishery resources and ecological health of the lake. Their major contributions include setting up of “*Matsyathavalam*” (fish sanctuary) and awareness building activities like promotion of ethical fishing practices and conservation actions like *Mandala* plastic cleaning campaign, participatory water quality monitoring and celebration of important days in conservation such as World Wetlands Day, World Environment Day etc.

Revival of a traditional ritual for conservation

One of the earlier activities of CERC was the revival of “*Ayilyam-Makom*” a traditional ritual with conservation significance. *Ayilyam-Makom* in the Malayalam month of Thulam (October-November), coincides with heavy showers and thunderstorms (North-east monsoon) and is the breeding time for many fishes in the Vembanad Lake. The ritual includes getting ‘seeds’ dedicated from two ancient temples Thrikunnapuzha and Mannarashala of the region and festively sprinkling those on the lake, and observing two harvest holidays following it. Observation of such rituals and practices attach them more to the nature which in turn promotes biodiversity conservation. It also promotes cohesiveness among the fishermen as they observe such rituals in a team with joint spirit. The feeling of responsibility to protect this public property resource springs from their understanding that the well-being of this lake is the source of their livelihood and existence.

Matsyathavalam (Fish Sanctuary)

One of the flagship programme of LPF is the establishment of small fish sanctuaries- locally called *Matsyathavalams* (or fish shelters) in the lake, (Fig 3). Traditionally paddal fishing/bush-bark fishing was used for fishing in Vembanad Lake. The bundles of foliage submerged, paddals as they are locally called provide ideal habitat for the fishes to feed and breed. The fishes are attracted to these paddals and the fishermen encircle the paddals and catch the entire fishes in the area. Since this method was removing brooders in large numbers, this method of fishing was legally banned by the Kerala government. The fisher-folk suggested that, if the paddals are kept in a safe area the fish production in the lake would increase, as it will provide an ideal habitat for the fishes to breed and the young ones to hide from predators. A modification of this paddal system was adopted for constructing *Matsyathavalams*, where the paddals were fixed to the lake bed and a bamboo fencing was provided to prevent other fishermen from entering into it, and the community declared it as sanctuaries and the area around it as 'non- fishing zones' (Fig 4). The fisher folk avoid fishing in these areas, spread the message among others and the LPF members keep a vigil to prevent fishing within the non-fishing zones. An independent evaluation of the efficiency of the sanctuary conducted by a group of fishery experts found healthy reproductive populations and large shoals of fish larvae in the sanctuaries compared to other similar locations in the lake. The larger presence of top predators like otters and cormorants in the sanctuary zones obviously indicate the richness of fishes. The native fisherman near the sanctuary has also the opinioned that the concentration of juvenile fishes in the region has increased after the implementation of the sanctuary. The experts opined that this conservation intervention based on the traditional ecological knowledge is helping in sustaining the lake ecology, its biodiversity and contributing to the sustenance of livelihood of local fisher folk.



Fish sanctuary at Vembanad Lake



Sign board stating Fish Sanctuary a "non fishing zone"

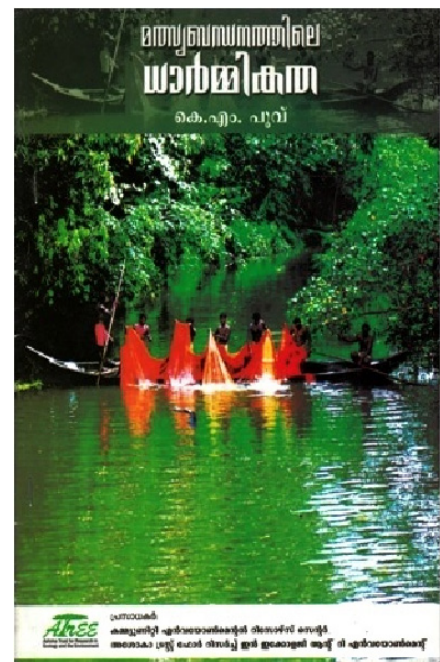
Other Campaigns and activities

The LPFs have been involved in carrying out several other activities and awareness campaigns for building up the conservation awareness of the stakeholders. To meet the increasing livelihood expenses and scarcity of the fishery resources has lead the fisherman venture into many unethical or destructive methods of fishing. In this context, a booklet “*mandala* ” (Fig. 5) which talks about the ethicalities to be followed in fishery, written by K.M. Poove, a community representative was published and distributed among all the fishermen around Vembanad Lake.

To solve the problem of plastic that flows down through the river Pampa into Vembanad after every pilgrim season at Sabarimala and also those flushed from the houseboats, the LPFs, with technical support from ATREE-CERC and the Vembanad Nature Club embarked upon a plastic cleaning programme of the Vembanad Lake during the last two *mandala* period, the time of the year revered as sacred by the community. The *mandala* plastic cleaning is carried out during this 41 days from mid- November to December end, when the fishermen and clam collectors collect plastics which are tangled onto their nets and those from the lake beds during their working hours. In the years 2011 and 2012, 45 and 70 sacks of plastic were collected respectively. While the governments and even scientists are groping in the dark about what to do with the loads of plastic waste generated, the LPF found their own answer to the problem. The plastic collected during *mandala* period was used to build strong foundations for the village roads.

Every year World Wetland Day is celebrated in Vembanad by the local community, fisher-folk and farmers. Different activities and campaigns are carried out on February 2nd which includes friendly competitions to plastic cleaning campaigns, rallies and processions to build awareness on conservation of the wetlands. The details of each year’s activities can be found at (http://www.ramsar.org/cda/en/ramsar-activities-wwds/main/ramsar/1-63-78_4000_0__).

Vembanad Water Watch Partnership Program or *Jaladarpanam* is a participatory water quality monitoring programme conducted by the local community. The major activities of *Jaladarpanam* include educating and training volunteers from the community on water quality and importance of monitoring; basin stations for water quality monitoring at



Malsyabendanthinte Dharmikatha- Booklet on ethical fishing by KM Poovu

identified points are set up to determine water quality at regular intervals and they maintain a publicly accessible comprehensive database on water quality. Eight Basin stations have been already set up near the lake. The parameters measured are: salinity, pH, temperature, dissolved oxygen and total dissolved solids. The results of water quality has been displayed on public hoardings in all the basins as well as published in India Biodiversity Portal (www.indiabiodiversity.org) for public discussion and awareness. The community, now empowered with data could effectively liaison with the authorities to operate the barrage on time, which is crucial for the fishery wealth and diversity. The programme, which has helped in building public awareness on lake pollution, plays a major role in monitoring the health of Vembanad Lake and helps the local communities to identify and intervene in pollution related issues.

LPFs are evolving as the grass root democratic conservation institutions, playing significant roles in the conservation and sustainable management of Vembanad Lake. The federation is making several efforts to resolve the conflicts between fishermen and farmers. The dialogues resulted in the formation of a joint forum of fishermen and farmers which provides a common platform to cooperate, discuss and find mutually acceptable means to solve the issues.

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Conservation of Traditional Rice Varieties and scaling up for livelihood security in the Bastar region of Central India

Background

Chhattisgarh is traditionally known as the Rice Bowl of India. Over 20,000 rice varieties have been recorded in the region. These are a result of centuries of rice farming by tribal (indigenous) communities through selection and adaptation to a variety of soil, water and micro-ecosystems conditions including predators. Today these varieties are being lost with market forces promoting high-yielding varieties and rampant use of chemical fertilizer and pesticide-based agriculture that focuses only on yields with no to limited analysis of the cost of production and returns to the farmers. Therefore there has been tremendous loss of traditional knowledge and traditional agro-ecosystems and production practices. The project is based in the central parts of India in the state of Chhattisgarh in the ten tribal villages of Kondagaon district in Bastar region. The region is located on the altitude of 593 meters above sea level with 90 percent tribal population. The region is mostly rain fed, thus agriculture is dependent for four to six months in rainy season.

Bastar region of Chhattisgarh is rich in biodiversity and local traditional practices of food security. Need of the hour is to conserve and scale by practices and skills in conserving biodiversity using traditional as well as scientific techniques. Greater need was felt for the conservation and propagation of rice varieties of the region through farmer's knowledge base. This would not only help in conserving the bio diversity but would also help in solving the problem of food security. Organic agriculture methods are followed in the areas but the crop yields were low and did not meet the food requirements for the whole year. The ideas developed through the Global Environment Facility/ United Nations Development Programme/Small Grants Programme (GEF UNDP/SGP) India supported project with the local farmer's community based organization (CBO) Dharorher to enable and help farmers in retaining their organic agriculture techniques and having a mix of Systems of Rice Intensification (SRI) techniques to maximize yields and sustainable livelihoods. Links established with Agricultural Department of the state and the Agricultural University. A mix of local and high yielding genotypes of seeds were selected by farmers based on several traits as colour, size, taste, duration, yield, type, religious ethics, and also easy harvesting and grain formation etc from the gene pool gathered at the seed banks. Rice is grown predominantly during *kharif* season as rain fed crop having 2.39 lakh hectare area but the productivity of this crop is very low 08.53 qt/ha, only 1.2% of the land is irrigated.

Bastar, the land of tribes, where about 70% of the total population comprises of the tribes contributes 26.76% of the total tribal population to Chhattisgarh. The major tribes of the *Bastar region are the Gond, Abhuj Maria, Bhatra, Halbaa, Dhurvaa, Muria and Bison Horn Maria*. Gonds are also the largest tribal group of central India in terms of population. Each tribal group in Bastar has their own distinct culture and enjoys their own unique traditional living styles. Forests play an important role in the lives of the people, providing food security and livelihood through the collection of non timber forest produce, and employment.

Project objectives

The objective of the project was to create and enhance local capacity of the community for the environmentally sound and sustained agricultural practices for the conservation and use of 250 local indigenous varieties of rice in Bastar region; promote use of more farmer friendly local tools as formation of seed banks, dissemination of traditional knowledge, and promotion of SRI method in rice cultivation.

Key activities

Besides the 600 tribal families from 10 villages (Golavant, Kanga, Komar, Kharpadi, Kungarpal, Mundagaon, Jhada, Pushpal, Hadwal, Tolank) of Kondagaon Tehsil involved in the field implementation; agricultural and watershed department of Chattisgarh involved in the selection of genotypes and facilitating knowledge on water harvesting methods at



the local levels; State Agricultural University linking on the fodder and related rice variety seeds; and local banks involved in linking the women self help groups with timely credit facilities by bringing the banking at their doorstep. The process approach adopted has built confidence both in the communities and the CBO Dharohar.

Strategy

Dharohar Samiti the community based organization provided a platform for farmers to discuss issues related to degradation of environment and loss of more than 200 traditional rice and minor millet varieties eg. Kodo (rice grass), kutki and ragi (finger millet) which have been developed over centuries. Through village level assemblies of tribal farmers, the skills and techniques of preparation and use of herbal pesticides, vermin composting were provided and integrated into traditional farming practices. Dharohar also made and strengthened the local linkages with govt. department and other resource organizations.

Development of the seed banks at village level was the first step, under which farmer's groups known as Kisan Dharohar Sangvari (KDS) were formed from each village and different types of seeds were distributed amongst them as per their selection processes. Initially 50 farmers from 5 villages were selected and were encouraged to develop the demonstration farming in one acre each of farmland. Exposure visits to farms located at other states like Kerala, Bilaspur district of Chhattisgarh, and farms applying best practiced were done at different stages of crop development. Modern sustainable agricultural techniques in adopting the SRI method were discussed in collaborative effort with scientists from Krishi Vigyan Kendra, Jagdalpur, Bastar on the farmer's fields. Periodic meetings and village level workshops seminars were arranged for experience sharing among the farmers about the results of activities performed. Several awareness tools and methodologies developed with street plays, banners and posters to propagate the use and benefits from the SRI methods. Farmer's experimentation of the SRI technique in their own farms has created a sense of greater ownership among them.

The community has started bio-diversity documentation through developing people's bio-diversity registers in five project villages. With focus on non-cultivated food resources, it has documented 47 sources including pot-herb species, tubers, flowers and mushrooms. As many as eight types of mushrooms were recorded from the area. Efforts are on to document traditional knowledge with appropriate protection measures to conserve the species and sustainable use in the future.



Formation of local institution such as Self Help Groups (SHGs) also played an important role in systemizing the project. 20 men and 5 women SHGs were formed. The activities, thought and knowledge of rice cultivation practices was promoted through 25 SHGs comprising of 250 members. The SHGs also discussed the issues related to farming among themselves in monthly meetings. This lead to healthy decision making towards the adaptation and application of SRI methodology. With total savings of Rs 62,500 the people are moving toward self dependent to supplement their livelihoods with more inputs.

Results

Village level and farm level seed banks were developed in five villages in the district to stock traditional rice varieties. The propagation and promotion of the organic practices and indigenous rice varieties was done through distribution of seeds. Nearly 263 varieties of rice were preserved and conserved in seed banks. Characteristic difference of 49 varieties of rice was analyzed by the scientists and was documented.

39 new rice varieties from remote villages of Bastar have been identified and added to existing collection in last two years. Taking technical support from rice scientist Jacob Nellithana from Jan Swasthya Sahayog, Bilaspur the CBO has started scientific characterization of 49 varieties so that the lines are recognized legally and deposited in the National Gene Bank of National Bureau of Plant Genetic and Resources (NBPG&R).

Dharohar sows their rice varieties every year on a 2.5 acre farm in Golawand village and keeps the genetic evolution process on-going. 200 more farmers have adapted the SRI and other improved methods of cultivation which forecasts the protection of indigenous rice varieties.

In addition to collection, documentation and in-situ conservation of rice varieties, Dharohar is also involved in distributing the seeds to the farmers in Kondagaon and Narayanpur blocks promoting exchange of seeds.

SRI use and practice has been much appreciated by locals as it is low cost, low input base, easy to understand by the local tribal farmer. More than 145 marginalized farmers learnt about the SRI technique. The project trials in the farmers fields have shown that the yields from the traditional varieties like *Basabhog* and *Asamchudi* reaches up to seven to eight tons per hectare through SRI, which is as equally good as any High Yielding Variety cultivated in the region. The project has shown that the System of Rice Intensification is an organic farming technique that requires only about 1/10th seed and less water compared to the traditional method of cultivation through flood

irrigation. Now SRI method is adopted in 16 villages of the region and led to better yields by 10-20 %. Attention paid to soil health balance helps in profuse production tillers and increase in yield.

System of Rice Intensification (SRI)

SRI is a combination of several practices which include changes in nursery management, time of transplanting, water and weed management. It is a different way of cultivating rice crop though the fundamental practices remain more or less same like in the conventional method. SRI is not a fixed package of technical specifications, but a system of production with four main components, viz., soil fertility management, planting method, weed control and water (irrigation) management.

The information regarding 18 forest medicinal plants, 10 varieties of wild mushrooms, 41 varieties of vegetables and 10 different varieties of wild tubers was documented. Today this has spread to nearly 16 villages with more than 670 farmers.

The use of paddy weeders the project supported is helping to reduce drudgery and time for women labour. Shri Bhakturam Kashyap, a tribal farmer, wood artist and a passionate folk lyricist from Golawand village developed a prototype local weeder using discarded cycle rims, which farmers

are finding useful and less cumbersome. Such small innovations have been the hallmark of the project.

The intensive work on Rice Conservation done by Dharohar Samiti was awarded by Plant Genome Savior Community Award during its 5th facilitation in 2013 by Protection of Plant Varieties & Farmers' Rights Authority in collaboration with the Department of Agriculture and Cooperation, Ministry of Agriculture. The award recognizes dedicated and untiring efforts in the field of conservation, management and improvement of plant genetic resources, particularly in areas identified as agro-biodiversity hotspots.

Challenges

One of the major challenges has been for the NGO to work in the Naxalite prone areas, involving the locals in planning and execution of activities, for the communities wanted more subsidy and free inputs in steering agricultural productivity. In fact the NGO and Shivnath, Secretary, Dharohar Samiti has been seen by the communities as a trust building person between different stakeholders and effectively bridging the various infrastructural and extension gaps in the region through seed bank. Being rain fed area; irregular rains have affected the implementation of the SRI techniques and the productivity, leading to crop losses and increased labour costs.

In the farming season, most of the farmers were unable to attend the meetings; therefore meetings were normally held in the night. Contacts were made with the scientists to test the characteristics difference between the different varieties of seeds but due to naxalite problems in the area, the study had to be relied upon on the basis of verbal information from the local farmers with the technical support.

Another challenge has been building mutual trust and respect for the access to local knowledge from the traditional healers from the tribal's, as they have rarely disclosed the formulations of various medicinal plants in the absence of systems to share benefits between the producers and farmers. There were also communication problem with the tribal community as they had their own dialects, mainly understood by the locals.

Lessons Learned

SRI techniques/ modern methods of agriculture can only be extended and adopted at the grass root levels if farmer's participation and involvement in decision making kept centrally. All are encouraged to learn through a more process approach than a target driven fund spending. Also the approach adopted needs to be gender sensitive, respects local knowledge, and needs to be flexible through the training and exposure programs.

NGO in collaboration with the farmers was able to conserve more than 250 varieties of rice. It was possible to generate results from local community through people's participation and their exposure and training at the grass root level. Forest officials and agriculturists were able to understand the genetic diversity and the characteristics through community knowledge and practices for better health and resilience. They were keen on growing rare varieties of the rice which had various characteristic and health benefits.

Networking partners

Jan Swastha Sangthan, Bilaspur | Indira Gandhi Krishi Vishwavidyalaya, Raipur | Mardapal Gramin Bank, Bastar | Krishi Vigyan Kendra, Jagdalpur, Bastar | Local banks and women self help groups (SHGs)

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Transforming lives and landscapes: Water as a source Conservation and management of Fresh Water Biodiversity in the lake district of Maharashtra

Freshwater biodiversity of the tanks is highly threatened worldwide due to false practices of management, overfishing, and unauthorized access to land for cultivation. The production of herbivores fishes has been introduced in the tanks in India for the last 25 years but no attention has been paid towards the vegetation of tanks. Spread of notorious weeds in tanks has badly affected the diversity of vegetation and water spread area of the tanks. The degradation of ponds and tanks resulted in the decrease of fresh water fish production.

The overall objective GEF UNDP/SGP, CEE project was to develop a community involved plan for the conservation of fresh water biodiversity and capacity building of local communities to improve livelihoods through water resource based and related enterprises and actions. The activities were carried out in four villages around Nawegaon Bandh Tank located in Gondia district of Maharashtra, India.

Gondia is a rice producing district in the state of Maharashtra. Apart from paddy, the main crop, other crops produced in the area include wheat, millets, barley, linseed, black gram etc. The district is also known as Lake District of Maharashtra due to the presence of numerous traditional tanks. The ecology developed around these water bodies also provides livelihood support to the communities residing in the area. Fishery is second major support provided by these tanks to the community, extraction of scented grass, cultivation of water nuts, fodder for livestock are the other traditional uses of these tanks.

The project involved Dhiwar, a nomadic tribe which is a traditional fishermen community depending on the fishery resources of the fresh water tanks and rivers in the region. Other project participants included landless from the Gond, scheduled tribe Gowari, other backward community and, Baudha, a scheduled community (SC). The other stakeholder groups involved were Gram Panchayat, Fishery Science College, Nagpur, Bombay Natural History Society (BNHS); Rural banks, Forest Department, Fishery Department, District Rural Development Agency (DRDA) and the Irrigation Department of Maharashtra.

The project activities were implemented at the village level through local institutions developed, the activities were identified through participatory exercise and to carry out the activities village level micro plans were developed in consultation with the communities. Around 16 SHGs were started initially, involving 290 women and men members of the local communities to support the

implementation of the activities.

The protection of indigenous fish species like “Dadak” (*Channa stiratus*), “Wagur” (*Clarius batrachus*) through improvement of habitat in water bodies was undertaken in four water bodies. Along with it, the smaller indigenous species- “Karwali” (*Puntius sophore*), “Botri” (*Channa gachua*), “Gani” (*Rasbora daniconius*), “Jalya Katwa” (*Mystus cavasius*), “Shingi Katwa” (*Mystus*



montanus), “Rengdya Katwa” (*Mystus bleekeri*), “Poshti” (*Puntius sarana sarana*), “Chachya” (*Ompok bimaculatus*) were also protected in the tanks. The emphasis was that these species will get benefit of the habitat development in tank and ensure biodiversity conservation. Five SHGs of men from fishing community were formed. Tanks were taken on lease by them, and activities of ploughing tank bed, collection of aquatic plant species from nearby tanks, plantation in the selected tank, release of indigenous fish species were undertaken by the group members. It was a village tradition, of catching fish on the occasion of family functions. Though the group has taken tank on lease, the villagers were allowed to catch five kg small species of fish, for their family functions, under the observation of group members. This approach has helped to get the support of all villagers to the activity of SHG in tank, as no one allows the villagers to take fish, after they get the tank on lease. All the activities were planned by the community members, as no one in the formal system has knowledge about the aquatic diversity conservation. The practical knowledge of the fisherman community was the base of all the conservation activities.

The groups of four persons, among SHG members were created to guard the tank at night. The four member groups formed protected tanks in turn. All the conservation and protection measures were evolved by the community members on the basis of their local experience. Half of the labour wages of fishing activity was paid to the person and half was deposited in the SHG account. 20% of this amount was kept as working capital and remaining was distributed among members as loan for their personal needs. Fish is sold in the village, and if remains in the local market in nearby village

at two km. After completion of project period this activity is going on at two places. The activities at other two places are stopped due to governance issues of water bodies. To solve the problem at village level and again starting the activity in those tanks, Bio Diversity Management Committee has been formed at village and Gram Panchayat level.



Desiltation of four tanks and repair of gates has been done through Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA). The following plant species *Schenoplectus articulatus*, *Hydrilla verticillata*, *Nymphoides indica*, *Vallisneria spiralis* were selected for plantation in the water bodies. These aquatic plants are important from the

fishery point of view, the indigenous as well as high yield fish species introduced, use these plants to nibble and for nesting and hiding place. It was observed by local people and birdwatchers that the availability of aquatic vegetation is directly related to the existence of water birds in the tanks. No water birds were found in the tanks, earlier when there was no vegetation. After the vegetation protection activity, Indian Moorhen and Cotton Teal had come back to these tanks.

Training on sustainable harvesting practices and marketing for Lotus has been done with the help of SHGs. Two workshops on MNREGA have been conducted in order to strengthen livelihood activities and natural resource management the villages. With the approval of the village panchayat, desiltation of the tanks were started and people got about 10 lakh rupees in two years as wage.



Several workshops were organized by the NGO with the partners and communities. One on Forest Rights Act, was organized to create awareness and also to facilitate the village level processes like forming local groups, developing institutional mechanism etc. During the training, different clauses of community rights were discussed in detail. Members from a village who already got the community rights as per the act were brought and shared their experiences in the workshop. Another workshop on Food security was organized by the Food Security Campaign of Vidarbha. Issues related to food security of the communities depending on the tanks were discussed and how the restoration of these water bodies could supplement the community's need for food and nutritional security.

The general perception about the people of Dhiwar community is that they are unorganized and engage in unsustainable methods of resource management. Convincing, motivating the community members and getting the support took some time and delayed of some of the planned activities. The other challenge faced was breeding of *Channa striatus* and other local fishes which is closely associated with cycle of rain which was disturbed through irregular rainfall in the region.

The project was executed in close association with the Fishery Science College of Nagpur. During discussions the community expressed the need to promote artificial breeding of the "Wagur",

according to local perception it is the threatened fish species and has high economic and nutritional value. After the project period, a training of a group of 10 traditional fishermen was organized at the hatchery of Fishery Science College at Nagpur. The technique of artificial breeding of the Wagur was imparted to this group and they in turn trained the other



fishermen in the village under the guidance of experts from Fishery Science College.

The project has resulted in self confidence and change in the attitude of the communities, now planning for the replication of results with the support of the related departments such as fisheries, rural development and the local panchayats. It is decided to take the support of other NGOs in the region to replicate the results. People's informal network of relations with other villages

can be used for spreading the idea and create awareness among the people in the neighboring villages. From the learnings the NGO already initiated the process of preparation of Master plan for management and development of water resources in Wainganga river basin with the support of Gomukh Environmental Trust, Pune to submit it to Water Resource Department, Govt. of Maharashtra. The master plan includes a separate chapter to address the management of fishery resources and biodiversity in the traditional tanks located in the region.

The project achieved the following major results

14 local fish varieties have been conserved in the water bodies of five villages through de-siltation, preparation of tank beds and plantation of aquatic plants and guarding the waster weir-

Sl.No	Local Name of Fish	Scientific Name
1	Dadak	<i>Channa striatus</i>
2	Wagur	<i>Clarius batracus</i>
3	Karwali	<i>Puntius sophore</i>
4	Poshti	<i>Puntius sarana sarana</i>
5	Bilona	<i>Channa orientalis</i>
6	Botri	<i>Channa gachua</i>
7	Tepri	<i>Puntius ticto</i>
8	Waranja	<i>Ompok bimaculatus</i>
9	Jalya Katwa	<i>Mystus cavasius</i>
10	Shingi Katwa	<i>Mystus montanus</i>
11	Pershi	<i>Salmophasia horai</i>
12	Dukkar	<i>Nandus nandus</i>
13	Chachya	<i>Xenetodon cancila</i>
14	Chandani	<i>Parambasis ranga</i>

Prior to the project intervention, the selected water bodies had average production of 40 kg, as no one was paying attention towards production. During the project period five SHGs of fishermen were formed and they have taken the tanks on lease and started intervention in terms of plantation of aquatic plants, guarding the waste weirs, releasing the indigenous fish species in the tank and protecting the tank during night, increased the fish production from 40 kg per hectare to 400 kg per hectare in four water bodies.

It was traditional practice of harvesting lotus roots in the villages around Nawegaon Bandh. Earlier the villagers used to harvest and sell it to trader and they get the wages only. Three SHGs of the villagers were formed and working capital was provided to them. Market study tour of the SHG

members was organized to the wholesale market places in Chattisgarh. The SHGs framed the rules for harvesting the lotus roots, which will ensure sustainable harvesting and then marketed it on their own. This has raised the income by 60% for 170 families which was achieved after adoption of sustainable harvesting practices and transport mechanism with the help of SHGs.

A document is prepared on local aquatic biodiversity which provides the details of 53 species of aquatic plants found in the area and the present conditions; local names, its uses and ecological role in the aquatic diversity, conditions in which these plants can be planted and process of plantation in local language. The document is shared with government departments and other stakeholders.

The learnings of project were presented before the Study Group, formed by Government of Maharashtra for rejuvenation of traditional tanks in Eastern Vidarbha. The Study Group has included the suggestions from NGO and community's experiences regarding designs of waste weir of the tank (Earlier the waste weir had slope to release the excess water from tank, this helped the fish in reverse migration, later the design of waste weir was changed by the Irrigation department, a straight wall was constructed in the way, which resulted in decrease of natural stocking and fish diversity of the tank) and de-siltation activity, in their final report to Govt. of Maharashtra.

The major lesson learned is that MNREGA can also be used as a resource for provision of funds for biodiversity restoration activities and support the livelihoods of the poor households in the villages.

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Investing in Future

Rediscovering endangered Lesser Florican by involving Phase Pardhi, a traditional hunting community

Grasslands are one of the neglected ecosystems from conservation point of view in India. Flagship species of this ecosystem are Great Indian Bustard and Lesser Florican, which are rapidly declining. In the state of Maharashtra there are no records of nesting of Lesser Florican in almost last 100 years. Phase Pardhi, is a predominant tribal community which resides in the region and neglected from developmental interventions. Their knowledge about local biodiversity was not recognized in conservation planning. The community has been marginalized and did not have access to credit, education, and technology and have fallen soft targets for wildlife related crimes. The project is based in 10 Pardhi tribal villages of Akola and Washim Districts of the state of Maharashtra in Deccan Plateau and Western Plateau of the eco-zone of India. The climate is tropical in nature both Akola and Washim districts. The grasslands in these area are having species like Lesser florican (*Sypheotides indicus*), blackbuck (*Antelope cervicapra*) *Ischaemum pilosum* (Kunda Grass) *Sehima nervosum* (Pavnya Grass) etc. which provide a congenial habitat for the Lesser florican. These two districts are mainly the regions which are largely covered by thorny scrub forests and grasslands. Three rivers viz., Katepurna, Morna and Maan are flowing and the water level is full during the rainy season.

In this background, this project was developed by SAMVEDNA, the local NGO with CEE and advocated for the use of traditional knowledge for grassland biodiversity conservation planning and facilitate alternate livelihoods to the tribe using their traditional skills and resources. The project was jointly developed with Maharashtra Forest Department, Global Environmental Facility (GEF), Small Grant Programme, and it was felt that a contiguous focus in terms area covered should be maintained to derive maximum benefits in conservation. An area of 800 sq kms was considered for conservation practices around 10 Pardhi tribal villages of Akola and Washim Districts of the state of Maharashtra.

The objective of the project was designed to create a model for conserving grassland biodiversity linking with livelihoods with an active participation of the **Phase Pardhi**, a traditional foraging tribal community, encouraged the *in-situ* conservation of grassland biodiversity especially Lesser Florican (*Sypheotides Indica*), an endemic species and find ways to scale up the operations in appropriate ecosystem. Around 200 tribal households, and nearly 400 other households involved in planning of sustainable actions for biodiversity and livelihoods. Forest and Rural development

departments of the Maharashtra State, banks, local photographers, Bombay Natural History Society and International Bird Conservation Network (IBCN) are the other stakeholders supported the project.

It adopted participatory, gender sensitive approach, village level meetings organized helped to actively collaborate with the Forest department and identify the livelihood needs of the tribal households. Two Forest Protection Committees were formed and MoUs were signed. The community was mobilized and organised in to women self help groups (SHGs). Seventeen SHGs were formed; these groups were with around 15 to 20 members, based on common trade, area, kinship relations and defining similar needs. Exposure visits and special trainings were organised for youths and women of the tribal and other communities on conservation based activities, and also to promote livelihoods activities to support grass land conservation.

Both male and female village communicators (VCs) were selected from the local communities who were socially committed; culturally sensitive and empathetic in interpersonal interactions and trained in forming local groups; fostering confidence and self reliance and providing the technical skills to people at large. Protection of Lesser



Floricorn in 800 sq kms area around 10 villages was agreed by the entire community as an ideal habitat for conserving the bird species; hunting of the bird was banned. While developing conservation plans using village maps, the traditional knowledge was taken in to consideration. These VCs took the help of experienced and knowledgeable Phase Pardhi tribals in identification of foraging, mating, breeding sites of Lesser florican. Efforts were initiated to impart skills in the use of cameras and modern equipments by the VCs. Monitoring of sites by Phase paradhi led to develop awareness of local farmers and Phase paradhi, in particular for the protection of the bird nests and eggs.

Through Joint Forestry Management programme special training sessions were organised and exclusive methods were adopted to protect the nests and bird from other threats. Alternate livelihood activities like poultry, goat rearing were established for the Phase paradhi community through

women self help groups (SHGs). Today 18 women SHGs exist with a savings of Rs 2,30,000 and with access to timely credit of Rs 9,00,000, which is regularly servicing the needs of credit access for the communities.

Local breeds of goat were introduced to the tribal families on a revolving fund based approach, the activity started with 50 household, every year nearly 10 to 15 families received support from the repayments made by others who received the goats in the previous years, now the total number has crossed more than 100 households. Similarly the poultry programme also expanding through adding more number of families from the payment made by the families borrowed loan already. The state government of Maharashtra has accepted the scaling up proposal through supporting the available government development schemes. Links were established through Panchyats for the local communities with The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) for employment. Nearly 300 tribals gained employment for land levelling, construction of stone and loose earthen bunds, small stone weirs etc in more than 1500 hectares of land. The Forest Protection Committees facilitated the planting and protection of around 3000 fruit bearing trees. Introduction of fodder cultivation helps the families to ensure fodder security fifty five households involved in this activity and 40 acres of land is now under fodder cultivation, this has helped the families an additional income of 15,000 per family every month.

The major results achieved in the project are a demarcation 800 sq km area as active Lesser Florican habitat for first time in Vidarbha region of Maharashtra state of India. Presence of bird confirmed after 30 years in the areas. Four Phase pardhi villages have taken '*Palti breaking*', the community oath to ban hunting of the lesser Florican and other wild animals and protect the animals in collaboration with the forest department and other stakeholders.

Forest department has proactively approached villagers for Joint Forest Management programme, and probably it's first time in Maharashtra with Phase pardhi community two JFMs have been undertaken. The support extended through goat rearing and poultry activities helped around 1000 tribal families to move towards economic enhancement and keep away from the earlier practice of hunting wild animals. This also led to interface with the existing schemes of the state government. Planning Commission, Government of India has accepted goat rearing as an income generation/ livelihood activity for Phase pardhi community on its 12th plan document. This has been a major impact from the project to influence action in other villages. A total of 3000 plants of both timber and non timber fruit plants, fodder grasses and foliage species have been planted in the region covering 200 ha. Most of the SHG members have been benefitted fodder for their cattle from the grass land area they are protecting.

The real challenge faced was developing a strategy involving the Phase phardi community in protection and alternate livelihoods than hunting was a great challenge as it required continuous persuasion, dialogues and meetings.

Monitoring of Lesser Florican with the help of Phase paradhi's in Akola and Washim District, forming a network of Phase paradhi community members from various parts of Vidarbha for rediscovery and monitoring of Lesser Florican. The NGO SAMVEDNA is keen on developing a set of good practices for the ideal habitats based on local knowledge and scientific studies and also identifies areas within reserved forest in Maharashtra State where such habitats can be created for the conservation of the Lesser Florican. The NGO is planning to enhance ways for better quality fodder production on village lands to support goat rearing for more number of tribal households as additional income generation activity

While promoting conservation initiatives necessary balance have to be ensured between conservation measures, livelihoods and linking the government schemes to support their existing livelihoods. Participatory conservation practices, process oriented approach with the involvement of local communities both men and women need adequate time frame to achieve the results.

The Samvedana's intervention is accommodated into the "Guidelines for state action plan for resident bustards recovery programme" prepared by Ministry of Environment and Forest (MoEF) Government of India. The document advocates the efforts taken by Samvedana and its expansion.

"Tanda Panchayat" of Pardhi tribe in the project area is the finalists in the "1st India Biodiversity awards" given by MoEF, UNDP in 11th Conference of Parties (COP) of Convention on Biological Diversity (CBD) held at Hyderabad. The conservation work done by "Tanda Panchayt" was awarded at national level. The felicitation as finalists was given under "Community stewardship" category.

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Trees in the forest fringe villages - that provide household resources, supports local biodiversity and buffers a Tiger Reserve

India with diverse forest types structurally dominated by diverse tree species play a versatile role in the human life ranging from being a resource for sustenance in the rural area to providing ecosystem services in the urban landscape. We at ATREE over years have accumulated knowledge through several collaborative research programs on trees covering a range of aspects such as a) long term monitoring of population dynamics of trees and their ecosystem services as an incentive for the forest fringe communities largely of farmers in Eastern Himalayas and Western Ghats, b) Understanding and enhancing the role of tree diversity in livelihoods , using participatory approaches and c) restoring the degraded landscapes or abandoned plantations with suitable tree species.

Under the conservation based livelihoods program we use trees in enhancing the natural resource availability in forest fringe villages. Village common space and under-utilized space such as backyards of homes, the farming landscape either in the middle of the farmlands or in the field bunds, lakes and irrigation channels supports diverse tree species and each one of them play unique role at individual household level to entire village. Also these trees support wide variety of local biodiversity and play an additional role of being 'transition forests' by providing habitat or food to some wildlife. At ATREE we closely work with communities in the forest fringe villages to revitalize the practice of tree based natural resource management to meet the household needs, improve the local biodiversity and buffering the forest from further degradation.

In forest fringe villages around Kalakad-Mundanthurai Tiger Reserve (KMTR), Tamil Nadu state we raise saplings of multi-purpose tree species which have been part of the landscape and meet various natural resource requirements of the local people as well as that could support diverse pollinators and dispersers. Tree saplings belonging to not less than 50 species could provide fuelwood, fodder, vegetable, medicine, minor timber, etc were raised in the nurseries at ATREE's Community-based Conservation Centers (CCC) as well as in the decentralized nurseries operated by individual women. Women groups have been formed around the home-gardening related activity which also took care of tree saplings that have been planted in the backyards. Children groups called 'Green Brigade' have been formed around the multi-purpose tree planting and monitoring program in the public space as part of Environmental Education program.

About six to seven decades ago, villagers around the KMTR forests practiced dryland farming except in certain pockets that are closer to rivers draining from the forests. Trees in the farmlands, fallow lands and village common space and crop residues generated from dry land farming (e.g.,

stocks of gingili, jowar, groundnut, pulses) took care of the biomass requirement such as fodder, fuelwood, green manure and minor timber in addition to forests. Forest also supported cattle and fuelwood collectors and provided income sources for the dependent village and nearby small towns. Two major changes - improved irrigation facility and forest management regime brought a cascading effect at a larger landscape level. Infrastructure development in the form of irrigation dams, network of irrigation canals and the subsequent change in cropping pattern brought a major change in the attitude of the farmers in the adjoining villages towards utilization and management of natural resources. There are not less than seven dams of various sizes provided opportunities to the farmers of villages along the KMTR to convert their dry lands into wetlands. Trees in the farmlands and village common space have been cut. Lack of fallow period for larger part of the year made the cattle to heavily depend on the forest. Similarly crop residues that was taking care of fuelwood and fodder requirements have not been generated due to shift in farming towards paddy and banana.

Secondly in the interest of wildlife conservation Forest administration shifted from reserve forest category towards strict protection regime not allowing any form of human use. Shift in management regime that is from Reserve forest status to Tiger reserve curtailed the access to the natural resources in the forest and the conflict increased. Fuelwood, fodder and manure become a major issue for the farming community in the forest fringe villages. Alienation as well as life style changes brought a major change among the community towards natural resources and biodiversity conservation activities.

Through Integrated Conservation and Development Project (ICDP) popularly known as Eco-development Program (EDP), Kalakad Mundanthurai tiger reserve got a global attention for its conservation effort in involving the forest fringe community in addition to its richness for biodiversity. Forest fringe community, living in about 200 villages is dependent on KMTR forests for their livelihood as well as biomass needs were covered under this program. Through several intervention mechanisms designed under the EDP, KMTR management tried to reduce the dependency of fringe community on the forests. One among the interventions was raising biomass resources outside the tiger reserve but it did not address the biomass demand of the community. In addition to this over several decades due to changes in farming practice from rainfed to irrigation trees have lost their relevance from the human point of view. We also got a feedback from the community that biomass needs such as fuelwood, green manure and fodder are the major issues that need to be addressed. In addition to this through our ecological study in the forest fringe villages of KMTR get to know that the trees in the agrarian landscape playing a major role in sustaining local biodiversity such as colonies of fruit bats, water birds, owls etc.

We felt that improving the green cover in the village in the form of raising more useful trees that could a) take care of biomass needs as well as providing ecosystem services at a larger landscape level b) could strengthen the stakeholdership among the once forest dependent community that they play a responsible role in protecting the tiger reserve c) provide opportunity to create awareness among the children and youth in the village by engaging them in raising the trees.

As part of conservation livelihood program we raised saplings of about 50 trees species that could provide multitude of products and services. Majority of the tree species could provide fodder, green manure and meet domestic timber requirements. We choose species carefully in such a way they also take care of providing habitat, food requirements of local fauna such as bats, bees etc. For example we did not promote the teak (*Tectona grandis*) tree though most of the villagers preferred to have it in the farmlands along the bunds and canals. We convinced them that *Gmelina arborea* locally called as Kumilam could provide equally good quality of timber as well as could provide fodder, green manure for the household. The Kumilam also could provide nectar to pollinators largely solitary bees as they play major role in performing the pollinators in the legume crops, chilly, brinjal, tomato as well trees such as Murungai. We also provided saplings to farmers who are interested to raise saplings of green manure and fodder trees such as *Gliriciedia*, *Thespesia*, *Subabul*.

Bamboo and Neer maruthu saplings have been planted by farmers who have larger bunds next to river or major irrigation canals with a purpose of stabilization. Also tree species such as Illuppai, Neer Maruthu were preferred by temples, schools and other official campuses. Many species of fruit yielding trees such as nelli, papaya, guava, sapota, seetaphal etc were also part of the multi-purpose tree sapling provided to the villagers.

Most of the households benefited in meeting the requirements of their households from these trees. Those households which had enough space and planted more saplings generated income by selling the trees as fuelwood, minor timber, and fiber in addition to their own use. Farmers who planted silkcotton and Subabul realized cash income after third year. Silk cotton fruits were sold being an important source of filling material for beddings. Foliage of fast growing tree such as subabul (*Leucaena leucocephala*) was used extensively as fodder and green manure. The branches provided fuelwood whereas the trunk sold as minor timber. Trees planted in the village common space such as roadside and religious sites improved the green cover and fetched the village special grants from Government (e.g., Green and Clean village) to improve infrastructure facilities such as toilets, community halls etc.

Village children and youngsters have been involved through a conservation education program that engaged them outside the class room in hands on activities. They have been involved right from raising saplings, planting and tending them. Saplings supplied to the villagers are monitored in regular intervals to know the growth rates and biomass increment, benefits accrued by the household etc. Monitoring programs on fruit bats roosting in larger trees, insect eating bats from temples, water birds from local tanks and roosting, nesting sites have been designed for Children and involved in the activity so that they learn about the importance of trees in the households of forest fringe villages.

Overall ATREE has demonstrable case studies on ground and data generated based on research and community participative approaches to highlight the importance of trees in improving the livelihoods and ecology of human dominated landscapes.

Contact Details

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Practice of Traditional Knowledge for Sustainable Livelihoods - Case study on tribes from Tamil Nadu and Kerala

Location/ geography

Tribal hamlets namely Udumanparai and Kooriakutty inhabited by Kadars and Karumutti hamlet inhabited by Muthuvans located in Anamalai hills of Coimbatore district in Tamil Nadu and Thrisoor district of Kerala India.

Rationale of the intervention

Over the millennia, human beings have been utilizing plants for food, medicine and other purposes. Tribal people living in biodiversity rich areas possess a wealth of knowledge on the utilization and conservation of plant resources. This traditional knowledge, developed over years of observation, has largely remained with these people. India is the home of rich biological and cultural diversity. There are about 67 million tribal people belonging to 573 distinct ethnic groups living in different geographic locations with various subsistence patterns. In south India there are 136 tribal groups of which 36 are in Tamil Nadu. Discussed in this paper are two of these communities: the Kadars and Muthuvans living in Coimbatore district of Tamil Nadu and Thrisoor district of Kerala respectively. The tribal groups have their own food habits, culture, religious rights, and rich knowledge on the value of plants available in their surroundings. Due to their long time association with nature, they have accumulated an enormous amount of knowledge on potential plant resources. The empirical screening done by the tribals over generations is highly useful in phyto-chemical and pharmacological studies. Right from the days of Cinchona, used for curing malaria even today, to the present day Rauwolfia, used for hypertension, many medical remedies are still learnt from the tribal people. The knowledge on properties and utilization aspects of plants is on the verge of depletion with the spread of 'modern' civilization. Hence, this Ethnobotanical study was conducted to document the knowledge which is likely to be lost due to obvious reasons.

Problem / objective

The problem faced by the tribals is that due to onslaught of modern civilization they are unable to practice their traditional knowledge based medicine. As their own community is gradually shifting to modern medicine, the knowledge on medicinal plants and their usage is dying. The objective of this study is to document such knowledge and practice in order to keep it as a knowledge bank so as to be used in future.

Participant community

Tribal communities namely Kadars and Muthuvans located in Tamil Nadu and Kerala states in India.

Other stakeholders

Forest, Agriculture, Irrigation, Revenue, Tribal welfare, Education, Rural Development and other departments and common public who will be affected due to loss of biodiversity.

Key activities

Tribal hamlets namely Udumanparai and Kooriakutty inhabited by Kadars and Karumutti with Muthuvans were selected. Field trips were conducted in different seasons to collect Ethnobotanical information. During these visits, the headman and elderly people in the hamlet were consulted as a way of understanding their beliefs, habits and customs and this helped in developing a rapport with them. Elderly people with sound knowledge on the vegetation of the forests and values of plants were selected as key informants. They were taken into the forest and Ethnobotanical information recorded on the utilization aspects of edible plants such as storage techniques practised by them for sustenance during off-season. For medicinal plants, information on collection of plant parts, mode of preparation, method of application, dosage and duration of medication was recorded along with diet restrictions. Information was collected of medicinal plants used singly or in combination with others. Information collected/documentated during every trip was counter checked on subsequent visits.

Results / impacts

The present study revealed data on the Ethnobotany of 79 plant species. 10 plants are used for food; 45 plants for medicine 9 of which are used for more than one disease; one plant each for veterinary and green manure; 4 plants for fish poison; 3 as hair wash and hair tonic; 11 plants in material culture and 4 plants in religious beliefs. In general 6 plants are used by the tribes for multiple purposes. Details of the plants with local names and uses are elaborated in Appendix 1.

Utilization of edible plants by the tribes - The majority of human population depends on just 100-150 plant species for most of their food requirements. In contrast, the tribal communities living in southern India use 1,000-1,500 plant species. A variety of plants are used as edible greens, for example, *Amaranthus* spp., *Colocasia esculenta*, *Hibiscus Jurcatus*, *Rhaphidophora*

pertusa and *Talinum cuneifolium*. Similarly, fruits of many plant species are eaten, eg. *Bridelia retusa*, *Cordia obliqua*, *Cullenia exarillata*, *Grewia tiliaefolia* and *Memecylon edule*. This approach not only increases the choice of plants and, hence, the nutritional values but also prevents over-exploitation of any single or a few species. Nearly 10 species of food plants, not reported hitherto, were recorded during the present Ethnobotanical study. They are totally unknown to the majority of people in the country. The lesson here for all human beings is that, by enlarging dietary habits to include a greater diversity of plant products, our dependence on and extensive cultivation of only a few species can be reduced.

Traditional Knowledge of the tribes about medicinal plants - Medicinal properties of plants have been recognized by tribal communities and their use has been practised as a tradition for thousands of years. All the members of the community have knowledge on some common medicinal plants and their locality. However, the elderly members possess a great deal more knowledge of medicinal plants, including those for curing certain life threatening diseases. Tribal people use plants singly or in combination. The same plant may be used for different disorders; for example, *Caesalpinia bonduc* is used for chest pain, stomach ache and hydrocele; *Cassia fistula* is used for body pains, giddiness and stomach-ache; while *Naravelia zeylanica* is used for stomach-ache, dysentery, body pain and rheumatic pain. In certain cases a combination of different plants are used in the treatment. For example, *Dalbergia latifolia* is used in combination with *Anogeissus latifolia* for cough; while *Phyllanthus emblica* with *Syzygium cumini* are used for toothache and infection. Every tribe has its own method of collecting the plants and preparation of the medicine. Dosage and duration of medication depends on the age of the patient and intensity of the disease. The tribals collect the plant parts used at particular times, e.g., either before flowering or fruiting, or during a particular season.

Sustainable methods of harvesting resources and their knowledge on the value and the availability of resources are the reasons for conservation and sustainable utilization of the plants by these tribals. The tuberous roots of the medicinal plant *Anaphyllum wightii* are used for cuts and wounds and the tribals are aware of the plant's rare occurrence in their area. Hence, they invariably harvest only a portion of the tuberous roots. Tribal communities show prudence and ecological wisdom in resource utilization. The Kadars, for example, select only mature plants of the yam *Dioscorea* for harvesting the tubers. They first examine the vine and choose only those whose leaves are yellow which is an indication of maturity. Tubers of young green vines are never dug out. After harvesting the mature yams, they cut off the upper portion of the tuber, along with the vine and replant it in the pit. They cover the pit with loose soil for the tuber to regrow for whoever may harvest it in the future. The community as a whole share the harvest, thus avoiding over-exploitation. Part of the

collection is stored for consumption during the off season, another unique example of community co-operation in plant utilization and conservation of resources.

Traditional cultivation practices - Traditional occupation of Muthuvans is agriculture and they practise shifting cultivation. Kadars also practise cultivation but on a small scale. Traditional cultivars of minor millets, Finger millet, foxtail millet and paspalum, maize, and paddy are cultivated. Both monocropping and mixed cropping are practised. Millets, namely 'varagu' (Karu varagu and Vella varagu) - (paspalum), 'Thenai' - (Foxtail millet), grain and leafy vegetables 'vella keera vidha' (Amaranthus sp.), 'Thuvara' (Pigeon pea), 'Moccha' (Field bean), and 'Makka cholam' (Maize) are also cultivated. Fertilizers and pesticides are generally not applied. On crop rotation, a Muthuvan commented: "We don't cultivate the same crop in the following season and necessarily we go in for an alternative crop. In particular, Finger millet is not cultivated on the same field in the next season. If we used the same crop it invariably gets attacked by pests, which results in wilting of leaves". He also said that usually Foxtail millet is grown after Finger millet. Even in the mixed cropping pattern, where more than one crop is cultivated, it is usually followed by monocropping.

Selection and storage of seed material from crops - According to Mr. Alli Muthu, the chieftain of Muthuvans, healthy, strong and erect earheads or cobs are selected by physical examination and common observation. The healthiness of the cobs or earheads are assessed by holding in the fist and by general feeling, if there are undulations and unevenness on the cobs, they are avoided. Considerable amount of grains are kept separately as seed material to be sown the following season. Seeds, which are identified as healthy and viable in physical appearance, are selected in the field itself, and these are harvested and stored separately.

Challenges

The interventions by the state in the name of development is not done in consultation with the tribals for whose sake the very development is being done in the tribal areas. Hence, on the one hand they are losing their traditional lifestyles and on the other the younger generation is migrating in search of jobs in which they are neither used to nor have skills to do the job.

Lessons Learned

The present study on the Ethnobotany of Kadars and Muthuvans has resulted in the documentation of first hand information on the uses of 79 plant species used for food, medicine, veterinary, fish poison, hair wash, material culture, green manure and religious beliefs. The information has been critically screened which revealed that the indigenous uses of 10 plant species used for food and

45 plants used for medicine are not reported so far in the literature. They are reported here for the first time. The utility of these plants by the two communities for different purposes reveals their knowledge of the plants available in their area. As the tribals know the value of the plants for food, medicine and other materials, they are conserving the plants. The sustainable practices by the tribals in genetic conservation of both wild and cultivated diversity have played a significant role, resulting in the availability of genetic material for further scientific research.

Muthuvans cultivate lemon grass extensively along the forest slopes for oil extraction from the leaves, using distillery units. It is observed that the distillery units are not enough to cater for their needs. This means that the grass collected for distillation gets over dried, resulting in decrease of quality and quantity of the oil. They need more distillery units so as to get the optimum quantity of oil and maximum returns from their production. Tribal areas in and around Valparai and Topslip are just next to the power projects where the electricity is produced and supplied to intra and inter-State necessities. However, the tribals living in the forests near the power projects are at the mercy of the wild animals, which are part and parcel of their ecological niche. They are forced to make fire, burning large amounts of wood material during night hours to keep off the wild animals. If each family burns a log or two per night, the resources wasted can be great. If electricity could be provided to the tribal hamlets wherever it is possible, it would save a substantial amount of wood. There are probably about 1,000 families living in these hamlets.

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Biodiversity conservation through Cluster centric approach for Tribal Livelihood Enhancement

Non Timber Forest Produces (NTFPs) play an important role in the tribal economy but vary from habitation to habitation based on the proximity of habitation to forest and availability of other livelihood opportunities. But the resources derived from forests still remain central to -tribal economy, contribute significantly to household food, nutrition and health security. Poor and vulnerable households are depending more on NTFP for their livelihood due to lack of other opportunities–tribal women in particular rely more than man on NTFP for household use and income. Poor access to information, knowledge and technology about the value addition of NTFPs limits the return from NTFPs to the tribal households. Market access is difficult, since these tribal villages are located in the remote areas with poor or no transportation facilities to bring the products to the markets.

The increasingly restricted access and degradation has reduced the capacity of the forests in enduring the food and livelihood security through supply of forest produce for direct consumption and income by sale of NTFPs. This has made landless and marginal tribal farmers more vulnerable to shocks. The large scale deforestation has



increased the tribal women's workload due to non availability of items related to their subsistence requirements and firewood in the immediate vicinity.

Kovel Foundation studied the situation by conducting several studies in Visakhapatnam district of the state of Andhrapradesh. Based on the results the organization decided to work on the issues related to food security, market accessibility, conservation of forests etc among the tribal communities of Chintapaka cluster of Visakhapatnam district in a holistic way with a cluster approach.

In the project area Kovel Foundation conducted a baseline survey followed by a resource analysis study in order to know the issues specific to the cluster of 500 families covering Chintapaka, Velagalapadu,



Koraparthu, Reddipadu, Rachakilam, Aramanigaruvu, Ballagaruvu, Vajangi, Mallampeta, Borrapalem, Dibbapalem, Valasalagaruvu and Chatakamba settlements wherein the major communities/sub-clans are Valmiki, Bagatha, Nooka Dora, Konda Dora and Konda Kammara. The local youths

from these communities were trained and involved in resource analysis exercise. The study reveals that the cluster of these habitations has no communication facilities, located in the remote thick forest, only an auto shuttles twice in a day from the village to a nearby market place called Devarapalli. Due to inaccessibility these settlements are neglected by all the service providers from government as well as the voluntary agencies.

Collection of NTFP is the major livelihood activity, lack of marketing skill and proper marketing mechanisms are the reasons for getting meagre amount and exploitative price from the visiting traders and middlemen. Although the community is aware that the resources they are depleting, due to lack of other options they continue collecting the products from the forests following the same techniques known to them which also contributing towards the depletion of the resources. As a result species like Gum Karaya (*Sterculia Urens*) and Naramamidi Bark the major species help them to get income are disappearing in the area in and around the cluster.

Understanding the whole scenario, the organization has started facilitating the tribal women to form primary producer groups formerly known as Common Interest Groups in order to mobilize them and to capacitate on technical aspects related to NTFP/Medicinal and aromatic plants collection, processing,



value addition and marketing. They were also trained on regeneration of the species through in-situ and ex-situ methods to promote sustainable resource management. Facilitated to build linkages with various service providers such as GCC (could you expand), forest department, traders and outside markets.

As a result of trainings on sustainable management of NTFP/MAPS such as Value addition & quality



control, training on propagation method etc were imparted, the groups have learnt the technical aspects related to collection of nearly 15 NTFP/ Medicinal and Aromatic Plants like Sugandhipala, Kalmegh, Amla, Tippa teega, Gum Karaya, Honey, etc. The following are the list of NTFPs along with local and botanical names

Sl.No	Local Name / Trade Name	Botanical Name
1	Gum Karaya	<i>Sterculia urens</i>
2	Amla	<i>Emblica officinalis</i>
3	Honey	<i>Apis dorsatta</i>
4	Tamarind	<i>Tamarindus indica</i>
5	Giloe	<i>Tinospora cordifolia</i>
6	Kalmegh	<i>Andrographis paniculata</i>
7	Nux vomica	<i>Strychnos Nux vomica</i>
8	Marking Nuts	<i>Semecarpus anacardium</i>
9	Clearing Nuts	<i>Strychnos potatorum</i>
10	Bael leaves	<i>Aegle marmelos</i>
11	Ambatimamidi roots & Leaves	<i>Boerhaavia Diffusa</i>
12	Jafra	<i>Bixa orellana</i>
13	Myrobalons	<i>Terminalia chebula</i>
14	Sugandhipala	<i>Hemedesmus indicus</i>
15	Pathalagaridi	<i>Rauvolfia serpentina</i>

Apart from training the community members were provided a tool kit containing tarpaulin, sickle, small crow-bar, forceps, polythene liners, bamboo basket, sting proof dresses, stainless steel vessels, torch, nylon rope etc. Which are being used for harvesting and processing of gum karaya, scientific collection & quality extraction of wild bees honey/wax (could you expand what is it? and how it is being used in brief) for collection and to do value addition of the products.

As a result of the constant inputs, orientation and trainings provided to the members of primary producer groups, the groups were managed to procure various NTFP/MAPS from the group members. The producer group was also able to market the same through building linkages with credible institutions like Natural Remedies, GCC and also to the private traders to sell larger quantities of the produce for better fair price. For example during last season 3.5 tons of Kalmegh was supplied to Natural remedies @ Rs.47.50 per kg whereas the local traders were paying around Rs.18/-per Kg. The community had received a total sum of Rs.1, 66,000 for this particular product otherwise the local traders would have purchased the same for Rs. 63, 000.

Chinthapaka village was identified as a nodal point for the cluster and constructed a godown to store the mobilized products from the members, which helps to promote collective marketing. They have formed a procurement committee consisting of three experienced and knowledgeable women who are responsible for quality control, proper weighing, prompt payment etc. The procurement and marketing centre works twice in a week for the purchase of NTFP/MAPS from the members and the procurement committee members make the payments to the producers from the seed money which Kovel Foundation has provided. Women have gained confidence in controlling and managing the local institutions like producer groups.



The Primary Producer Groups have also interested to take up 'Maa thota' (Our Garden), program in the fallow land available in the surroundings of the villages that are falling into the cluster. In this program, planting of trees has been done up to 16 acres of fallow land both as core and border plantation along with millets as inter crops. The Maa thota consists of Mango, Amla as

core plantation, Gum Karaya and Teak as border plantation and pulses like black gram, green gram, millets like sorghum, ragi, foxtail millet, several species of vegetables as inter crops. This helps the communities to get food items primarily to meet their nutritionally balanced subsistence requirements. Some of the members of the community have started cultivating foxtail millets in their lands.

Honey bees play important role in bio diversity conservation, hence the Foundation organized the honey collectors and discussed about the drawbacks of the traditional methods which destroys the combs and bees and imparted trainings on scientific measures of honey collection that includes using smokers instead of fire which kills the bees, collecting only honey portion from the comb leaving brood and pollen portions so as to ensure immediate regeneration of comb, using draining technique to extract quality honey instead of squeezing the comb containing larva and pollen. As a result of the draining system the community is able to sell honey and wax.

Consultation has been taken up at community level to identify progressive farmers/best practitioners in order to act as community resource persons/bare foot botanists. After identification of the members, the organization has imparted trainings on leadership and techniques related to sustainable collection of various forest produces. This strategy has enabled to transfer the technology with a lesser cost and ensure that the knowledge gets disseminated in the community.

Conscious efforts have been made to identify the traditional knowledge related to forest resources, harvesting and post harvesting practices and this helped to assimilate the existing traditional knowledge of the community with the scientific knowledge to make it efficient and sustainable. This also helped the community to become aware of their strength and save from disappearing from the community.



At the beginning of the project men members of the communities didn't encourage the mobilization of women members, forming them as producers groups, their representation in the management committees etc. But over a period of time the organization was able to sensitize the men through continuous discussions and dialogues. Market linkage for some of the products is still an issue due lack of scale. Illiteracy is also a challenge while encouraging the women to take management responsibilities and leadership roles like dealing with market personnel/companies and also in

managing records like minutes, stock registers, purchase registers, cash book, receipt book, etc. Lack of storage and lack of better transportation are the other vital issues need to be addressed. GCC monopoly is also one of the policy level issues which is hindering the community to opt for outside market where they get better price for the products. For example for honey they can get an average amount of Rs 180 per kg in the outside market, where as GCC is paying them Rs 120 per Kg.

The major lesson learnt is that in the case of NTFP the project area needs to be larger to mobilize higher quantity and to achieve the required scale for collective marketing instead of confining to one cluster of villages. Therefore, now the organization with the support of National Rural Livelihood Mission's Mahila Kisan Sashaktheekaran Pariyojana programme of Ministry of Rural Development (MoRD), New Delhi and Society for Elimination of Rural Poverty (SERP) Hyderabad is able to expand the interventions to six districts Visakhapatnam, East Godavari, Kurnool, Khammam, Chithoor and Warangal in the state of Andrapradesh. The plan is to cover around 12,000 families across these six districts with the approach Producer Centric Decentralised Supply Chain Management system.

Full Contact Details of the organization

Kovel Foundation – A trust by the indigenous people for research on sustainable technologies has been promoted in the year 1994 with its headquarters at Visakhapatnam of Andhra Pradesh State in India. It is an Apex organization of 250 Girijan Gum Pickers Associations (GGPAs) spread across 15 tribal concentrated Districts of AP and has a strong clientele of 8500 tribal families. Faith in the capacity of indigenous community, integrity, accountability and transparency has been the core values of the organization. Kovel Foundation is one among a few NGOs in the country owned and headed by NTFP dependent tribal/client communities who form the board.

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Eco-development in a Biosphere Reserve – honey collection and indigenous livelihoods in the Nilgiri Biosphere Reserve

Location

The Nilgiri Biosphere Reserve (NBR) is part of the Western and Eastern Ghats chain of mountains of the Indian peninsula, and lies between 100 45'N to 12 0 N and 760 E to 770 15' E with a total area of 5520 km² spread across the three southern states of Karnataka, Kerala and Tamil Nadu.

Altitude varies from 250m to 2650m, and at least four of the major rivers of south India originate in this region - the Bhavani, Moyar, Kabini and Chaliyar rivers. The western ranges of the NBR receive higher precipitation (up to 4600 mm) while the eastern parts fall in the rain shadow, receiving less than 800 mm rainfall annually.



This range of topography and

climate has resulted in sharp gradients of vegetation composition, ranging from thorny scrub forest dominating the north-eastern region and intergrading westwards into dry and moist deciduous forests and wet evergreen forests towards the Wayanad western parts. The NBR comprises 0.15% of India's land area and has 20% of all angiosperms, 15% of all butterflies and 23% of all vertebrates. Of the 285 endemics in the Western Ghats, 156 (55%) are in the NBR. More than 70% of the reserve is under protected area status as national parks, tiger reserves and wildlife sanctuaries.

Rational of the intervention

Worldwide forest dependant cultures have lived for centuries using biodiversity and have developed a close understanding of the same. The indigenous people of the NBR like others around the world have kept their livelihood baskets very diverse, supplementing forest gathering with agricultural work both for commercial and subsistence purposes. Those that practiced pastoralism continue with



smaller herds of cattle in more recent times. One of the forest gathering traditions that are common to many indigenous cultures is collection of honey from the wild. This practice is guided by knowledge of the ecology and skills that display the spirit of human endurance. Honey collection or hunting practices are

important traditional knowledge that is passed from elders to the next generation only through an oral tradition. Like many biodiversity rich areas across the world the cultural diversity of the NBR is as rich as its biodiversity. There are more than 30 distinct indigenous or adivasi groups, like the Kurumba, Kattunayaka, Irula, Paniya, Bettakurumba, Toda etc who depend on the forests of the NBR for their livelihoods. The quality of the environment is an integral part of the well-being of these communities. This balance between biodiversity and indigenous livelihoods lies at the core of Keystone Foundations approaches and interventions in the area of eco development.

Problem/Objective

Displacement of indigenous people and conversion of biodiversity have gone hand in hand, leading to an irreversible erosion process for both. Indigenous world views reflect a bond to nature which is mirrored in traditions and beliefs centered on forest deities and sacred places in the forest. A landscape for the indigenous people becomes



not just a source of livelihood but a repository of social relationships and important linkages with their ancestors. Development interventions that displace these communities have caused severe damage to them by increasing their marginalisation. With the advent of the British, lands were

taken by the state and `worked' for revenue in different ways and the ancestral domains of adivasi people were not taken into consideration. The process of land alienation has since only become more intense, with increase in population of migrants and settlers. Further changes in the forests, with the advent of commercial forestry and logging, changed forever the status of the adivasi's lifestyle. As an example, a detailed survey done in the Kotagiri/Coonoor region in 1998 by Keystone shows that 39% families are landless, 14% have land which is less than 1 acre and 35% between 1-2 acres. 11.8% have land which is between 2-3 acres. The problem is much higher in regions like Gudalur and Wyanad which lie on the western part of the NBR.

Keystone Foundation was established in 1993 with the mission to improve the quality of life and the environment in mountain regions with indigenous communities leading to sustainable development and ensuring the well-being of people and forests. The Foundation has undertaken its mission in



mountain areas, using applied science, appropriate technologies, traditional knowledge and fair business practices. The work has been in the area of non timber forest produce, traditional food crops, hill water & wetlands, sustainable farming, bee keeping, marketing, ecological and organic certification, community mobilisation through cultural revival, environmental governance with an emphasis on advocacy.



The case study focuses on the approach to a livelihood intervention in a high biodiversity area with the most marginalised communities. The intervention over the past 20 years has come up with sustainable development for adivasi populations using the example of wild honey

collection. Dovetailing development programmes with peoples’ traditional knowledge and skills seems to be proving effective in the case of the intervention with regard to honey. This approach has strived to maintain the balance between conservation, enterprise and livelihoods, within the cultural context and against the backdrop of a good governance framework.

Honey plays a significant role as profits are high in a good season. The product is usually high in demand and finds an easy market. According to a survey conducted during the Bees, Biodiversity and Livelihood Project of the Darwin Initiative, NTFP collection contributes between 20 – 80% of gross income amongst adivasis, varying across regions.



Collection from the wild is a particularly challenging issue especially when it lies at the center of the planned economic activity. The challenge mainly arises from lack of control over production,



seasonality of the product, fuzzy nature of tenure that surrounds many of these products etc.

Sale and barter of honey was always a part of the indigenous livelihood. In the startup period of the eco development initiative with honey, trainings were provided to gatherers of honey on hygienic handling processes. The intervention started by procuring honey at a higher price than the regular market. Detailed surveys and assessments were made on the traditional methods of harvest, and the ecology of the region and these guided the market interventions. The surveys were published and shared with a cross-section of society. A film made on the honey hunting practice, had far reaching effects on building sensitivity to local traditions and practices. Over the years the volume of honey being brought to Keystone marketing enterprise grew and the

competent price helped the enterprise initiative stay among the top buyers of honey in the region. Honey volumes fluctuate according to conditions in the forests but on an average the enterprise began with 100kgs of honey and today handles upto 8000kgs of local wild honey in a good season.

Often the question ‘is the harvest sustainable?’ is raised by consumers, biologists etc. Measures to address this question were part of the market intervention from the start and have evolved as the core of the work on ecological monitoring. The question really to be asked is ‘under what conditions can the harvest be sustainable’. Given below are some of the conditions that are at the center of the honey initiative at Keystone Foundation:

- a) Ecological – Harvest monitoring is undertaken in participation with communities. For instance when the honey is brought into the center the harvester spends some time explaining the details of the harvest to the person at the enterprise; this information is part of a database which has been maintained from the beginning of the enterprise. Periodic ecological assessments have also been undertaken by researchers at the Foundation which have gone a long way in establishing authentic baselines of wild bee populations and quality of the habitat. Some of the publications from this work are given below as additional readings.



- b) Economic – Offering a market price which was higher (approx 40%) setting standards for the quality of the product, establishing a well-connected marketing network, locating sources for bottling, labeling and other needs of retailing were crucial to the success of the honey marketing. Today the marketing intervention has raised market access for organic and natural products grown on adivasi homesteads and people are able to sell their surplus at better prices. The initiative also supports other groups through out India and shares its experience and skills with groups nationally and internationally. Additional information about the marketing can be sourced at www.lastforest.in
- c) Cultural – Understanding the traditional knowledge which exists with the community was very central to the eco-development intervention. Participatory documentation, results of which were shared with the community formed an important part of the cultural documentation. Decisions to modernize were driven by market needs but very much in consultation with the practitioners or in this case the harvesters of honey. As an example - plastic food grade cans were preferred

for storing honey as a hygienic option to recycled tin oil drums. Decisions regarding equipment are taken by the harvesters as in the case of their choice to continue with the use of forest vines to make the rope ladder, an important tool for scaling the cliffs. Today the tradition of honey hunting is practiced by youth and young people in the community as an activity that they are proud of and not hidden away as a primitive activity. It is worth mentioning that keeping the practise within the cultural contexts can be a benefit for biodiversity through limiting the number of people who have direct access to harvest the resource at the same time securing the livelihoods of the most marginalised.

e) Governance conditions-The honey hunters are organised in a loosely held network and are more than 500 across the NBR who are direct beneficiaries of the marketing. This has helped to keep the identity of the gatherers and ensure that standards are followed. Honey harvesting areas are marked and community boundaries of harvest have been established. These boundaries are overlaid with the community forest rights maps that are a requirement under the Forest Rights Act (2006). Advocacy with the government at many levels is underway to recognize the livelihoods of the honey harvesters and their responsibility in ensuring the sustainability of the collection.

Regular training on sustainable harvesting practices are conducted, and offered to other groups across the country. Forest departments of Tamil Nadu and Kerala have facilitated a number of these trainings. The emphasis in these trainings has been on the need for documentation of traditional knowledge and practices, ecological surveys and restoration efforts going hand in hand with building such a forest based enterprise.

Keystone has initiated the enterprise division Last Forest Enterprises Private Limited which markets the products that are produced from value addition units across the NBR. These value addition units procure process and market forest produce gathered by adivasi people, especially women. The units maintain records about the harvest, product source and are located across the NBR.

Eight such units have now been federated to form the Aadhimalai Pazhangudiyinar Producer Company this year. During 2012-13 the company had a turnover of over Rs. 50 lakhs, employing about 50 women permanently for value addition, processing and packing of NTFPs and organic agriculture produce.



Approximately, 1000 farmers and harvesters across the region give their produce at a premium price of over 8% over market rates, which get processed in these centres. Products like honey, *eecham*, *shikakai*, *gallnut* and *nellikai* are the main NTFPs collected in these areas and are made into an array of value added items like jams, jellies, pickles, dry bits, mouth fresheners, candy, hair wash powders, etc.

Some challenges along the way

1. Keeping the balance between livelihood, conservation and markets has been at the forefront of Keystone's work and this balance needs constant callibration.
2. Working in the niche sector – 'indigenous people', 'biosphere reserves', 'wild collection' brings up site specific issues. Local governance frameworks then need to be contextual and creative.
3. The impacts are at many layers and results are difficult to measure. Baselines in many cases are missing, and the absence of a reference point complicates measurements.
4. Data about sources are not regularly updated. This poses a major challenge for certification processes and guaranteeing quality and fair price.

Eco-development initiatives that help to keep the balance between biodiversity and livelihood needs has been at the core of the work of Keystone Foundation. Today many of the villages with strong livelihood interventions are leading the conservation initiatives through conservation centers which are meeting places for conservation education programs and forest restoration activities. The livelihood-biodiversity situation is not of a 'win-win' one but a constant balancing act that keeps the road ahead challenging and exciting.

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Agro bio diversity and sustainable market-based farmers' cooperatives for livelihood security

In the year 2003 the NGO Lok Panchayat organized a Farmer's Dialogue Yatra which covered 36 villages and more than 1500 farmers. This was held due to high risks, poor returns, limited opportunities and declining returns, and spiraling costs for the small and marginal farmers in agriculture. During this meeting a number of concerns and problems regarding agriculture were voiced by the poor and marginalized farmers. This was one of the first efforts in the region to provide a forum for the farming community particularly the small holders to come out and voice their concerns. Some of the major issues which came emerged during the dialogue were:

- Indebtedness due to high input oriented cultivation
- Growing un-viability of agriculture due to mono cropping and overtaking the traditional systems of multi-cropping and increasing use of pesticides and fertilizers and less of organic manure.
- Non-availability of the seeds of native varieties and increasing dependency hybrid seeds in agriculture
- Lack of agriculture based enterprises and collective actions
- Skewed rainfall in the region in the last 10 years and therefore increased uncertainty in agriculture.

Lok Panchayat then approached GEF SGP/UNDP, CEE support for addressing the issues and improve the livelihoods of the farmers. Discussions between communities led to develop market linkage for organically grown food crops to sell for premium prices and to revive and sustain agro biodiversity of the region. This should be with support from consumers and developing a competitive, professionally managed farmers' body. The project then would potentially be a win-win situation for all and address the issues of availability of seeds of the local varieties, providing household nutritional security, low cost, low external inputs to reduce the cost of cultivation and increasing the affordability for small and marginal farming communities. The project covers around 35 Villages of Sangamner Block in Ahmednagar District of Maharashtra State. The area lies in the Kalasubai Harischandragad Wildlife which spreads from Kalasubai to Harischandragad in Akol Tehsil of Ahmednagar district.

The farmers from the 35 villages are the main stakeholders from different social groups like Schedule Caste (SC), Schedule Tribe (ST), and Other Backward Communities (OBC). National

Bank for Agriculture and Rural Development (NABARD), Local commercial banks, Agricultural University, Krishi Vigyan Kendra, (KVK) and state department of Agriculture and Livestock are the other stakeholders involved in the project.

Community consultation

In the project over the last five years more than thousand village level meetings have been conducted in more than 30 villages to select seeds prior to Rabi Season crop cultivation and farmers for production of seeds of traditional varieties. Average three meeting per month to each village have been conducted regularly over the last 5 years by the NGO.

Also, reach out through mobilization of self help groups. and develop self sustainable *Institute of Village Entrepreneurship* owned and managed by farmers ??.

In-situ conservation of traditional crops and development of Seed Bank

23 native crops such as Maldandi Jawar (Sorghum bicolor), Chandoshi Wheat (Triticum Spp), different millets, Red Gram (Cajanus cajan), Linsee (Linum usitatissinum), Safflower (Carthagmus Tinctorius) etc. Selected farmers from the villages including women farmers were identified for exclusively seed production. Totally 60 farmers were trained in seed production skill and Until 2009, the seed bank (*Gavran beej kosh*) of Krishak Panchayat has reported exchange of the seeds with more than 550 farmers from Ahmednagar district and Nasik district. Today it has more than 1200 members. Change in the behaviour of the Krishak Panchayat farmers made them to heavily rely on local material and Farm Yard Manure (FYM). This resulted in roughly the cumulative saving of Rs. 800,000/ for the farmers-. This was a great learning for the members that judicious use of FYM can bring big dividends.

Promotion of SHGs farmers clubs leadership training

Series of meetings and workshops were organized to mobilize the men and women farmers as Self Help groups and Farmers clubs. Training programmers were conducted on topics such as leadership development, organic farming methods, the advantages and revival of traditional crops,

In Sangamner town Lokpanchayat has set up a retail outlet for organic farm produce. In the first year, the outlet has sold 50 Q Pearl, millet, 40 Q Sorghum, 30 Q Wheat and 25 Q *Kalb hat*, a local traditional variety of rice. This outlet has a committed consumer base which is gradually increasing in the last few years.

mixed cropping system etc. Totally around 590 SHGs and 120 farmers clubs were formed with the active support of NABARD in the project area with a savings of Rs. 40 lacs and annual turnover of around five crores. Recently the NGO has introduced the community led farmer friendly and low Participatory Guarantee System (PGS) for certification of organic farming.

Irjik organic spot - an initiative of Baliraja Krishak Producer Company helps the farmers to get quality seed, fertilizer, adequate rate to various agri-commodities and forest produce, The community grain bank programme started to support the tribal families is gaining momentum and will be replicated and become self-sustained model for food security. The NGO planning to extend this program needs to all SHGs.

Established Baliraja Krishak Producer company in the year 2009 with 350 members with share capital over Rs.1,50,000. Revenue generated in 2009-10 – Rs. 4.5lacs, 2010-11 – Rs.7lacs, and 2011-12 – Rs.12lacs.

Results

A seed bank is in operation which supports the farmers in the region to get seeds of native crops Mixed cropping system, the traditional method of cultivation has been revived among the farmers in the region. This also results in the increased productive of the crops. Practice of organic methods

Krishakpanchayat Farmers

It is a village level farmer's group meant for collective decision making and action towards low external input sustainable agriculture. Krishak Panchayat is a change vehicle. It provides a platform to marginal men and women farmers to (a) share their experience and learn from each other and (b) collective decision making which was in the past very much a part of the village culture but declined with onset of market oriented agriculture. Krishak Panchayat provides for documentation and dissemination of traditional knowledge of farmers. Krishak Panchayat conducted training programs on preparation and effective use of plant based organic insecticides, in particular extract of Dashaparni (a mixture of ten plants). Now substantial number of Krishak Panchayat members used Dashaparni extract and becomes a common practice. Consequently these farmers started looking after Dashaparni constituents on their farms which they would otherwise ignore and would even remove treating them as weed. Farmers resorted to conservation of local crop varieties and linked with market to make it effective and sustainable. Krishak Panchayat has successfully experimented value addition to organically grown rice. Hand pounded organic rice fetched three times the price of usual rice.

like use of farmyard manure by huge number of farmers has substantially reduced the cost of cultivation.

Lokpanchayat is working as a service provider in organic farming certification program of Ministry of Agriculture, Government of India. This is in order to substantiate our efforts in sustainable farming.

A farmer managed organic outlet opened provides marketing opportunities for millet and other traditional crops and fetches premium prices for the farmers. This encourages more number of farmers to go for the cultivation of traditional crops through organic methods and increase the crop diversity in the region.

Farmers realized that traditional knowledge coupled with technical knowledge will give them better results; therefore it is important and necessary to have a mix of technology use to increase productivity of different local varieties. This has resulted in the increasing area and productivity for traditional crops like Devthan Bajara and Kaal Bhat rice variety.

The major challenge is the development of the community institutionalization model, which is a process and demands high amount of patience and with collaborative planning at every state with the active participation of the men and women farmers.

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Livestock Conservation and Livelihoods in Surendranagar, Gujarat

Despite India's position as highest producer of milk, productivity per animal remains a challenge particularly for the poor families in the rural areas. Among various factors contributing to low productivity of the animals, the chronic shortage of feed and fodder, coupled with their poor nutritive value, and timely veterinary care are considered as the major reasons. The increase in area under fodder production cannot be envisaged; therefore it is important to use available resources very cautiously and efficiently.

Surendranagar district in the state of Gujarat is a drought prone area, has a large number of pastoralists with huge number of cattle herds, but the income from the dairy is abysmally low. Even the cooperative sector has failed to bring any positive result among the pastoralists. As the area is mainly rainfed, consistent drought has led to poor feed availability, increasing pressure on the community lead to migration from the area and selling of livestock. The Global Environment Facility (GEF) UNDP/Small Grants Program (SGP) project supported the NGO MARAG with the objective to build the capacity of the community to address livestock production constraints, to promote sustainable livestock based livelihood by ensuring timely availability of quality inputs and most efficient use of the animal waste, revive the traditional practices and to improve the productivity.

The project activities were carried out in the following four villages Mera, Manavada, Gosana and Naviyani. Each of these villages has 120 to 400 families among whom a substantial number are of Maldharis, the pastoral people. Animal husbandry and agriculture are the primary livelihoods of the people. The Rupen River forms the northern border of the district. Gujarat livestock & animal husbandry department which provided the support for fodder species, veterinary care in developing the local communities as paravets (community livestock managers). Local banks provides access to credit and loans; and the Milk Diary for market support and the services of cattle feed etc. and; NABARD guiding and providing the additional grants for allied activities in the program for livestock management and conservation for enhanced livelihoods.

During the project period, through an interactive community led- process approach the NGO encouraged the local communities attitude towards grassland development, institutionalize them into small women led Self Help Groups (SHGs) in the four project villages. Fodder banks were created through local production systems, cattle feed was produced and stall feeding and promotion of best practices was encouraged and adopted. Veterinary services trainings were provided. 13 of the local farmers were trained as paravets so as to provide the communities with services on chargeable basis in partnership with the department of Livestock & Animal husbandry.

Promotion of indigenous breed

As part of promoting indigenous breed 10 units of good variety cows which could provide 9-10 litres of milk such as Kankrej and Gir were given to four villages . Also to improve the next generation breed good male bulls were provided to the communities.

Regarding the keeping of good variety calves from the best breed like Kankrej, Gir and HF cows, four calves (2 females and 2 males) were kept in Mera village and people from the other villages came to see these calves and they were told the advantages of keeping and maintaining better pedigree of calves.



From the villages of Mera, Naviyani, Manawada and Gossana people were taken to Adalaj, Gandhinagar, to show them how the best breed Kankrej cows were taken care of, the treatment given to them, and the fodder provided for them.

Promotion of fodder crop and fodder bank: MARAG found certain fodder crops were best suited for the area and by promoting them cattle rearing is better benefitted in villages. For the promotion of fodder crop cereals like maize, millet and oats were cultivated in

the four villages. In Mera village five acres of land was cultivated with maize as a fodder crop. Maize considered as a good protein helps enhance the milk quality for the cattle, and also increases the yield of the milk. This results in the development of the fodder bank by the local communities, six fodder banks were developed in four villages with the local varieties like Napier; Barseem, Millets, and using the local Glaricedia etc. Total stall feeding was not possible in this region because traditionally the cattle herders were sending out their cattle for open grazing. However a constant discussion in meetings with the community members to reduce the pressure on the grazing lands has led to the introduction of partial stall feeding system. Again the stall fed system also reduced the drudgery of the women who take the cattle for grazing.

Cattle Feed supply and Veterinary Services

Earlier farmers mostly women farmers had to go to faraway places to fetch cattle feed which involves a considerable amount for transportation and drudgery. To reduce the cost and avoid the drudgery a cattle feed shop has been opened in Bechraji town to facilitate the supply of cattle feed

to the four project villages. Now a group of women collectively hire a vehicle to transport the feed to their respective villages with considerable reduction of amount on transportation. With the support of women groups, milk cooperatives and local banks revolving funds were created to meet the financial requirement during crisis time to buy cattle feed from the shop. The NGO also facilitated the linkage with Mehsaa Dairy for the door delivery of certain products to the milk cooperatives in these villages.

Biogas and Organic Compost

Biogas plants the cheapest source of energy were also introduced around 30 households are successfully utilizing the biogas for their cooking needs from the organic waste. The waste or the slurry from the plant is used as good manure in their fields, perceive as a good system for converting the organic waste in to quality organic manure. The community preferred because they need not to spend time to collect



firewood, again drudgery to women members only. Seeing the advantages of BGP, now 50 more people have submitted applications to build the plant. An organic compost pit was made in Mera village for the demonstration purpose. The compost pit was filled with agricultural waste and it was mixed with “madhyam” or sani-treat to convert it into organic compost. The process takes 45 days to convert the agro waste into organic compost for use in agriculture. One pit can produce the compost needed to cultivate one acre of land. A total of 25 compost pits were made in the four villages under the project area.

Since Maldharis being traditional livestock rearing people, they know a lot about how to take care of the cattle, and the feed that is best suited for their growth and better milk yield, treatment for common ailments etc. Through several participatory workshops such a wealth of indigenous knowledge was documented and shared among the herders.

Results

The demand for Kankrej breed of cow has increased among the farmers of the project area and beyond. Now people have realized that keeping such a variety of cow is very much advantageous for them to get a better yield of milk and an increased income from the milk. Trainings and exposure visits help the villages to know about the better management of the Kankrej cows in their own village conditions.



There is a change in the attitude of the villagers to keep the better pedigree calves for themselves instead of selling them. Kankrej bull is very much in demand now among the farmers. Farmers now like to own good pedigree male calf to ensure better breed of calves.

The sowing of fodder crops taught the farmers its significance to produce good cattle feed in order to increase the milk yield. Nearly 80 farmers participated in demonstration of fodder crop. 84 families have replicated the spread of fodder crops in over 112 hectares of land. six fodder banks are now working in the project villages with a consumption of high green fodder. The fodder banks proved to be a great relief to the cattle herders, especially during the scarcity seasons of the year as they could provide fodder to their cattle easily. The cattle feed production unit established providing nearly 7500 kgs of cattle feed every month to the 400 plus farmers. Nearly 76 stall feeding pits were constructed during the project period for fodder.

After seeing the advantages of using organic compost, the demand for organic compost has increased among the village farmers. People have now become increasingly aware of the advantages of biogas plant and therefore requests to get help to make biogas plant have increased in the area. The workshop on appropriate technology has given a morale boost to indigenous knowledge holders regarding the treatment for various ailments of the bovine stock and the indigenous medicines used for them. It will help to preserve those indigenous knowledge and practices and treat their cattle.

Grassland development process was delayed due to legal conflicts with the villagers who encroached the common land. This has adversely affected the objective of developing 30 hectares

of grassland during the project period. Out of 30 hectares only 14 hectares of land was developed as pasturelands, because of land conflicts among the village people. Land demarcation was another problem that hindered our project. Cultivating different varieties of fodder grass and fodder crop helped to strengthen up fodder diversity in the area.

Maldharis migrate periodically in search of fodder and pasture to far away places and because of this it is very difficult to work with them regarding their livestock care and up keeping.

A range of community benefits have emerged in the project leading to form 4 SHGs and federations for the milk collection. Nearly 870 litres of milk collected (2008) could you elaborate this point a bit more. 30 bio gas plants have been constructed in the villages. 50 more have been constructed with government subsidy. A total of 30 compost pits were constructed in the four villages under the project area in leverage to the departments and communities own co financing.

Linking the nomads and the poor herders with milk cooperatives was much needed and had to be ensured that the farmers get fair prices for their yields. Milk cooperatives can be a viable means to ensure regular income, and to reduce the migration of Maldharis because of enhanced livelihoods.

They also learned that indigenous veterinary practices are better for the health of the indigenous livestock than the modern practices.

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