People and Protected Areas

Conservation and Sustainable Livelihoods in Partnership with Local Communities

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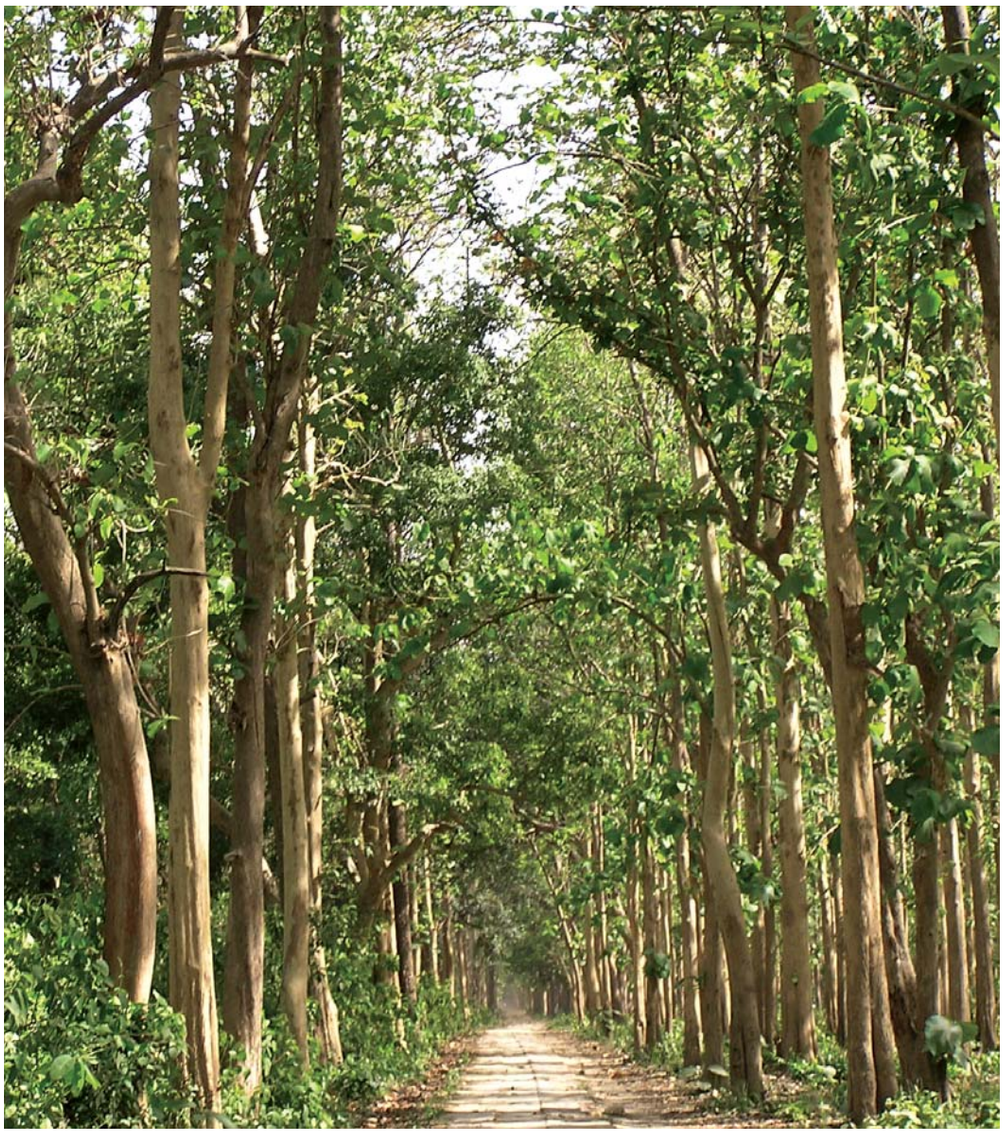

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People and Protected Areas: Conservation and Sustainable Livelihoods

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People and Protected Areas: Conservation and Sustainable Livelihoods in Partnership with Local Communities

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Many organisations and individuals have contributed towards the successful implementation of the network programme on People and Protected Areas. The foremost among them is the SEED division of DST without whose support the programme would not have been possible.

Dr Vinita Sharma, Advisor & Head, SEED Division, Department of Science and Technology, Ministry of Science and Technology, Government of India was the motivating force behind the programme and played a significant role in its conceptualisation and design. She guided the programme at each step and allowed the programme to be flexible and innovative.

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The network programme was implemented by a large number of partners. They were the most crucial as without them we would not have been able to work in such diverse areas and issues. Almost without exception, all the work was completed on time. For such a large exercise, involving 12 partners and 13 Protected Areas, this in itself is a remarkable achievement. We would like to thank each and every Principal Investigator and their colleagues from each partner organisation for all the hard work and dedication in executing the work on the ground.

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Photo Credit: Vishaish Uppal

Fuelwood collection from forests

FOREWORD

India is a country with tremendous biological and cultural diversity. It has 10 biogeographic zones representing different ecosystems as well as 91 eco-cultural zones, which are inhabited by more than 4500 community groups. Around 20 per cent of the geographical area of the country is covered with forests and many of these forest areas have tribal or traditional communities dependent on forest resources for their subsistence and livelihoods. For such communities the forests are an integral part of their life with important and irreplaceable social and cultural values.

In India, the Protected Area (PA) network consists of 668 PAs extending over 4.9 per cent of total geographic area of the nation. There are 102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves. Protected Areas in India have been declared with the primary objective of biodiversity conservation and exclude most activities related to resource extraction and use by local communities. Very few direct benefits of PAs therefore accrue to local communities. The cost of conservation, however, has primarily been borne by such communities (such as depredation of crops and livestock by wild animals, death and/or injury to humans by wild animals, opportunity costs from denied access to use of resources within PAs). The government and the civil society are taking several measures to address these issues. Improved synergies and better coordination amongst the wide array of stakeholders are needed to meet the challenges of conserving India's diverse wilderness resources.

The Department of Science and Technology (DST) has been playing a major role for socio-economic development through science and technology applications. DST has been implementing a range of schemes and programmes for connecting S&T with society. The Network Programme "People and Protected Areas: Conservation and Sustainable livelihoods in partnership with local communities" has been a joint initiative of the SEED division and WWF-India to coordinate and support the efforts of local and grassroots NGOs promoting innovative mechanisms to enhance local livelihoods for communities living in and around Protected Areas. In the period spanning over three years (2008-11), 12 voluntary organizations worked as a part of the network programme. This recently concluded programme has a plethora of learnings to offer to the relevant authorities, conservationists, local community leaders and others interested in human-nature relationship in general.

Overall the results of the network programme have been very encouraging. I congratulate WWF-India and all the partner organizations for successfully completing the programme. Encouraged by the results of this network programme, SEED, DST is supporting a second phase of the network programme extending the coverage and number of partners to be supported.

This publication provides glimpses of the work carried out by grassroot level voluntary organizations for linking need based technological solutions with viable support mechanism to address conservation and livelihoood issues involving community. I strongly recommend to those interested in understanding the work to visit the field locations and our partners. On the special occasion of CoP-11 being hosted by India, it is my pleasure to present you the results and share experiences of this wonderful work.

Dr VINITA SHARMA
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LIST OF ABBREVIATIONS

AERF	Applied Environment Research Foundation
ARTI	Appropriate Rural Technology Institute
BAIF	Bharatiya Agro Industries Foundation
CARD	Centre for Action Research and Documentation
CBO	Community Based Organisations
CCD	Covenant Center for Development
CDC	Community Development Center
DA	Development Alternatives
DDS	Deccan Development Society
DEG	Darjeeling Earth Group
DST	Department of Science and Technology
FRLHT	Foundation for Revitalization of Local Health Traditions
HESCO	Himalayan Environmental Studies and Conservation Organisation
HIMUL	Himalayan Cooperative Milk Producers Union Limited
IIT	Indian Institute of Technology
KVK	Krishi Vigyan Kendra
MNRE	Ministry of Non Renewable Energy
MoEF	Ministry of Environment and Forests
MoTA	Ministry of Tribal Affairs
NGO	Non Government Organisation
NTFP	Non Timber Forest Produce
ORMAS	Orissa Rural Development and Marketing Society
OUAT	Odisha University of Agriculture and Technology
PA	Protected Area
RC	Rural Communes
RRDRO	Raghavendra Rural Development and Research Organisation
SAKTI	Search for Action and Knowledge for Tribal Initiative
SC	Scheduled Caste
SEED	Science for Equity Empowerment and Development
SGNP	Sanjay Gandhi National Park
SHG	Self Help Group
ST	Scheduled Tribes
SU	Shramjivi Unnayan
TRIFED	Tribal Cooperative Marketing Development Federation
WWF	World Wide Fund for Nature

Chapter 1
INTRODUCTION

India is one of the ten mega-biodiversity countries in the world and signatory to many international conservation protocols. India is also home to over a billion people accounting for about a third of the world's poor. About 200 million of these poor people are estimated to be dependent on forest resources for their livelihoods. At the same time, India is a rapidly developing economy and must find ways to address the interface of poverty, development and conservation. The resources on which the poor depend for their livelihoods are being increasingly eroded due to a complex set of factors including lack of tenurial security, rapidly changing aspirations, external threats and pressures, and breakdown of traditional management systems. Environmental degradation deepens vulnerability of the poor leading to overexploitation of resources and further poverty.

There are 187 tribal districts in India and some of them are the poorest districts in the country. 20 per cent of the geographical area of India is covered with forests. Many of these forest areas have tribal or traditional communities dependent on forest resources for their subsistence and livelihoods. For these communities, forests are an integral part of their life having important and irreplaceable social and cultural values. The Protected Area (PA) network in India covers around 4.9 per cent of India's total geographical area. The primary objective of a PA is biodiversity conservation. Activities related to resource extraction and use by local communities are discouraged. Very few direct benefits of PAs accrue to the local communities. However, the cost of conservation is mostly borne by the local communities (such as depredation of crops and livestock by wild animals, death and/or injury to humans by wild animals, opportunity costs from denied access to use of resources within PAs). This leads to hostility and conflict between local/tribal communities and the PA managers. In some areas, the consequences of conflict between PA managers and the local communities lead to degradation of habitat and little or no support for conservation at the local level.

The root cause of this conflict is in the limited availability of viable alternatives and affordable solutions to the problems faced by the local communities. In order to demonstrate that local/tribal communities and PAs can exist in a progressive society while ensuring mutual benefits, there is a need to learn from ongoing initiatives, promote new ideas and scale up the impacts of existing programmes so as to inform both policy and practice across the country. Various schemes aimed at balancing the costs and the accrual of benefits of PAs to the local communities have been initiated by the government. Such schemes include development of sustainable livelihoods, sharing of tourism revenues, employment generation, as well as enhanced compensation. These initiatives are being implemented by the Forest Department as well as NGOs with varying degrees of success.

The programme, "People and Protected Areas: Conservation and Sustainable livelihoods in Partnership with Local Communities" is a joint initiative of the Science for Equity Empowerment and Development (SEED) Division of the Department of Science and Technology (DST) under Ministry of Science and Technology, Government of India and WWF-India. The programme is focused on coordinating and supporting the efforts of local and grassroots NGOs promoting innovative technologies with systems approach to enhance local livelihoods for

Map 1: Location Map of the Projects in the Network Programme

communities living in and around PAs. The aim is to demonstrate the way technological innovations and scalable interventions can help to enhance sustainable livelihood opportunities for local communities as well as conserve the resources they depend upon.

The objectives of the network programme are given in Box 1.

For the implementation of the network programme, WWF-India and SEED division of DST collaborated with 12 NGO partners. The programme covered 13 PAs spread over various eco geographical regions of India. Partners were identified on the basis of their willingness to engage in this programme, their long association with the region and local communities around PAs from diverse ecosystems and those working on sustainable livelihoods and conservation issues.

Box 1: Objectives of the Network Programme

1. To demonstrate innovative approaches and mechanisms based on appropriate technological inputs that enhance sustainable local livelihoods for local and indigenous communities living around PAs and strengthen ecological services and long term sustainability of the PAs across the country.
2. To support and build capacity of NGOs and CBOs implementing these initiatives for enhancing links between conservation and sustainable livelihoods.
3. To enhance impacts and sustainability of the initiatives through facilitation of learning and sharing of lessons within and between community groups, NGOs, government agencies and the private sector.

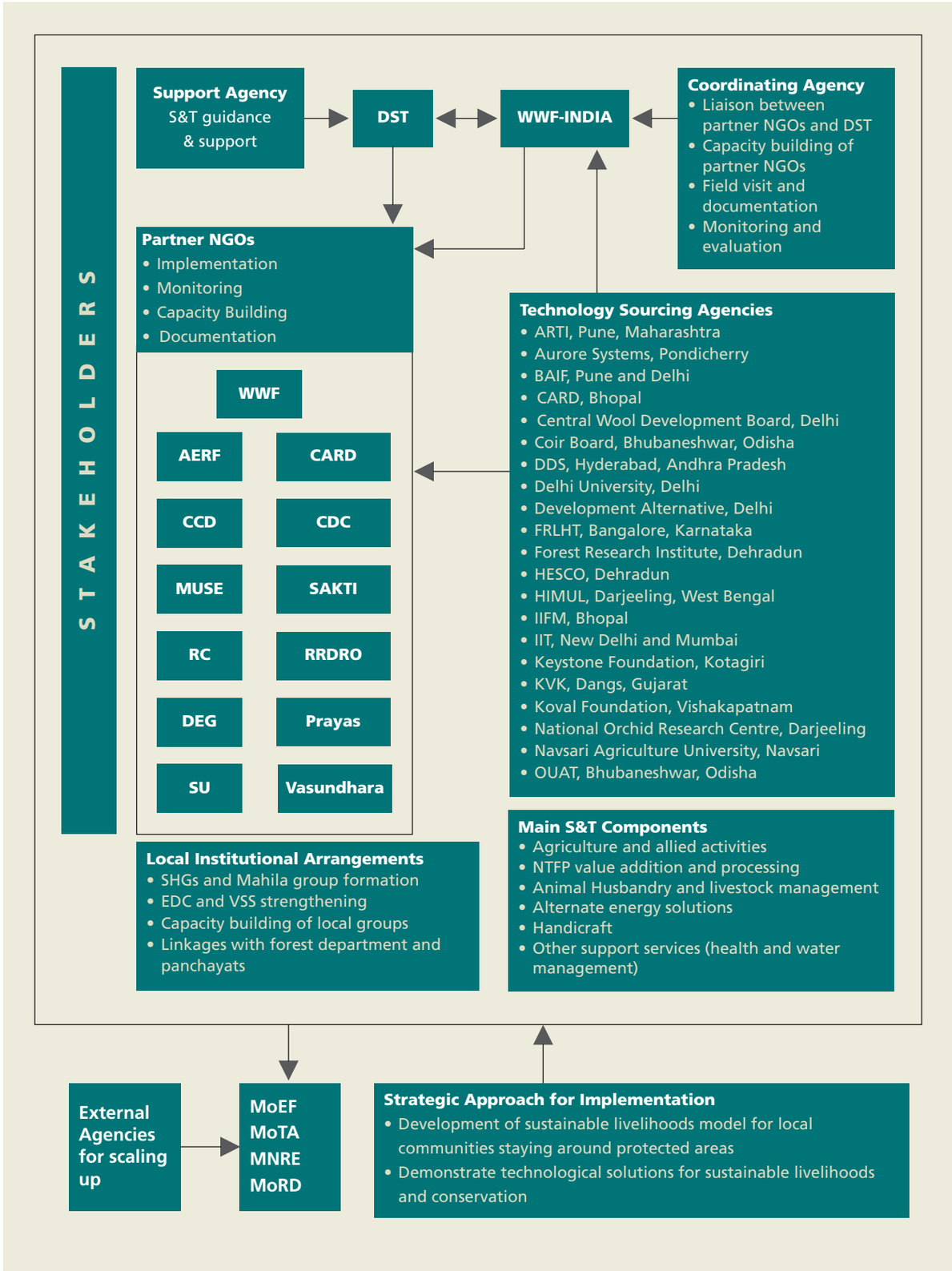
Operational framework of the network programme, its geographical coverage and information on the collaborating NGOs of the network programme are provided in Annexure I.

In the following chapters (chapters 2 to 14), information on work carried out by each partner agency has been provided. Last chapter of this publication is an over view of the significant accomplishments of the network programme and it concludes with a note on the way forward.

Photo Credit: WWF-India

Review Workshop in Progress

Diagram 1: Stakeholders of the Network Programme and Their Roles



Chapter 2
SUSTAINABLE LIVELIHOOD AND CONSERVATION: A JOINT ENTERPRISE

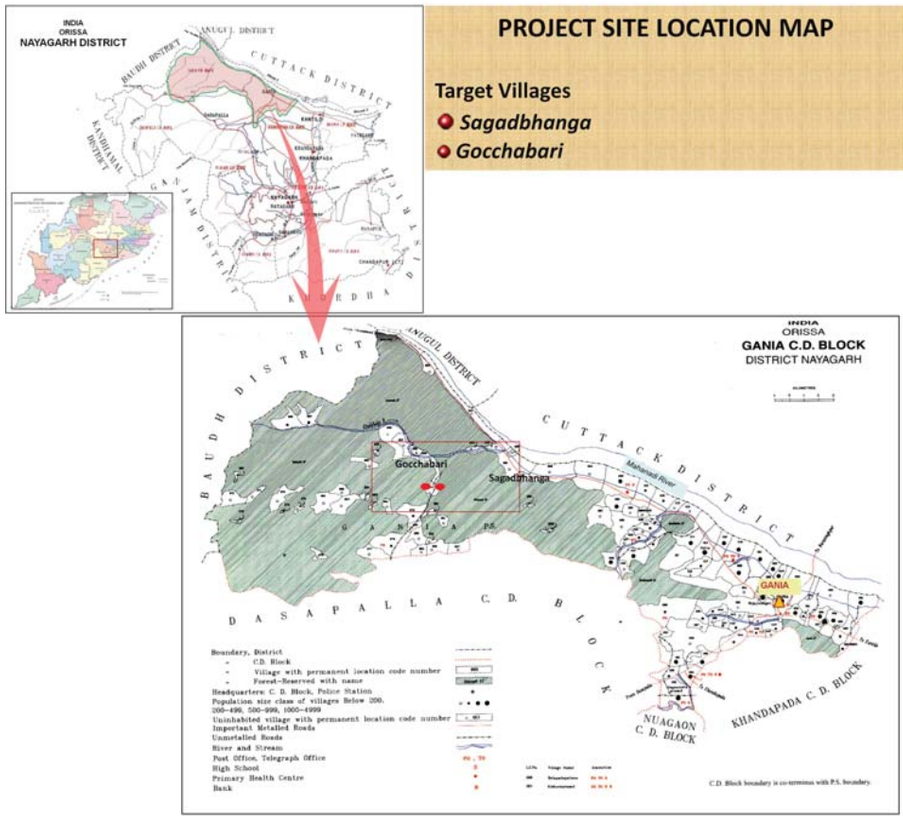
Baisipalli Wildlife Sanctuary is situated in the Nayagarh district of Orissa. It covers an area of 168.35 square kilometers and is spread over two forest divisions of Nayagarh and Boudh. The sanctuary is contiguous with the Satkosia Wildlife Sanctuary and has a mixed forest ecosystem with dense canopy cover. The sanctuary has dense Sal forests which harbour wildlife like the leopard, sambar, wild boar and the elephant. The sanctuary is also a source of various perennial streams and water bodies and serves as a carbon sink for the growing industrial and mining projects in the neighbouring Angul district. The local people realise the importance of forests as it provides them with fuelwood, materials for household construction, agricultural equipments, water source, various tubers and NTFPs that are a major source of their livelihood and sustenance.

Vasundhara has worked with two villages bordering Baisipalli Wildlife Sanctuary in Nayagarh District of Odisha. These two villages are dependent on the forests for their livelihood. Paddy cultivation is the major occupation in these villages. However in the lean season, the forest becomes the lifeline of the villagers. Introducing sustainable, non destructive harvesting and value addition of NTFPs was timely and helped the villages. Therefore, technological interventions in these villages have focused on sustainable harvesting and value addition of select NTFPs, semi-processing of traditional millets and introducing a simple water purification device to check water-borne diseases.

Village meeting in project villages of Vasundhara

Photo Credit: Vasundhara

Map 2: Location Map of the Project Villages



2.1 AREA, PEOPLE AND LIVELIHOOD

The villages Sagadbhanga and Gucchabari are inhabited by the Kondh tribe. The former has 25 households whereas the latter has 51 households. Population of both these villages is around 300.

Paddy cultivation constitutes a major livelihood activity in this area. Casual wage labour in the nearby towns is also important for augmenting cash income. Forests contribute in various ways to the local livelihood. For example, many NTFPs are valued for their support.

Table 1: Major Activities

Activities	
Livelihood diversification	Value addition and sale of Mahua products Value addition and sale of Millet products
Modification of existing livelihood practice	Oil extraction from seeds using modern, manually operated oil expeller unit Reviving Millet cultivation Collection of Mahua flowers using net Water filter for quality drinking water
Capacity building	Training Programmes on preparation of Mahua Jam, Millet processing for marketable products, use of water filter
Institutional Set Up	Community based SHGs Linkage with ORMAS and Reliance Fresh for marketing and sale of products

Box 2. Sustainable Harvesting and Processing Of NTFPs: A Case of Mahua Flowers

Collection of Mahua flowers is a tedious job. It involves clearing the ground by burning the undergrowth of each tree. This helps locate the flowers easily. There are two disadvantages associated with this collection method. If unchecked, it often escalates into a forest fire. Also the fallen flowers get soiled with dust and become unfit for use in the preparation of edible products.

Vasundhara introduced an alternative to the conventional Mahua flowers collection method. In this improved method, instead of burning the undergrowth, nylon nets of appropriate mesh size were introduced. The nets are tied to four wooden poles to keep it raised above the ground. This enables the Mahua flowers to fall into the net instead of the ground and not get any dirt on them.

Photo Credits: Vasundhara

Mahua flowers is an important NTFP in the local economy of villages bordering Baisipalli Wildlife Sanctuary

For processing of Mahua flowers, a cement platform was constructed. The flowers are sun dried by spreading them on the platform. The earlier practice of drying the flowers was on any flat surface including the home courtyard leading to flowers getting soiled.

Under the guidance of Food and Nutrition Department of the Odisha University of Agriculture and Technology (OUAT), women of both villages learnt to prepare Mahua jam from the dried flowers. The women also learned various processing and production techniques to improve marketability of the jam by mixing it with various locally available fruits. The jam is now being marketed in Bhubaneshwar. The women's group is also participating in various fairs and exhibitions to sell their product. The Odisha Rural Development and Marketing Society (ORMAS) and Reliance Fresh are also helping in marketing of the jam to other parts of Odisha. Although the net income in the initial stages was not substantial, it was sufficient to reinforce enthusiasm and motivation of the village women to continue Mahua jam production and sell it through various channels mentioned above.

Mahua jam being bottled by women SHG members in Vasundhara's project village bordering Baisipalli Wildlife Sanctuary

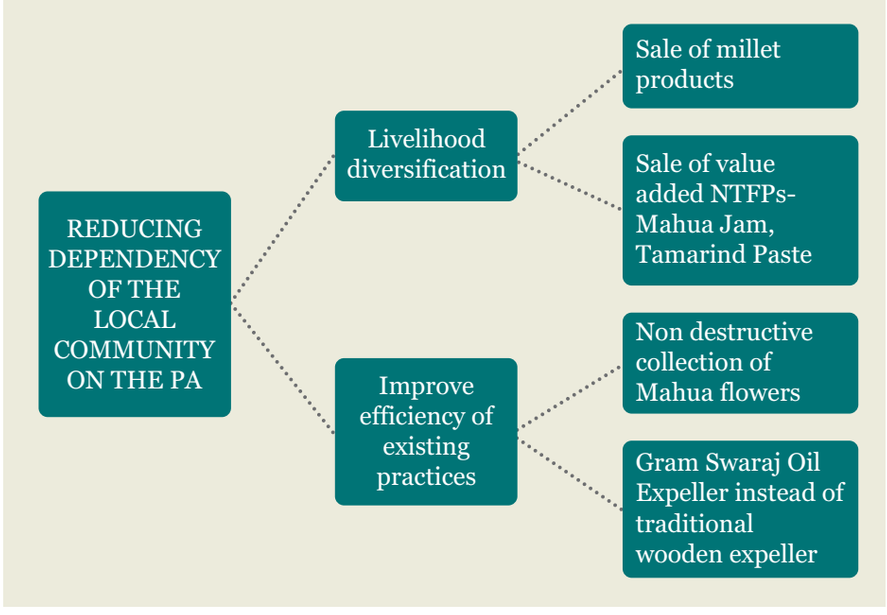
Under the project, a smallscale processing unit with relevant equipment like gas stoves, utensils, measuring cylinders, beakers, grinders, gloves, aprons, sealing machines and nets for the collection of flowers has been established.

Collection of mahua flowers by nets was introduced by Vasundhara as a modification to the traditional collection practice

Photo Credit: Vasundhara

The reconnaissance survey conducted before the intervention revealed that there was reasonable scope to introduce processing of NTFPs so as to improve their marketability and shelf life. It was also observed that semi processing of the traditional millets would improve saleability in the local market. The baseline information also provided information on some prevalent and persistent health problems in the project area. Based on these observations and consultations with the villagers, especially women SHGs, it was decided that Vasundhara would introduce an alternative method of collection of Mahua flowers and its value addition, an oil expeller to improve efficiency of extracting oil from Karanj and other local oilseeds, millet processing to improve its marketability and install a water purifier which would be managed and owned by the village community to reduce incidences of waterborne diseases.

Diagram 2: Green Livelihood Model of Vasundhara



2.2 TECHNOLOGY ADOPTION AT COMMUNITY LEVEL AND LIVELIHOOD BENEFITS

Millet cultivation and processing to improve marketability: Millets are rich in both major and micro nutrients. Another critical characteristic of millets is that they can grow on poor soil conditions with little or no external input. In brief, millets are a boon for farmers owning marginal lands, in particular tribal cultivators inhabiting inaccessible areas. However, over the years, area under millet cultivation has been decreasing. The main reasons for this are the fragmentation of land, lucrative offers of cash crops, reduced availability of cultivable land at the household level, and shortage of man power due to outward migration of the young generation to town and cities in search of employment. It was thus necessary to provide incentive to revive this tradition of millet cultivation, which is also crucial for food security. Thus, improving saleability of Ragi (*Eleusine coracana*) in the local market and own consumption by value addition was crucial. Consistent efforts of the enthusiastic community members along with Vasundhara's staff resulted in gradual increase in number of households participating in Ragi cultivation in the second and third year of the project compared to the first year. The community members were trained in processing the millet to prepare ragi burfi and ragi powder. The women's cooperative participated in the trade fairs and exhibitions in Bhubaneswar and Kolkata and local weekly markets to sell the products.

Modified manually operated oil expeller as alternative to traditional oil expeller: Traditionally, in the project villages, wooden oil press was used to extract oil from the seeds of Karanj (*Pongamia pinnata*), Kusum (*Schleichera oleosa*) and Mahua *(Madhuca indica)*. Vasundhara introduced a manually operated improved oil expeller, which had an improved output of 15kg of oil per hour as compared to 2 kg per hour by the traditional wooden expeller for the same amount of physical effort.

Drinking water unit: Waterborne diseases were common in the project villages. During consultations with the villagers in the initial part of the project, clean drinking water was identified as a priority requirement for the villages. To address the quality of drinking water, a water filter has been installed in both the villages. For maintenance of the water filter unit, a water user committee has been formed in both the villages. The committee collects monthly contribution from each family in the village which is used for the maintenance of the water filtration unit. The community members regularly drinking the filtered water have reported that waterborne ailments, in particular among children, have reduced considerably.

Photo Credit: Vasundhara

Water purifier set up by Vasundhara in the project villages bordering Baisipalli Wildlife Sanctuary

2.3 CONCLUSION: INTERVENTION IMPACT

Collection of Mahua flowers by using nets has provided a strong alternative to physical labour intensive conventional collection method. It has reduced drudgery among women. It also has contributed in reducing the forest fires caused due to open uncontrolled burning of the leaf litter to clear the ground for Mahua flower collection. In brief, introducing collection of Mahua flowers using the net has contributed directly to conservation of flora and fauna in the wildlife sanctuary. This method of collection has also provided good quality Mahua without any soil impurities which fetches a good price in the market. Value addition, processing and sale of Mahua jam are important in keeping up motivation of the community members to continue the non-destructive Mahua collection. Revival of millet farming, its value addition, improved oil expeller has also led to diversification of livelihoods among the community.

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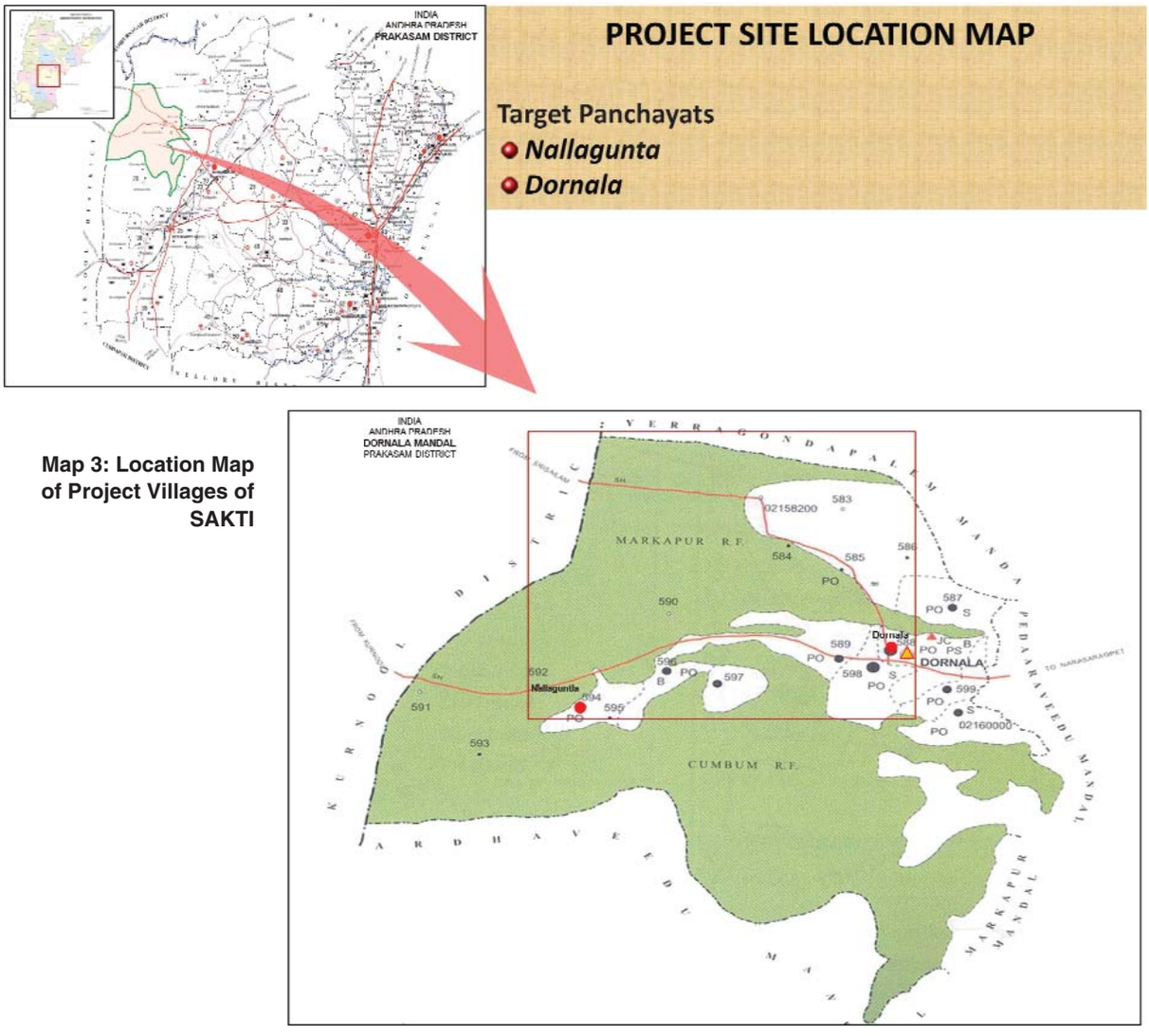
Chapter 3
LINKING CONSERVATION AND EMPOWERMENT OF CHENCHUS

Srisailam Wildlife Sanctuary is unique for its scenic beauty with River Krishna meandering through it. The geological formations, the topography and the forest types are true representatives of features of Deccan Plateau. Besides being a wildlife sanctuary this area is also notified as a tiger reserve along with Nagarjuna Sagar and is the largest tiger reserve in India. The amazing and rich floral diversity encompasses scores of medicinal plants and also several rare and endangered species. Trees like Teak, *Terminalia tomentosa, Terminelian bellerica, Chloroxylon swietenia, Boswellia serrata* etc; form a majority of the forest. Huge trees of Ficus are concentrated in places like Chintala, Farhabad and Pullaipally. There are Bamboo brakes as pure patches forming ideal habitat. Mammals like Leopard, Indian wolf, Sambar, Sloth bear, Wild dog, Jackal, Striped hyena, Spotted deer, Mouse deer, Chinkara, Chowsingha, Honey badger, Nilgai, Dhole and Porcupine also share the Tiger's domain.

SAKTI is an Andhra Pradesh based voluntary organisation. It works in villages bordering the Srisailam Wildlife Sanctuary. The sanctuary is home to the Chenchus, a primitive tribe. The Chenchugudems (tribal habitations) are not easily accessible. They are spread over the hills along river Krishna passing through the sanctuary.

Leafplate making machine installed in a project village by SAKTI as an effort towards livelihood strengthening

Photo Credit: SAKTI



Map 3: Location Map of Project Villages of SAKTI

3.1 AREA, PEOPLE AND LIVELIHOOD

The project was implemented in six villages falling in Nallagunta and Dornala Panchayats in Prakasam District. The villages are Korraprolu, Tummalabayalu, Peda Mantanala, Chintala, Ayyannakunta, and Pothannagude bordering the Srisailam Wildlife Sanctuary. The sanctuary comprises of dry deciduous forests.

The Chenchus are primarily honey collectors. In addition to honey collection, they are also into collection of NTFPs like gum, tamarind, amla and adda *(Bauhinia vahlii)* leaves from the forest. However, there is a high level of exploitation by the traders to whom the Chenchus sell NTFPs. Often, the traders are also money lenders who give cash advances to Chenchus for a buyback of all their forest produce at very low rates. During the initial survey, it was found that Chenchus do not have any facility to carry out NTFP value addition. Poor access to health

Photo Credit: SAKTI

Adda leaf plates prepared for being pressed in machine in villages bordering Srisailam Wildlife Sanctuary

facilities, lack of education and alcoholism also add to social complications. Some Chenchu families are engaged in agricultural activities. Their lands are mostly marginal and rain fed.

The project focused on science and technology inputs to existing livelihood practices of the Chenchus in the project villages. Sustainable harvesting and value addition to various NTFPs collected by the community members formed the core of the project interventions. Some activities like machine repairing, using improved seeds and tools for agriculture and ecotourism were introduced as livelihood diversification. Quite a few training programmes have been conducted as part of the capacity building of the community members. The project interventions were implemented through SHGs. Participation of women of the community was noticeable and significant.

Table 2: Activities of SAKTI

Activities	
Strengthening existing practices	Tamarind and Amla processing Fishing and fishing nets Honey collection Gum collection and processing Improving farming techniques
Livelihood diversification	Adda (*Bauhinia sp.*) leaf plate making
Capacity Building	Demonstrations and Exposure Visits Training Programmes

3.2 LIVELIHOOD IMPLICATIONS AND IMPACTS

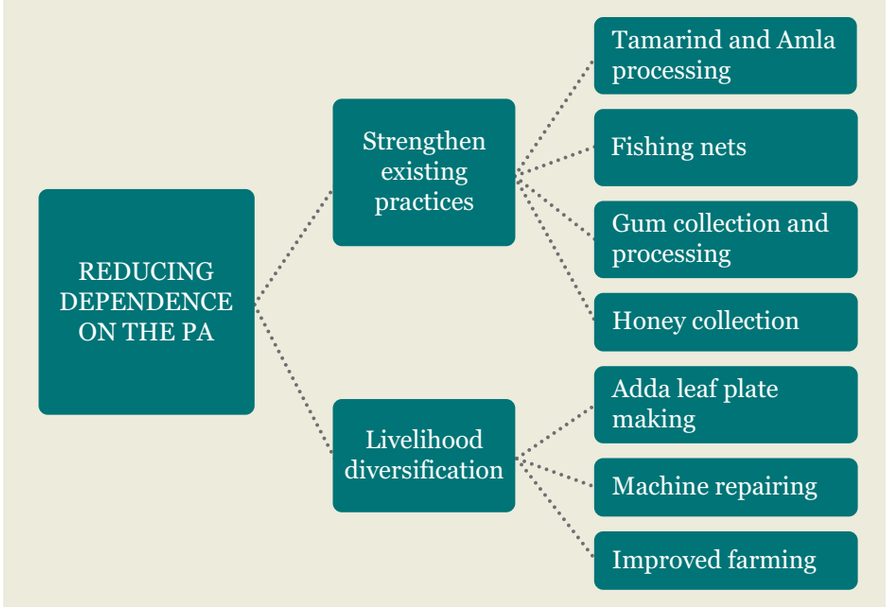
To strengthen existing livelihood practices, Tamarind (*Tamarindus indica*) and Amla (*Phyllanthus emblica*) processing has been introduced. Fifty women were trained in tamarind deseeding, drying and cake making. Tamarind cake making machines have been installed in the villages of Mantanala and Cheruvugudem. The women SHGs successfully prepare the cakes and sell them locally. In three years, the total income earned was almost double their annual income from the sale of unprocessed Tamarind and Amla.

Focus was also paid to the current agriculture practices by introducing improved farming techniques in these villages. Better tools and improved quality seeds of Bajra, Jowar, Horse gram, Bengal gram, and Kodo millet were provided to 100 families. Through this small intervention, each family was able to meet its food requirements and also earn some additional income through sale of surplus produce. There was an addition of almost 25 per cent to their annual income from the sale of agriculture produce.

Four fishing nets were purchased and given to one family each in the villages of Korraprolu, Tummalabayalu, Mantanala and Cheruvugudem. Each family is earning Rs 2000 in the season by selling fish in the local market. Similarly, two groups of community members were trained in sustainable, non destructive honey harvesting by providing honey collections kits which has helped to collect honey through non destructive practices. During the three years of the project period, the volume of honey collection was 15,000 kg.

Training programmes on sustainable and non destructive harvesting of gum from the forest trees have been conducted for the women SHGs. The training programme included drying, grading, weighing and non destructive gum collection from various tree species in the forest. Training programmes on leaf plate making machine was also conducted for the women SHGs. Adda (*Bauhinia vahlii*) leaves are used by the women to make leaf plates and sell them to locals visiting the sacred hill and the temple.

Diagram 3: Green Livelihood Model of SAKTI



Box 3: Value addition and sustainable harvesting of honey and gum to augment household income

Honey collection: Chenchus are traditional honey hunters. They collect honey with great interest, commitment and dexterity. Unlike the other pursuits of food gathering, collection of honey is a difficult task, requiring great skill, courage and expedient material for its operation.

Honey is collected from hives overhanging various objects like tall trees or bushes or cliffs of the rocky outcrop. Traditional honey collection involves burning leaf litter or small bushes below the hives. The smoke generated from burning disturbs and distracts the honey bees. During this time, honey bees keep away from the hive. The honey collector then removes the entire hive or whatever portion he can lay his hands on. Often honey collection by this method leads to the total destruction of the hive.

SAKTI organised a series of training programmes on non-destructive honey collection with help of experts from the Keystone Foundation in Nilgiri Hills, Tamilnadu. The technique in which Chenchu community members have been trained ensures keeping the bee hive intact so that the bees can reconstruct the hive. Only honey core of the hive is removed. As a follow up of the training, 20 participants were given honey collection kits that included ladder, ropes, drums, buckets and baskets to collect honey of the rock bees. The honey is sold in the local market and to the tourists visiting Srisailam temple.

Photo Credit: SAKTI

Bee hive in Srisailam Wildlife Sanctuary

Gum collection and processing: Chenchus collect two types of Gum namely Tapasi karyia gum (*Sterculia urens*) and Kondagogu gum (*Cocholospermum gossypium*). It is sold to the Girijan Cooperative Corporation, a government undertaking. Commercially the gum is classified into different grades based on purity and colour of the gum. Gum of each grade fetches a different price. It was observed that the community members hardly had any information on grading of the gum. A training on sustainable extraction, drying, weighing and grading of various types of gum was conducted. The training also included a component on pricing and rates for different grades. Trained community members are now able to effectively process, weigh and grade their produce. This has resulted in getting a better price compared to what they used to get earlier for their ungraded produce.

As a functional capability development initiative, youths from Tummalabayalu, Peda Mantanala and Chintala were trained in bicycle and diesel engine repairing to provide additional source of income. They have been provided with a toolkit containing essentials like wrench, screw driver and pliers.

3.3 CONCLUSION: INTERVENTION IMPACT

Among all interventions of SAKTI, training programmes on sustainable harvesting of honey and gum and subsequent application of these techniques by Chenchu community are directly linked to conservation of forest resources. Tamarind and Amla processing is important for improvement in income generation of the community members. Similarly machine based Adda leaf plate making is important for the women. All the above has helped in augmenting income and the improved agriculture has provided food security to the Chenchus.

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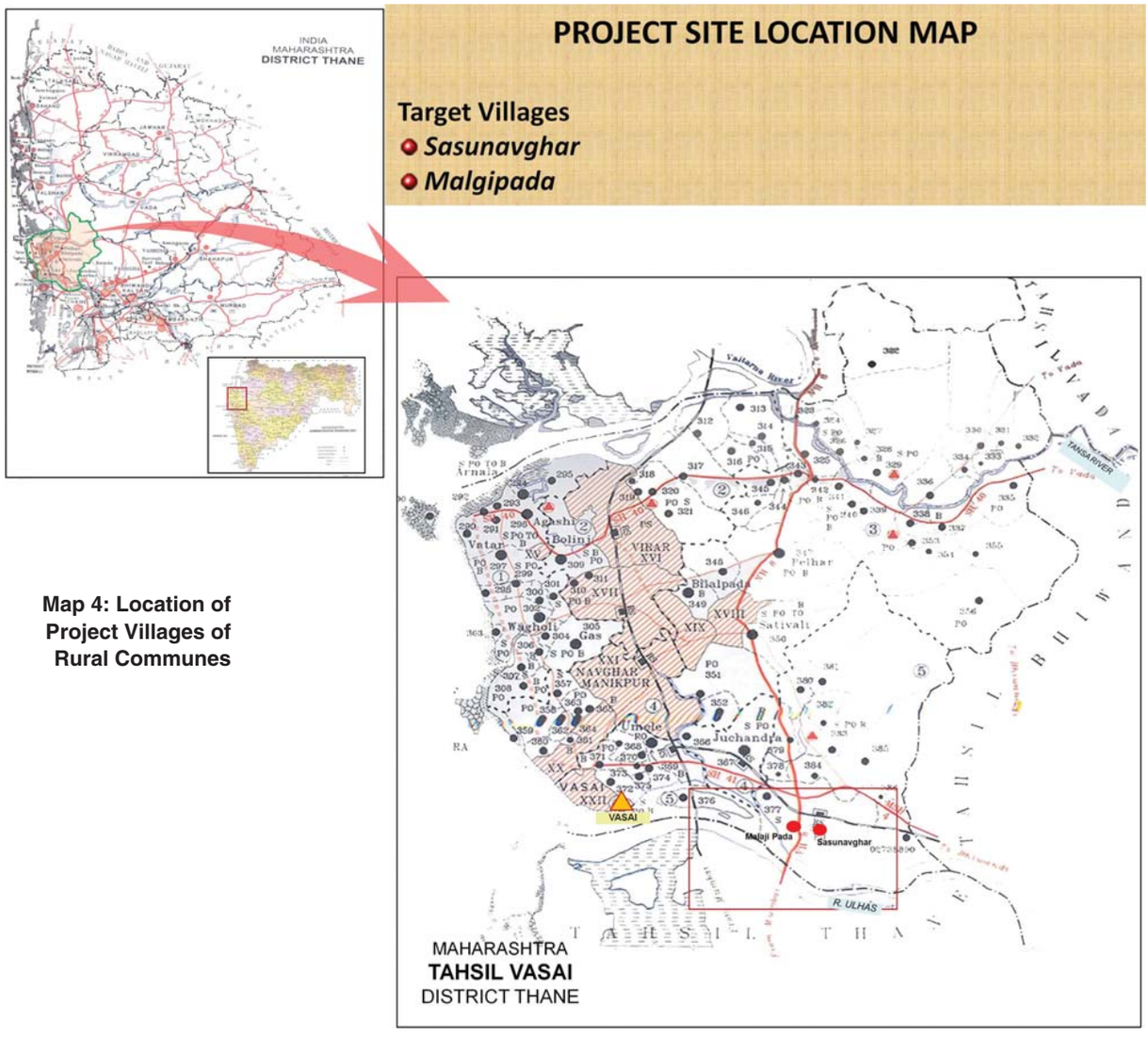
Chapter 4
APPLICATION OF APPROPRIATE TECHNOLOGY AND FIELD BIOLOGY BASED NATURE TOURISM

Sanjay Gandhi National Park is located on the north western border of Mumbai. Sanjay Gandhi National Park (SGNP) has dry to moist deciduous, semi-evergreen, mangrove, open scrub and thalophyte forest types. A narrow strip of mangroves and semi-evergreen hilly tract with dense bamboo growth and a perennial water stream locally known as Korlai Nalla are some of the interesting features of the area. The target community mostly comprises of tribals i.e. Katkari, Thakur, Mallhar-koli, Varli, and Agri i.e. OBC. Their major occupation is agriculture and around 50% families have illegal liquor distillation business. School facility is poor and the illiteracy rate is very high. To augment cash income, women collect fuelwood from the forest and sell it in nearby villages and towns. They also work in the farm for daily wages. Men work in small companies on daily wages and the youth are engaged in illegal liquor distillation. Some tribal families have boats for fishing and they sell fish in Bhaindar, Malad and Thane. However, most of the families collect fuelwood from the forest and sell it in nearby villages.

Rural Communes is a Mumbai-based NGO. Since 1976, it has been working with tribal and farming communities in the districts of Thane and Raigad, in Maharashtra. As a part of the network programme on People and PAs, Rural Communes worked in two villages bordering SGNP. In consultation with the local communities of these villages appropriate technology-based applications like solar dryers and

Beneficiary of collective farming, harvesting tomatoes in Malji Pada village bordering SGNP. Introduced by RC as a livelihood improvement intervention

Photo Credit: Rural Communes



Map 4: Location of Project Villages of Rural Communes

fuel efficient *chulhas* were introduced. Collective farming, forest home gardens and nursery-raising were also initiated. Training and capacity-building programmes on nature tourism, drying of vegetables, *chulha*-making and nursery-raising were also carried out.

Table 3: Activities of Rural Communes

Activities	
Strengthening and/or Modification Of Existing Practices	Forest home gardens
	Fuel efficient chulha
Introducing New Practices and Technology	Solar Dryer
	Charcoal kiln
	Oil expeller
	Pulveriser
	Mat Nursery
Capacity Building	Self Help Groups

4.1 AREA, PEOPLE AND LIVELIHOOD

The project was implemented in two villages viz. Sasu-Navghar and Maljipada. They are located in the Nagla block of Thane district across the Vasai Creek. There are six hamlets in these two villages. There are four tribal communities namely Katkari, Thakar, Mallhar-Koli, Varli and Agri, a non-tribal farming community in the project villages. Important livelihood activities of the communities in the project villages are paddy cultivation, NTFP collection, fishing and working on daily wages in nearby industrial area and residential townships.

4.2 COMMUNITY LEVEL ADAPTATION OF MODIFICATION TO EXISTING PRACTICES AND NEW TECHNOLOGY

Rural Communes conducted community based consultations to identify energy solutions to reduce fuelwood extraction from the forest. As a result, training programmes on making fuel efficient *chulhas* and its uses were conducted for the women and youth SHGs. Over a period of three years almost half of the total households in both the villages installed smokeless *chulhas*.

Nursery for forest home garden introduced in villages by RC

Photo Credit: Rural Communes

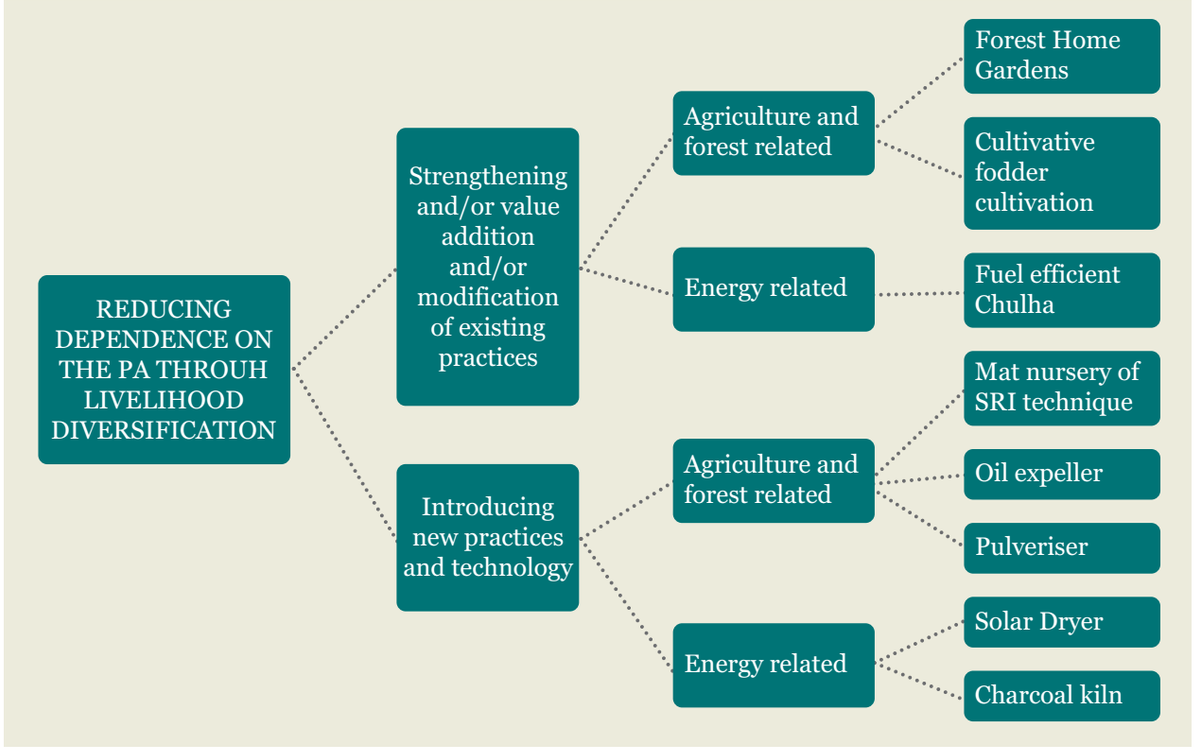
Solar Dryer is installed in Sasu Pada village to help SHG process vegetables and medicinal plants. This is an initiative of RC

Photo Credit: Rural Communes

A youth group trained in vegetable cultivation and another group of girls trained in processing of medicinal plants required a drying facility to increase the shelf life of their produce. A simple solar dryer was installed in Malji Pada for the convenience of both the SHGs. For the women SHG, the medicinal plants processing and sale has become a major income generation source.

In the case of agriculture, a group of men was trained in developing paddy saplings by Mat Nursery technique. It was observed that the group members initially found the technique labour intensive. However at the end of the cultivation season when all operations including thrashing and winnowing of rice were completed, it was found that Mat nursery in combination with the SRI

Diagram 4: Green Livelihood Model of RC



method of paddy cultivation resulted in saving 50 per cent input costs i.e. the group members had used half of the usual quantity of seeds, fertilizers and water and thus saved substantial input costs.

As a part of livelihood diversification, a group of village youth has been trained as nature guide and serve the tourists visiting the national park. These trained youth are called village biologists as the training built existing knowledge of the youth on the local flora and fauna and also increased their observation skills. This village biologist group not only has become self-sufficient but also contributes in documenting biodiversity of the national park.

For livelihood strengthening, another youth group has been trained in nursery techniques. This group successfully runs the nursery of wild tree species, ornamentals and medicinal plants. In the second year of setting up the nursery, net earnings of the group was around Rs 10,000. The group invested the major part of the earnings to acquire equipment and tools like plant pots, pipes, manure, water tank, shed net and have extended the area and number of saplings raised in the nursery.

A women SHG was also trained in making and installation of fuel-efficient *chulhas*. Each *chulha* is sold for Rs 250 per unit. The group gets a profit of Rs 50 per unit. Over the three years period, the group has managed to sell *chulhas* in their villages and save upto Rs 2,500 per year due to decreased use of fuelwood. It was also seen that the fuelwood consumption by using these *chulhas* was reduced by 40% in the households, which has also reduced the dependence on the forest.

Training SHG members in a project village bordering SGNP to make fuel efficient chulhas

Photo Credit: Rural Communes

4.3 CONCLUSION: INTERVENTION IMPACT

Forest home gardens, collective fodder cultivation and fuel-efficient *chulhas* are directly contributing to reducing extraction of resources from the forests. Other initiatives introduced by Rural Communes are contributing to supplementing income generation of the community members. SHGs formed to carry out the interventions are important for sustainability of the interventions.

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Chapter 5
LINKING TECHNOLOGY WITH SUSTAINABLE LIVELIHOOD AND CONSERVATION

Senchal Wildlife Sanctuary was set up in 1915 in the Darjeeling District of West Bengal, India. It is one of the oldest wildlife sanctuaries of India. It covers an area of 38.6 km² (14.9 sq mi). The elevation ranges from 1,500 to 2,600 m (4,900 to 8,500 ft). High-altitude animals such as Barking deer, Wild pig, Himalayan black bear, Leopard, Jungle cat, Common rhesus monkey, Assam macaque, Himalayan flying squirrel are found in their natural habitats. The sanctuary is also rich in bird life. The two Senchal lakes supply drinking water to the town of Darjeeling.

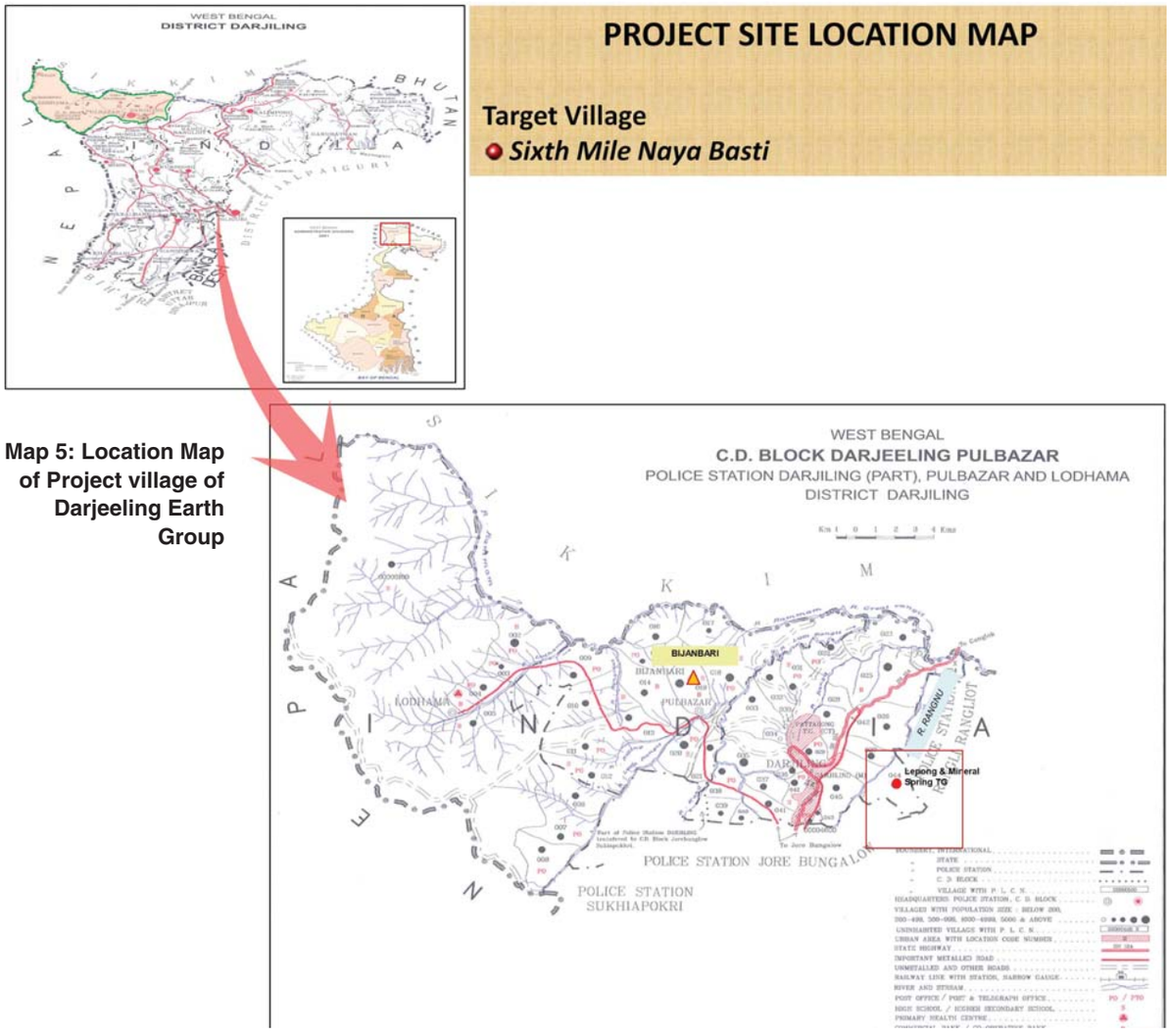
Darjeeling Earth Group (DEG) works with tribal communities in Darjeeling district of West Bengal and adjoining Sikkim state. In the network programme on People and PAs, DEG worked with Lepcha and Bhotiya communities in Sixth Mile Naya Busty village located in block Pulbazar Bijanbari of Darjeeling district. The village is located on the fringe of a long stretch of the eastern boundary of Senchal Wildlife Sanctuary.

5.1 AREA, PEOPLE AND LIVELIHOOD

The village is inhabited by SC, ST, OBC and others. Their main occupation is animal husbandry and farming and firewood collection from the Sanctuary. Animal husbandry and farming system followed by them was very basic and did not yield the desirable outputs.Working as casual labour in the tea gardens and commercial establishments like hotels and restaurants in Darjeeling town is a supplementary way of income generation. For fuelwood, almost the entire village was dependent on the natural forests. In consultation with the community members, DEG implemented activities which strengthened the existing livelihood practices and also introduced appropriate technologies and new farming techniques. These have helped in income augmentation and reducing pressure on forests tremendously.

Floriculture has been introduced as an alternate livelihood option in villages around Senchal Sanctuary

Photo Credit: DEG



Map 5: Location Map of Project village of Darjeeling Earth Group

Table 4: Activities of AERF

Activities	
Augmenting Existing Resources	Community based eco-tourism Nursery and plantation of fuel wood species
Livelihood Diversification	Water purifying system Biomass packaging – Paper bag making Waste bins from Bamboo and *Vitex negundo* Biogas and Dhaba Digester as alternate energy sources
Capacity Building	Training Programmes on eco tourism, biomass packaging and waste bins
Institutional Set Up	Community based SHGs and farmer groups

5.2 LIVELIHOOD IMPLICATIONS OF DEG INTERVENTION

In the context of strengthening existing livelihood practices, animal husbandry, cultivation of fodder species and floriculture were selected for improvement as per the local needs.

The most important step under animal husbandry was to convince villagers to stall feed their cattle. Initially the community members were reluctant to participate in stall feeding the animal. However, persistent efforts of the field staff resulted in 50 community members volunteering to stall feeding the cattle. Modern techniques of animal husbandry management such as improvement of the cow shed, collection of cow's urine, training of animal medics, supply of medicines, equipments and artificial insemination technique for improved variety of cattle DEG helped these community members in carrying out alteration and changes in the cowsheds. As a result of stall feeding with improved fodder, the milk production increased by 15 per cent. Artificial insemination also helped in improving the breed and getting good quality calves. The village milk cooperative has become functional and the community members have benefitted at large.

Simultaneously, to meet the fodder requirements of livestock, approximately 2 to 5 hectare area was covered under fodder plantation each year. Fodder species planted were *Napier sp, Fixus hookeri* and *Saurajya nepalensis*. The community members use the fodder for their own livestock. A system has been developed and nurtured by the community members for equitable and need based sharing of the harvest. Fresh and better quality fodder is ensuring better health of the livestock.

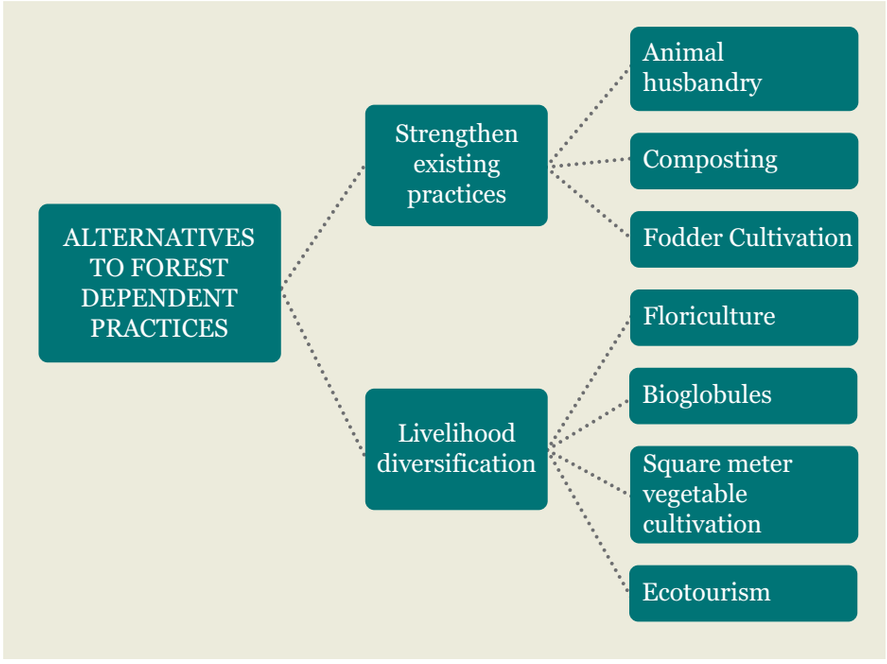
Photo Credit: DEG

Napier Cultivation as part of fodder improvement, an intervention of DEG in Sixth Mile Naya Busty village

Introduction of low cost poly houses has helped in strengthening the floriculture business. Introducing high demand flowers like Begonia and Lilium and ensuring supply of good quality bulbs, and the technique of cultivation has augmented the incomes of households involved by 20 percent. The cut flowers are sold in Darjeeling wholesale market. Flowers are also sold in Siliguri and Gangtok.

Composting ensured recycling of organic waste in the village. A series of orientation cum training

Diagram 5: Green Livelihood Model of Darjeeling Earth Group



programmes on enclosed composting was conducted by DEG. After initial orientation, 40 community members volunteered to participate in the enclosed pit based composting. These community members instead of throwing away or burning the domestic and agriculture waste, now use it for composting in their own land. The compost is used for vegetable cultivation, floriculture and also sold to nearby tea gardens as per demand and extra availability of compost.

Vegetable cultivation was also introduced as a livelihood diversification activity. A new scientific method – square meter gardening was introduced. Twenty community members voluntarily participated in setting up the square meter vegetable gardens. Over the period of one year, each household produced a variety

Low cost polyhouse for vegetable cultivation in DEG project village. It has been introduced for livelihood augmentation

Photo Credit: DEG

Box 5: Bio-globules/Biomass briquette as means to reduce pressure on the forests

Bio-globule or briquette is a low cost, eco-friendly and sustainable alternative to firewood. As a project activity, DEG introduced bio-globule technology sourced from G.B Pant University's extension department to reduce the villager's dependence on the forest. Bio-globules are made with local available biomass, charcoal dust and clay in 1:2 proportions. The coal can be prepared from agricultural waste, dry leafs, twigs and dry shrubs around the village. An easy to prepare kiln is made on the ground. The kiln is usually a pit in the ground of the size 1 m X 0.75 M X 0.45 m in which dry biomass is heaped and burnt. The pit is covered with a tin sheet so that the biomass get only charred but not burnt into ashes. The charcoal is mixed with clay earth in 1:2 proportions and pressed into globules using a hand pressed moulding machine and then allowed to dry. The dried globules can be used as cooking fuel. A survey of 18 households revealed that they were consuming 14 globules per month in summer and 44 in winter with the benefits mentioned as follows

Resource	Monthly Saving per Household
Fuelwood	116 kg
Charcoal	31 kg
Fuel wood collection time	41 hours

In addition to fuelwood saving and reducing dependence on the forests of Senchal Wildlife Sanctuary for its collection, the bioglobule technology has also contributed to improvement in the health of women of the project village. Commonly observed improvement in the health of the women are: (a) reduced cough and respiratory problems due to smokeless bio-globules for cooking and, (b) reduced drudgery-fatigue due to reduction in fuelwood collection trips. Moreover, washing utensils has now become faster, easier, and cheaper (due to soap saving) because when briquettes are used as cooking fuel, the utensils are not blackened with soot. Further, surplus can be sold in the market to supplement the family income. Seeing the potential as clean and alternative fuel, local artisans have been trained in fabricating bioglobule moulding machine which village women are now using for making bio-globules to earn additional income.

Photo Credits: DEG

Biomass briquettes are being used extensively as an alternative to fuelwood in Sixth Mile Naya Busty Village in Darjeeling Area

of vegetables which was sold in the Darjeeling market. At the end of the year, each household earned around Rs 6,000. It has led to a 25 per cent increase of income for the participating households.

Ecotourism training was one of the activities undertaken in the context of livelihood diversification and conservation issues. Six trainings were organized to cover topics like home stay, environment protection, forest and wildlife conservation and management of man animal conflict. This has led to awareness generation among the village communities.

5.3 CONCLUSION: INTERVENTION IMPACT

As Senchal also provides water for the whole area, it is crucial that the habitat is preserved for ensuring that the forests serve as a catchment area for the lakes. The tremendous pressure for fuelwood and fodder has been reduced due to DEG's initiatives in this area. Introduction of bio globules as a fuel source has provided an alternative to fuel wood. In the context of conservation, use of bio globule/biomass briquette technology is definitely contributing in reduction of use of fuel wood. This activity has been adopted by around 20 other villages and some tea garden labourers as well. Improved animal husbandry techniques, stall feeding of cattle and fodder cultivation has also helped in conservation of biodiversity in Senchal Wildlife Sanctuary. Income generation activities like floriculture, vegetable cultivation, vegetative composting has helped to get better yields and also in augmenting income of the community.

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Chapter 6
LIVELIHOOD DIVERSIFICATION TECHNOLOGICAL INTERVENTIONS FOR CONSERVATION

Bhimashankar Wildlife Sanctuary is located in the North Western Ghats. It is an ecologically sensitive area which harbours great biodiversity. Its vegetation comprises of evergreen forests on top and gradually changes to moist deciduous forest on western slopes and dry deciduous to scrub forest on eastern slopes. Area receives high rainfall during monsoons and mountaintops remain under cloud cover throughout the season. This type of landscape gives rise to a variety of microhabitats, which in turn support large varieties of fauna and flora. Due to its avifaunal diversity, this area has already been included in the list of important bird areas of the world. It also harbours various endemic species of the Western Ghats viz. giant squirrel which is the state animal of Maharashtra and the shield tailed snake, to name a few. Among the large mammals there is the Sambar, Muntjack, Wild pigs and Leopards. It is the place of origin of River Bhima, an important tributary of River Krishna. The Bhimashankar temple is surrounded by the Wildlife Sanctuary which has been named after the temple.

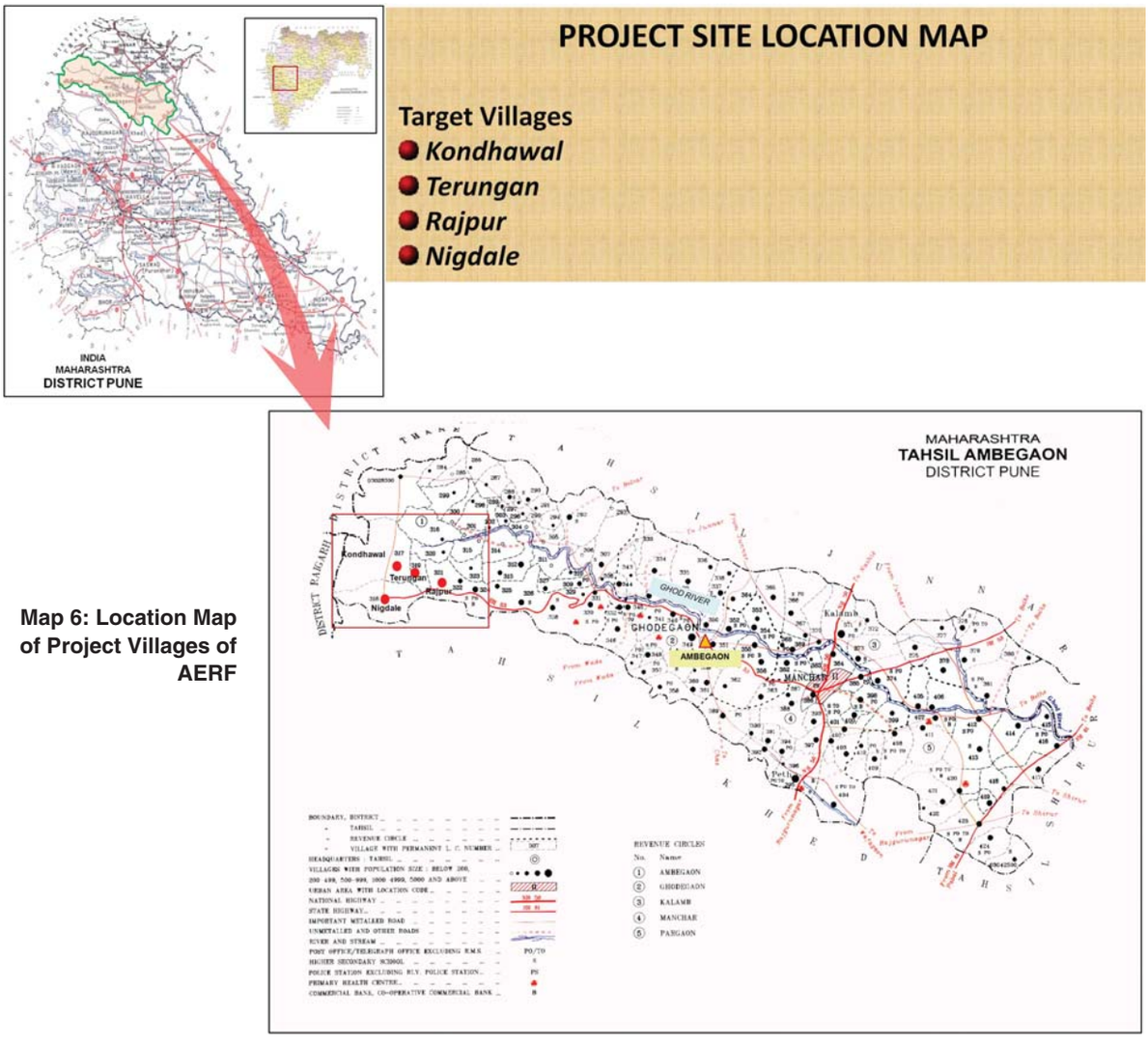
Applied Environment Research Foundation (AERF), an NGO based in Pune, Maharashtra is working in four villages bordering the Bhimashankar Wildlife Sanctuary.

6.1 AREA, PEOPLE AND LIVELIHOOD

AERF is working in four villages namely Kondhwal, Terungan, Rajpur and Nigdale bordering the wildlife sanctuary. These villages are located in the mountainous part of the Western Ghats. Compared to the plains, agriculture in the mountainous

Giant Squirrel is endangered animal found in Bhimashankar Wildlife Sanctuary

Photo Credit: AERF



Map 6: Location Map of Project Villages of AERF

Western Ghats is less productive due to iron rich lateritic soils formed by intensive leaching of the parent basalt rock.

A majority of the population residing in and around the study area comprises of the Mahadev Koli tribe. Seasonal agriculture of rice paddy and *nagli* is the main livelihood for these people. Cattle and sheep rearing are also done but the pay off from this activity is marginal due to acute water and fodder scarcity in dry seasons. Tourism provides an alternative livelihood to the communities but it is limited to few families. The area has a historic shrine of Lord Shiva, which is of great religious importance since it belongs to one of the 12 Jyotirlingas. Tourism is continuously on rise throughout the year especially on every Monday as well as on occasions like Mahashivratri, Makar Sankranti and the month of Shravan. This area also attracts quite a number of nature lovers during monsoon as well as during other seasons.

As mentioned above, rain fed paddy cultivation is the main livelihood activity. It is supplemented by finger millet (*Eleusine coracana*) and sesame (*Sesamum*

indicum) cultivation on the hill slopes. Paddy cultivation is supplemented by the collection of Hirda fruits (*Terminalia chebula*) from the forest and village surroundings. The collected fruits are sold to middlemen or to the tribal cooperative society. Cattle-rearing is a supplementary livelihood activity. In the villages where AERF worked, religious tourism from Bhimashankar temple and nature tourism from the wildlife sanctuary provide an alternative livelihood but it is limited to a few families.

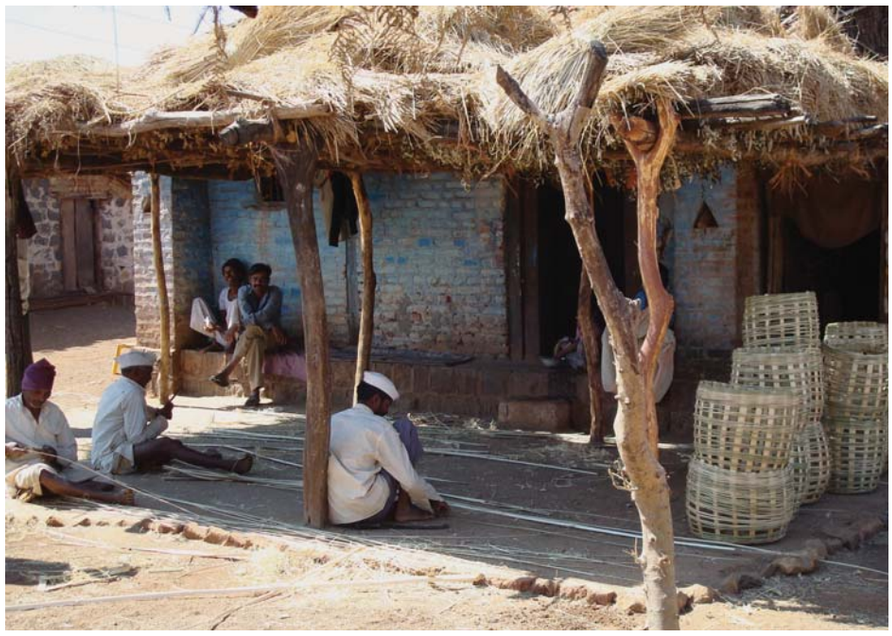


Photo Credit: AERF

Preparation of Bamboo bins as a livelihood activity is introduced by AERF

Realizing the potential of tourism and availability of natural resources around the sanctuary, AERF decided to work on two aspects of the local livelihood. Firstly towards promoting sustainable use of existing resources and secondly towards livelihood diversification by introducing some income generating activities like making value added products from handmade paper and bamboo. To substantiate the intervention activities, capacity building activities like training programmes and exposure tours were conducted. The interventions of AERF are summarized in the table below.

6.2 COMMUNITY OWNERSHIP AND IMPROVED QUALITY OF LIFE

Need-based initiatives of AERF namely paper bags, bamboo bins and sale of good quality drinking water to the tourists were focused on augmenting existing livelihood practices of the community members in the project villages. Other initiatives were making papers bags and waste bins and their sale in Pune and to tourists for augmenting cash income. Plantation of fuelwood species on the village common land was done to reduce pressure on the forests. In the case of

Table 5: Activities of AERF

Activities	
Augmenting Existing Resources	Eco-tourism guide Nursery and plantation of fuel wood species
Livelihood Diversification	Water purifying system Biomass packaging – Paper bag making Waste bins from Bamboo and *Vitex negundo* Biogas and Dhaba Digester as alternate energy sources
Capacity Building	Training Programmes on eco tourism, biomass packaging and waste bins
Institutional Set Up	Community based SHGs

Box 6: Biogas and Dhaba Digester as Alternate Energy Source

It is well established that biogas produced by anaerobic digestion of biodegradable material is an excellent alternative energy source. In the context of global climate change, it checks release of nitrogen dioxide produced by open decomposition of the manure. Anaerobic digestion of manure with help of a special device produces useful methane gas which can be used for domestic cooking.

Photo Credit: AERF

***Dhaba* digester installed in Nigdale Village bordering Bhimashankar Wildlife Sanctuary**

A biogas unit and a *dhaba* digester designed by ARTI, Pune (a core supported group of DST) were set up on pilot scale at two locations in the project villages. The *dhaba* digester is specifically designed to utilize biodegradable waste generated in *dhabas* (local food joints). A digester was set up at a *dhaba* in Nigdale village located on the road leading to the Bhimashankar temple. Two families in Kondhwal village volunteered for setting up and maintaining the biogas units. In the case of the *dhaba* digester, the amount of food waste was the selection criterion whereas the biogas unit was set up based on number of cattle and amount of manure generated.

The *dhaba* owner shared that after the digester became functional, it saved him substantial amount of fuel wood, almost one-third of saving of the monthly expenses on the fuelwood purchase.

community-based ecotourism, training programmes were conducted for a group of selected youth from the project villages. The youth were trained in conducting guided tours for the devotees visiting the temple as well as nature tourists visiting the wildlife sanctuary. The trainees were given hands on training by involving them in two guided tours for nature tourists from Pune visiting the wildlife sanctuary. Some families of Kondhwal village volunteered for training in organizing home stays for the tourists. Besides, in the consultations with the community members to discuss the nature of interventions, it was revealed that providing good quality drinking water to the tourists could be an income generation opportunity for the youth. It is quite an achievement that two unemployed youth turned into entrepreneurs by procuring and using a simple water purification unit.

Two new activities were also introduced by AERF in line with the livelihood diversification approach. One of these initiatives was paper bag making and their sale. A group of youth and women were trained in paper bag making from waste paper. AERF helped the women SHG involved in the paper bag making to get in touch with a departmental store giving paper carry bags to the customers. At the

Photo Credit: AERF

Water filter installation has become an income generation activity for the youth in Nigdale village bordering Bhimashankar Wildlife Sanctuary

end of the first year of paper bag making activity, the SHG members had earned at least two-fold of what they would earn in the lean season.

The villagers have been trained in preparing baskets using the branches of Nirgudi (*Vitex negundo*), a shrub abundantly available in the project villages. It provided a viable alternative to bamboo which is a costly raw material in the project area for making waste collection bins. The Forest Department purchased the first lot of bins prepared by the SHG to encourage the women. Similarly local hotel owners also purchased the bins from the SHG. This activity is gradually picking up.

Diagram 6: Green Livelihood Model of AERF

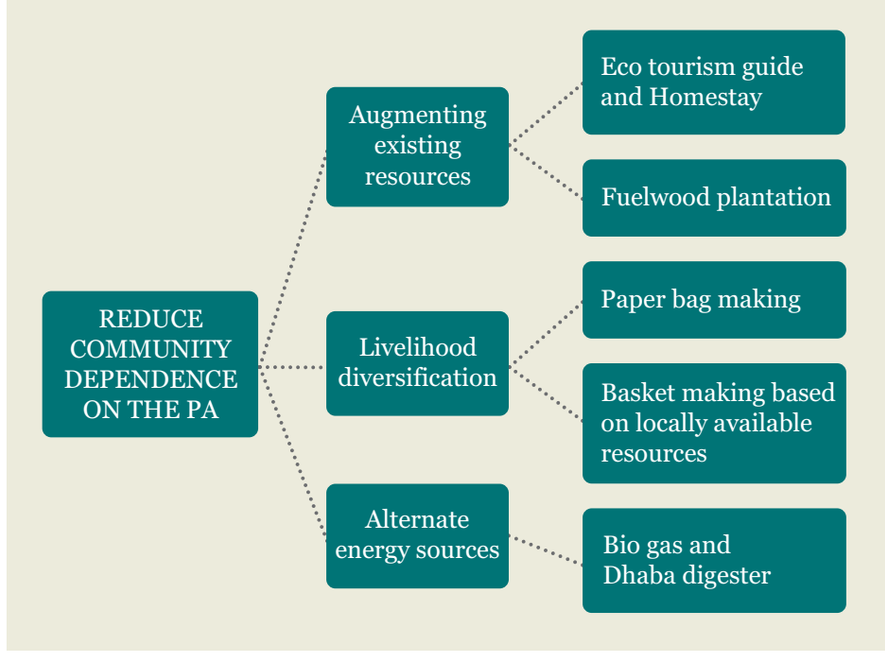


Photo Credit: AERF

Community members of Kondhwal village bordering Bhimashankar Wildlife Sanctuary carrying out plantation of fuelwood species

Plantation of fast growing fuelwood species was done in the common lands of all project villages. On an average 3000 saplings were raised in the nursery developed by the villagers and planted in the village common lands. Community members were consulted for the selection of fast growing fuelwood species. Similarly, only those lands were selected for plantation which had some potential to create buffer and connectivity with adjacent forest patches.

6.3 CONCLUSION: INTERVENTION IMPACT

AERF provided three options to reduce dependence of the community on the forest for their livelihood needs. The first has been augmenting existing livelihood practices. Before the project intervention, community members would guide the tourists informally and occasionally on a paid basis. After the AERF interventions, community members trained to become nature guides started getting regular income through ecotourism. Although market linkages and procurement of raw material need further support, handmade paper bag-making and basket-making have added two new avenues for the livelihood to the community.

Biogas and *dhaba* digester are directly contributing in reducing fuelwood extraction pressure on the wildlife sanctuary.

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Chapter 7
INTEGRATING CONSERVATION AND SUSTAINABLE LIVELIHOODS AMONG FISHING COMMUNITY

Chilika Lake is a salt-water lagoon separated from the Bay of Bengal by a sandy ridge. The lake is spread over 1100 sq km. It is a unique ecosystem with a range of aquatic flora and fauna found in and around its brackish waters. It is home to a number of threatened species of plants and animals.

Nalabona Bird Sanctuary in the island of Nalabona is one of the major attractions of Chilika. The island with circumference of 8 km is a protection site that preserves contrasting species of migratory birds. The sanctuary is home to thousands of migratory and regional bird species and hence considered a delight for bird lovers.

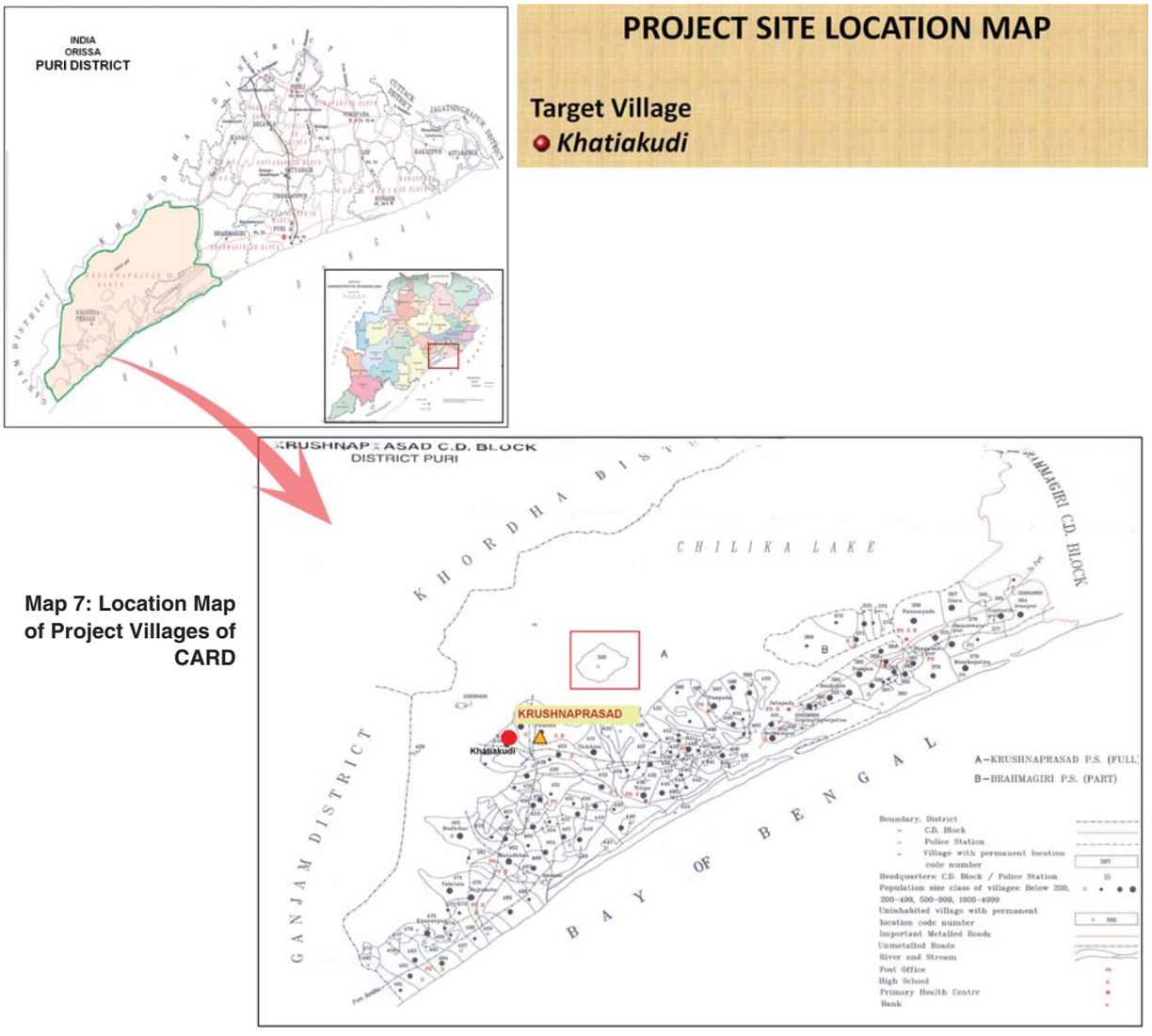
Gulls, Terns, Eagles, Goliath Heron, *Ardea goliath,* Herons, *Eurynorphynchus pygmaeus,* Asian Dowitcher and Egrets are some of the common bird species that take shelter in the sanctuary. Along with these species, Golden Plover, *Pluvialis fulva,* Green Sandpiper, *Tringa ochropus,* Spoon-billed Sandpiper and *Limnodromus semipalmatus* are some of the noteworthy species of the Sanctuary.

Centre for Action Research and Documentation (CARD) worked in Khatiakudi village located on an island in Chilika Lake. The inhabitants of Khatiakudi live in an inaccessible area. Fishing is their major occupation. The women of this village are engaged in vending fish and dry fish in the local area. They depend on the lake because they have no other alternative source of income. Except two or three families of this village, the rest are below poverty line. Unemployment and indebtedness of the community has become an acute and pervasive economic problem eroding the very fabric of society. The village has limited cultivable land and over the years with increasing population, availability of cultivable land at the household level is decreasing. With this background, it was necessary that interventions through the People and PAs initiative focus on developing income generation avenues other than agriculture and fishery.

7.1 AREA, PEOPLE AND LIVELIHOOD

As per the revenue classification, Khatiakudi village is located in Krishnaprasad block of Khurda district in Odisha. The nearest mainland location for the villages is Balugaon. Ferry boats of the Chilika Development Authority connect Khatiakudi to Balugaon twice in a day. It takes about one hour by ferry to reach Balugaon.

A majority of the population in the village belongs to Kandara, a scheduled caste community. There are a few households of the Baura community residing in the village. Fishing in Chilika Lake is the mainstay of the Kandara community whereas mat and basket weaving is the traditional occupation of Baura community. Casual wage labour in Balugaon and/or Puri is also an important income generation



Map 7: Location Map of Project Villages of CARD

Table 6: Activities of CARD

Activities		
Livelihood Diversification	Introducing skills and techniques to process local resources	Coir rope and mats
	Introducing appropriate technology on pilot basis	Mats from Kewra (*Pandanus fascicularis*)
Capacity building	Training on sea weed cultivation and pilot scale testing	
	Training Programmes, Exposure tours, Market studies	
Institutional Set Up	Community based SHGs	

activity for both the communities. All Kandara families own fishing boats. Traditionally men do the fishing and women take care of cleaning, drying and sale of the fish at Balugaon and occasionally at Puri.

Box 7: A Case of Rope Making and Mat Weaving as Livelihood Diversification

There were four non-functional women SHGs in Khatiakudi village before the intervention of CARD. In the community-based consultations in the initial period of the project, these groups got revitalised. Quite a few concepts, suggestions and ideas were put forth by the group members. It took a considerable number of meetings to decide coir-based rope-making and mat-weaving as income generation activities. Members of the SHGs were more or less familiar with rope-making. The prerequisite of setting up a rope-making unit was space. Another bottleneck was fine marketable quality product and scale of production. It was decided that an existing dilapidated community shed should be repaired to set up a community-based rope-making unit. Given the financial limitations, the community constructed a *kutchcha* shed by *shramadan*.

Photo Credits: CARD

Kewra mats being prepared under supervision in Khatiakudi village

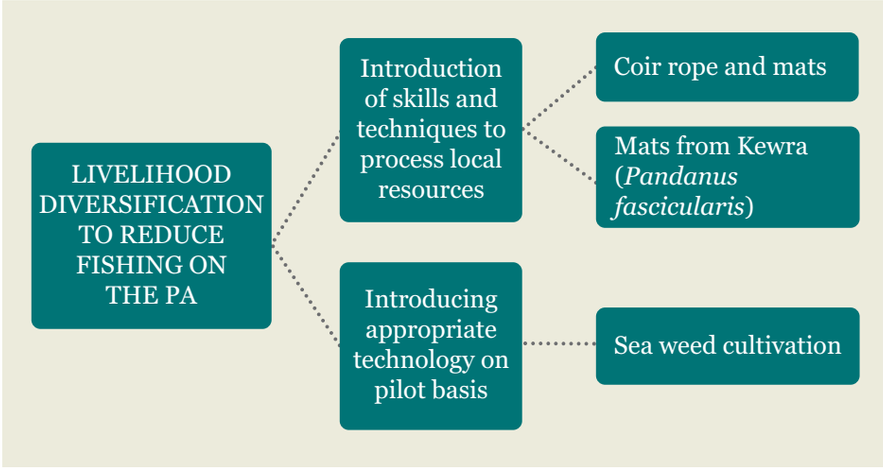
Coir rope and mat making initiated by CARD as an income generation activity in Khatiakudi

Under the capacity building phase, training programmes on rope making, mat weaving, quality control and marketing aspects were conducted by experts. These experts were drawn from coir industry units and retail outlets of coir products. Simple and easy to maintain machinery for rope making and mat weaving was procured under the technical guidance of the Coir Board, Government of India.

The raw material required for the coir products is brought from the outside. Over time it emerged in the monthly meetings of the SHGs that they needed to diversify their products. Mat-making using Kewra as raw material was identified as a potential activity. The Bauri community members in particular showed great interest in Kewra mat-making. As earlier with coir mats and rope-making, CARD organised training, procured the required tools and assisted the SHGs in finding marketing channels.

The village has no forest area within its jurisdiction. Agriculture in Khatiakudi is limited to rain-fed rice cultivation. However it is constrained by small family owned landholdings as mentioned earlier.

Diagram 7: Green Livelihood Model of CARD



In the context of livelihood diversification, before the CARD intervention through the network project on People and PAs, fishing and casual labour constituted major income sources in the project village. In consultation with the villagers, especially women, it was decided that rope-making and mat-weaving from coir and Kewra (*Pandanus fascicularis*) could be additional income generation options. Over time the community picked up rope-making and mat-weaving. Adequate financial returns due to focused marketing have resulted in a persistent interest of the community in continuing with this entrepreneurial activity in the post project period. Seaweed cultivation as another livelihood diversification activity was tried on an experimental basis. However, it did not pick up due to economy of scale because the amount of product required for marketing and achieving net profit was huge.

7.2 CONCLUSION: INTERVENTION IMPACT

The success of rope making and mat weaving is evident from the fact that SHGs continue production and sale of rope and mats with enthusiasm after the completion of the network project. Mat-making has increased income of the participating SHG members three fold. A spill-over effect of the intervention is that community members from neighbouring islands, Baurisahi and Badapokharia, have approached CARD to organize training programmes for them so that they can adopt the same livelihood options.

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Chapter 8
DIVERSIFYING LAND BASED ACTIVITIES FOR SUSTAINABLE LIVELIHOOD

Dalma Wildlife Sanctuary is located on the Chhota-Nagpur Plateau. The area represents the dry deciduous forests of the Chhota-Nagpur Plateau and lies between the moist deciduous forests of the Eastern Ghats and Satpura Range and the lower reaches of the Gangetic Plains.

Shramjivi Unnayan (SU) worked in two villages bordering Dalma Wildlife Sanctuary. The sanctuary is an abode to mega fauna like Asia's largest predator and largest herbivore, the tiger (*Panthera tigris*) and the Asian elephant (*Elephas maximus*). Dalma Wildlife Sanctuary predominantly consists of dry deciduous Sal (*Shorea robusta*) forests.

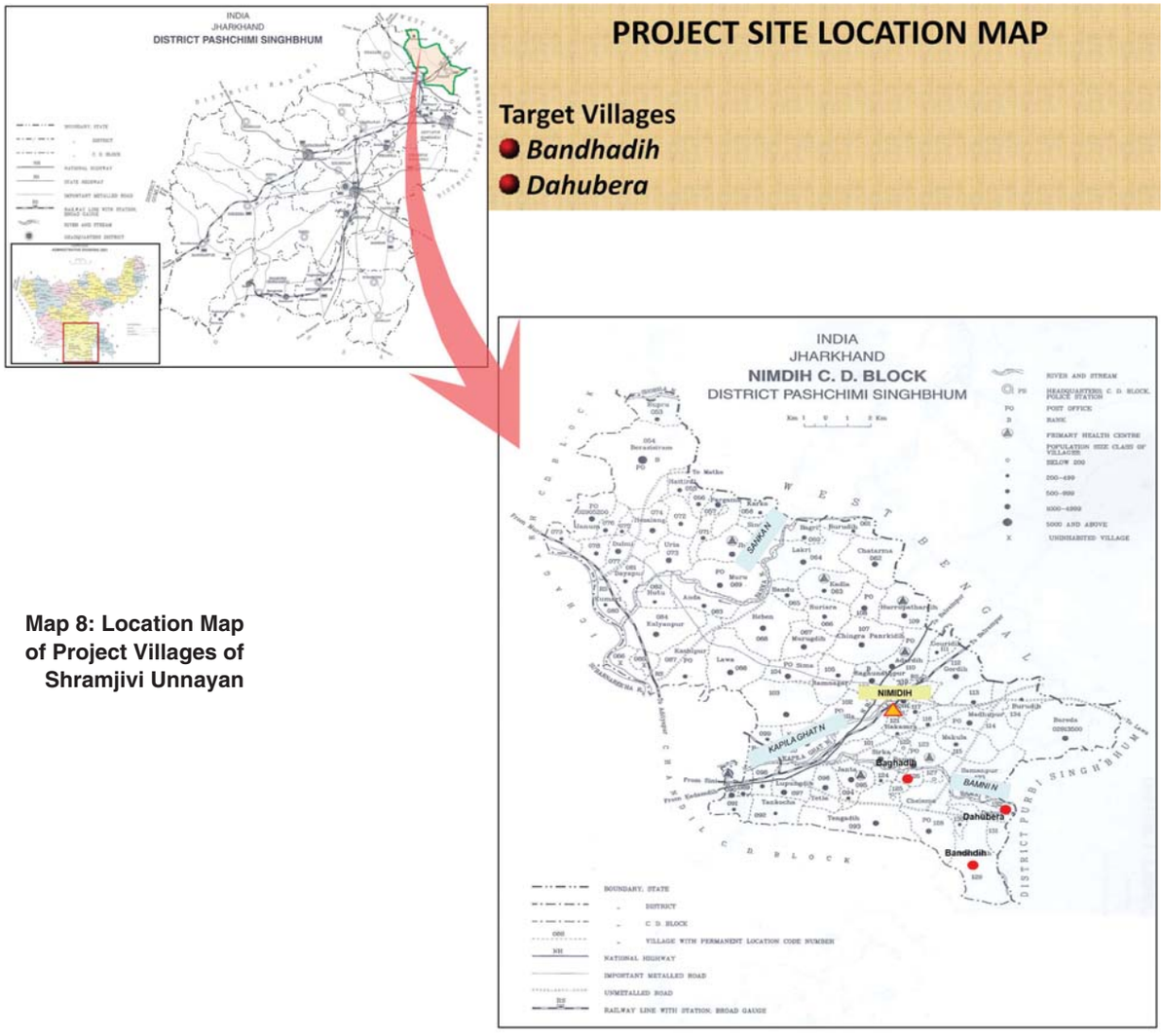
8.1 AREA, PEOPLE AND LIVELIHOOD

The project area is hilly and covered with dense natural forests. Some of the villages are inhabited by tribal communities who live on hillocks and dense forest of the Dalma range. Agriculture and wage labour are the main sources of subsistence but the impact of the forest can be seen not only in terms of their economy but life and culture also. Some of the villages are very close to Jamshedpur while some of the villages are situated in inaccessible areas. Similarly some of the villages have a mixed population while others are uni caste/tribe. The Bhumij and Santhal are the major tribes but the Sabar, Paharia and the Kharia also live in the forested areas.

The project villages are inhabited by Bhumij, a tribal community. Agriculture and casual wage labour in Jamshedpur, are the main subsistence sources. The

Vermicomposting is introduced by SU as existing livelihood improvement activity

Photo Credit: SU



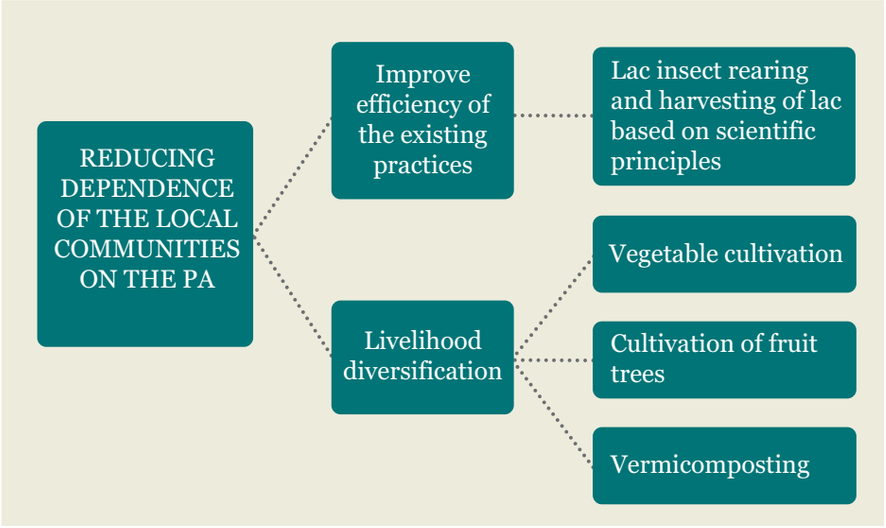
Map 8: Location Map of Project Villages of Shramjivi Unnayan

important crops are paddy and maize cultivated in the rainy season (kharif). The uplands which are degraded due to runoff are used for the cultivation of pulses, oilseeds and millets in a very limited quantity. The forest is an important source of wild edibles, NTFPs and fuelwood for the villages. The activities initiated by Shramjivi Unnayan in consultation with the villagers were in the context of augmenting existing practices and introducing some new activities.

Table 7: Activities of Shramjivi Unnayan

Activities	
Augmenting existing practices and resources	Fruit tree cultivation Vegetable cultivation
Livelihood Diversification	Vermi-composting Lac cultivation
Capacity Building	Training Programmes on vermi-composting and Lac cultivation
Institutional Set Up	Community based SHGs

Diagram 8: Green Livelihood Model of Shramajivi Unnayan



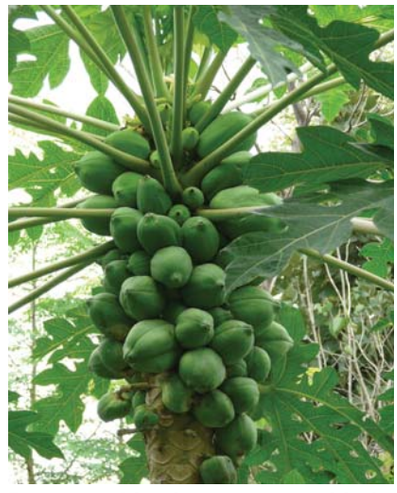
8.2 CAPACITY BUILDING AND LIVELIHOOD BENEFITS

To reduce dependence of the community members on the forests, two approaches were followed by Shramjivi Unnayan. One was to improve efficiency of existing practices and the other was introducing new activities appropriate to local conditions. For improving existing practices, lac cultivation was taken up. Training and orientation programme on scientific method of lac collection has been carried out and 40 households have adopted this activity.

Cultivation of fruit trees, vegetables and vermicomposting were also initiated in the project villages as a strategy towards livelihood diversification. In case of fruit tree cultivation, eight types of fruit trees have been planted by the participating households in their backyard or on the farm bunds. These were Mango, Guava, Lemon, Amla, Banana, Papaya, Bel and Litchi. In all, 30 households planted 2300

Photo Credits: Vishaish Uppal

Household level vegetable nursery. Vegetable cultivation in the backyard is introduced by SU in the project villages bordering Dalma Wildlife Sanctuary



Papaya cultivation as a part of fruit tree cultivation is introduced by SU

Box 8: Scientific Lac Cultivation: An Attempt towards Strengthening Existing Livelihood Practice

Shramajivi Unnayan (SU) has been working in Nimdih block over last 15 years. Major constraint of working in Nimdih block is restrictions on movement due to Maoist activities. Nevertheless the voluntary organisation has managed to be in touch with the villagers.

Lac collection is a common livelihood activity in the project area. Local community members shared that the volume of lac collection as well as the number of trees on which lac insects are naturally found have decreased over the last few years. Scientific cultivation of lac provides strong alternative to lac collection and maintaining the production volume.

Lac insects (*Laccifer lacca*) survive by sucking the tree sap. Lac insects prefer particular species of trees like Kusum (*Schlichera oleosa*) or Ber (*Ziziphus jujube*) over others. Repeated occurrence of lac insect infestation results in loss of vigour of the host tree and subsequently volume of lac production goes down.

Scientific cultivation of lac is based on the principle that much needed rest is given to the host tree so that the host is not exhausted. Certain precautions are also followed at the time of collection to ensure sustainable harvesting. In the project villages, traditional lac collectors were trained in scientific lac cultivation. The community members formed groups to cultivate and harvest the lac systematically. As a result, in the first year of the intervention, the villagers harvested 300 kg of lac which was almost a 100 percent improvement over the traditional harvest volume.

individual saplings. In the second year of plantation, the survival rate was almost 60%. In case of vegetable cultivation, each participating household was provided a set of 10 vegetables and 60 households from both the villages volunteered for vegetable cultivation. Each household, on an average, harvested 8 to 10 quintals of produce which was sold in the local market. The net income of all households participating in vegetable cultivation has increased at least two-fold annually.

8.3 CONCLUSION: INTERVENTION IMPACT

Introducing scientific lac cultivation is significant from the conservation point of view. Systematic approach of lac cultivation will protect the flora, in particular, the host trees in the sanctuary. Also it has helped to improve the output of lac harvesting and income for the community members. Vegetable and fruit tree cultivation is important from the point of view of augmenting cash income of the community members.

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Chapter 9
LINKING MANAGEMENT OF MEDICINAL PLANTS AND SUSTAINABLE LIVELIHOODS

The Grizzled Giant Squirrel Wildlife Sanctuary lies in the Western Ghats mountain region which is a famous global biodiversity hotspot. GGSWLS is located on the eastern side of the Western Ghats hill ranges known as Sathuragiri hills in Sirivilliputhur Taluka of the Virudhunagar district in Tamil Nadu. The elevation ranges up to 2100m and vegetation comprises of a mix of dry thorn forests and dry deciduous forests.

Covenant Centre for Development is working in the villages around Grizzled Giant Squirrel Wildlife Sanctuary. Four villages, West Pudupatti, Maharajapuram, Kodikulam and Sunderapandiyapuram located in the Watrap Block of Virudhunagar district in Tamil Nadu state consist of the project area.

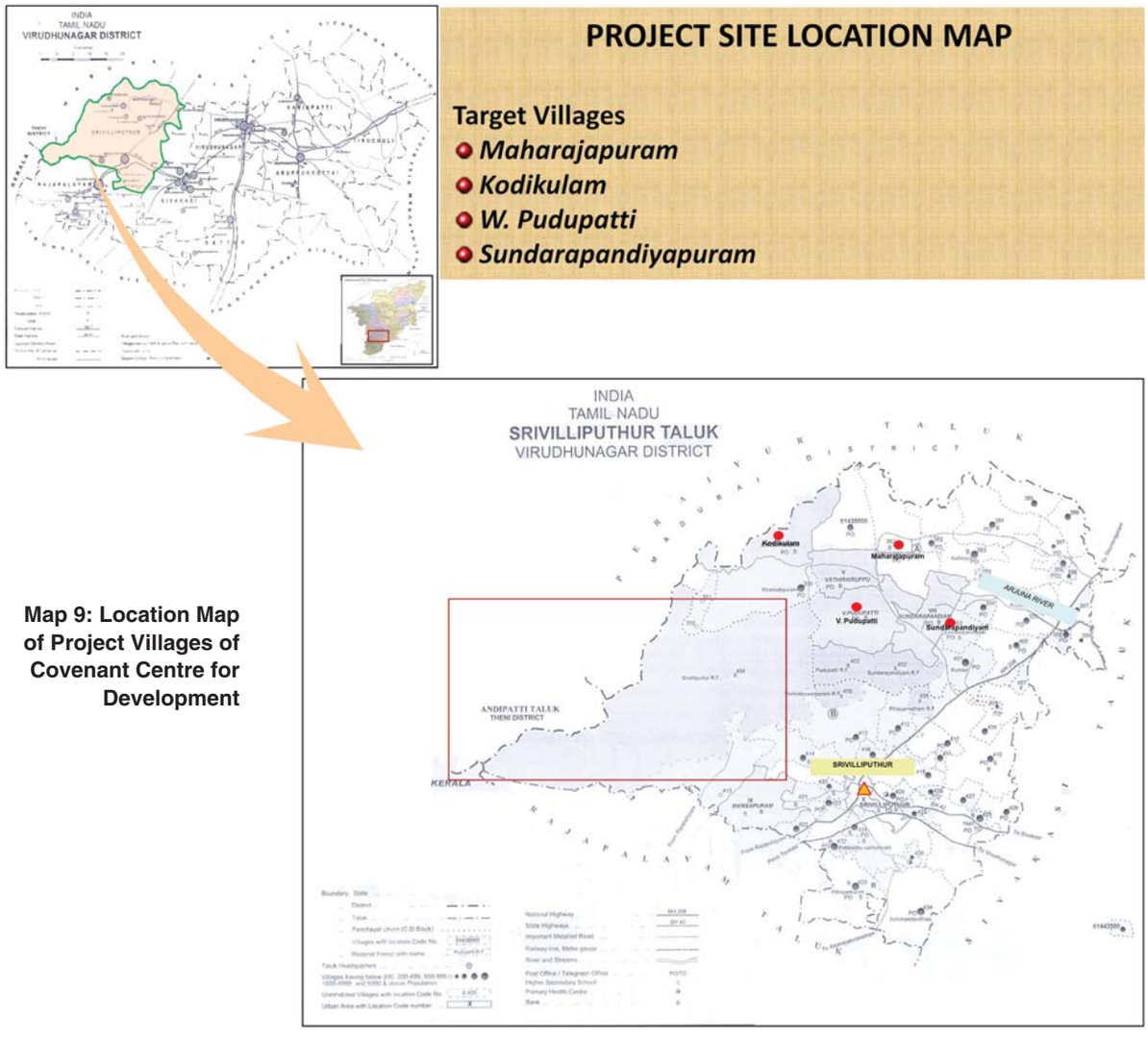
9.1 AREA, PEOPLE AND LIVELIHOOD

Paliyan, a hunter-gatherer community constitutes the majority of the population in the project villages. The Paliyan community subsists on collection and selling of NTFPs. Most of the community members are landless. Agriculture is of primitive nature in the project villages, with millets and vegetables grown sporadically, mainly by the tribals and the scheduled castes. Paddy and coconut groves are grown at the foothill plains by other communities.

The tribal and other communities near this wildlife sanctuary collect forest produce including medicinal plants sometimes resulting in over-harvest or destructive harvest during the dry season. They sell it to the traders, at a meagre price, compelling them to collect more for sustenance. The project was focused on improving tribal livelihoods by raising their income ensuring sustainability of the resource base by introducing and training the community members in non-destructive harvesting and in some cases cultivation and value addition to the non-timber forest produces (NTFP). In this context, four critical, longterm, community-based interventions were carried out. They were: formation of SHGs, sustainable collection and cultivation of select NTFPs, semi-processing and value addition to some NTFPs and collective marketing.

Table 8: Activities of Covenant Centre for Development

Activities	
Sustainable harvesting and cultivation	Kitchen herbal gardens NTFP cultivation Fodder Cultivation Demonstration
Value addition	NTFP processing
Collective marketing	Linkage with the producers company
Capacity building	Training on medicinal plants cultivation, NTFP processing SHG formation



Map 9: Location Map of Project Villages of Covenant Centre for Development

9.2 LIVELIHOOD STRENGTHENING, INSTITUTIONAL STRUCTURE AND NTFP MANAGEMENT

There were 10 SHGs existing in the project villages when the project work was initiated. Each SHG had 10 members. These SHGs became the focal point of the interventions by CCD. During project implementation, the women members of the SHGs were trained in developing kitchen herbal gardens. A mix of medicinal plants useful in the household in curing common ailments like headache, stomach ache and digestive ailments have been planted in the kitchen herbal gardens.

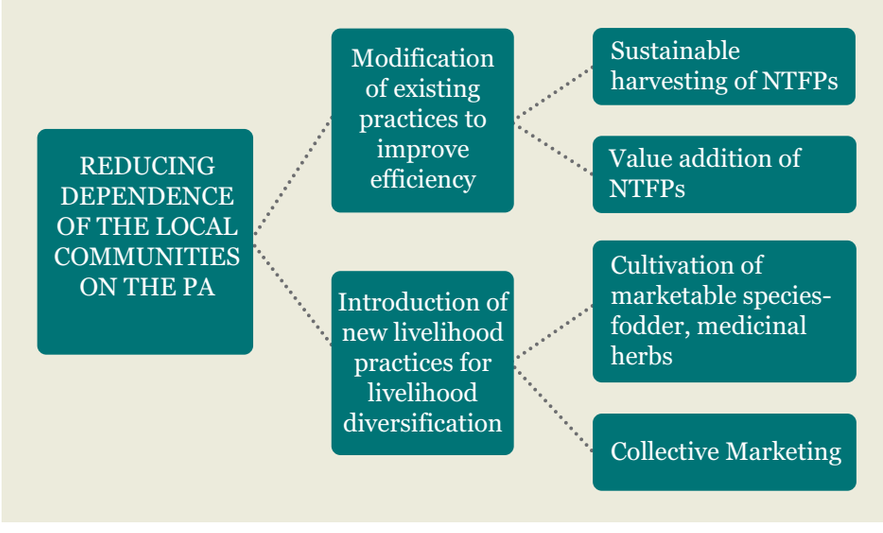
The SHGs also have taken up cultivation of fodder. In 2010 and 2011, *Alfa alfa,* a fodder species was cultivated on 10 acres in the monsoon season. Fodder is used for own use and sale as well. Generally the fodder is sold in spring. Income earned from fodder cultivation has led to a two-fold addition to the family's annual income.

Photo Credit: CCD

Drying and processing of medicinal herbs in villages near the Grizzled Giant Squirrel Sanctuary

It has been observed that the Paliyans and other communities in the project area collect 27 types of NTFPs. CCD has helped the community members to set up institutional mechanisms to ensure systematic collection of medicinal plants and regular income for the community members. A community person selected by the community members in the village monitors the NTFP collection and ensures quality control of NTFPs. The community members participating in the medicinal plants collection are trained in systematic drying, storage, packaging, labeling of medicinal plants which fetch a good market price. The final produce is sold to Gram Moolige Company Limited (GMCL), a public limited company owned by women SHGs. In the project villages, 125 people are involved in this activity.

Diagram 9: Green Livelihood Model of Covenant Centre for Development



Box 9: A case of sustainable harvesting and collective marketing of NTFPs by women SHGs

In the initial period of the project, importance of group formation and association was explained to the community members. After agreements with them, the women groups were trained in collection, storage, sale and cultivation of medicinal plants in the herbal garden. They were also trained in sustainable and non destructive collection methods. This was followed by training in post harvest management i.e. processing (cleaning, grading, drying, powdering, extraction, storage, packing, and labelling) and maintaining records of collection amount and financial information.

As a follow up of the training, each group has been provided weighing scale and the central (cluster) unit with a moisture meter to ensure quality and fair trade. Recorders (local literate persons) have been appointed in each group and a raw drug store has been set up on rental basis under his/her watch. Collection and payment registers along with weighing scale are kept here for spot payment. Raw drug prices have been prefixed by Gram Moolige Company Limited (GMCL), the marketing agency. GMCL is promoted by CCD and owned by 30 women self help groups to provide fair price to the gatherers. The price offered by GMCL collection center is acceptable to the community and is better than the price offered by traders. Main benefit has been avoiding loss of 10 per cent or more from the trader due to cheating on price or weight. Semi processing has also added about 10 per cent to the price and the prior income of the gatherers. The total sale of raw drugs from the 10 groups collectively in the 3rd year has been more than Rs 3 lakh, indicating a sort of break even in the 3rd year. Since the sales value was Rs 1.9 lakh in the 2nd year, this indicates nearly 100 per cent growth and shows signs of sustainability even after the project. Many more gatherers from nearby villages have been inspired by the success of the herbal trade model of the project and want to associate with this model.

9.3 CONCLUSION: INTERVENTION IMPACT

Covenant Centre for Development's intervention was focused on reducing resource extraction pressure on Grizzled Giant Squirrel Wildlife Sanctuary. This was accomplished by introducing modifications to the existing NTFP collection practices of Paliyan tribal community. Additionally, cultivation of some NTFPs by the tribal community has been also introduced. Systematic and non destructive harvesting of NTFPs by the community members ensures sustainability of the resource base and reduces the pressure from the wildlife sanctuary. Linkage of the SHGs with the producer's company has ensured fair price and income augmentation. This has also helped in assured marketing of the processed NTFPs, collected and cultivated by the tribal community members.

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Chapter 10
INTEGRATING CONSERVATION AND COMMUNITY LIVELIHOOD

Kanha National Park is also a Tiger Reserve located in the Mandla and Balaghat districts of Madhya Pradesh. It is nestled in the Maikal range of Satpuras in Madhya Pradesh, the heart of India that forms the central Indian highlands. Kanha National Park was declared a reserve forest in 1879 and revalued as a wildlife sanctuary in 1933. Its position was further upgraded to a national park in 1955. The Kanha National Park is spread across the area of 940 sq km in the Maikal chain of hills. By adding the buffer and core zone altogether, the Kanha Tiger Reserve has the total area of 1945 sq km. The landscapes and the surrounding luxurious meadows along with the wooded strands and the dense forests offer magnanimous sightseeing experiences for nature lovers.

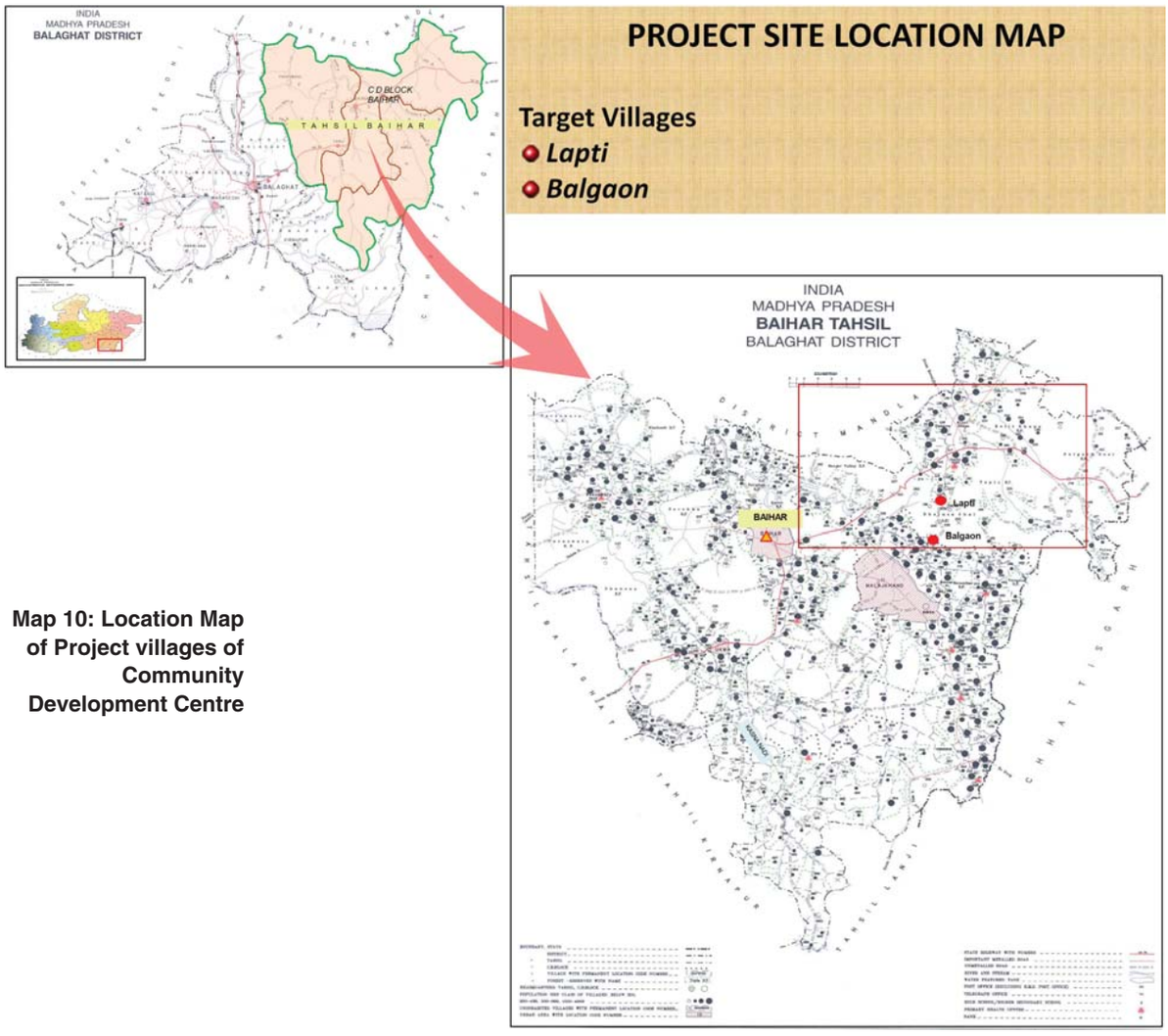
The Kanha National Park is an ideal home for a wide range of wild creatures; right from the mighty tiger to the Barasingha and countless species of plants, birds, reptiles and insects.

The park has a significant population of Royal Bengal Tiger, leopards, the sloth bear, Barasingha and Indian wild dog.

Community Development Centre (CDC) works with rural and tribal communities in Balaghat district of Madhya Pradesh. For the network programme on People and PAs, CDC worked with Gond community in two villages bordering Kanha National Park in Balaghat district. Salient features of the work have been improving land based activities and diversification of agriculture.

Improved vegetable cultivation beds under better farming practices

Photo Credit: CDC



Map 10: Location Map of Project villages of Community Development Centre

10.1 AREA, PEOPLE AND LIVELIHOOD

The project villages namely, Balgaon and Lapti are located adjacent to Kanha National Park (KNP). Geographically the villages are part of the Maikal hills in Central India. The entire region is an undulating terrain and has continuous forest cover. The area is heavily forested and comprises of mixed forests, which are dominated by Sal and bamboo. As it is a mixed forest, there are lots of species of Non Timber Forest Products (NTFPs). Some of the main ones are Harra, Bahera, Amla, Lac, Tendu leaves, Mohul leaves and Honey.

The project villages are inhabited by the Gond tribe. Their livelihood is dependent on rainfed agriculture, wage labour and NTFP collection. The community members collect NTFPs like Amla, Harra, Bahera, Chironji, honey, Mohul leaves from the forest and sell them in local market. In case of agriculture, paddy is the main crop cultivated whereas Arhar (*Cajanus cajan*), a pulse crop is cultivated on the farm bunds. Some community members cultivate beans and vegetable crops if there is assured irrigation post-three months after the rainy season.

Beans, produce of the improved farming introduced as livelihood augmentation by CDC

Photo Credit: Vishaish Uppal

CDC introduced sustainable agriculture through WADI, vermicompost and vegetable cultivation. They also carried out trainings to build capacity on sustainable harvesting of forest produce.

Table 9: Activities of Community Development Centre

Activities	
Augmenting existing practices and resources	Sustainable harvesting of NTFPs Vegetable cultivation Plantation of fruit trees Fodder species cultivation Fuel wood species cultivation
Livelihood diversification	Vermicompost WADI programme

10.2 CAPACITY BUILDING AND LIVELIHOOD BENEFITS

The villagers of both the project villages have been trained in sustainable harvesting of major NTFPs. In Balgaon, a NTFP processing unit has been set up. Triphala Churna and purification of honey are done at the processing unit.

CDC worked with almost all families in both the villages. Each family has been provided with around 30 fruit plants. The families planted them either in the backyard or on the farm bunds or in some suitable land under individual ownership. Community members ensured precautions like fencing, irrigation in summer through bucket or vessels, sheds made of leaf and grass to protect from heavy sun in summer and prevention from white ant infestation. In the second year of plantation, Papaya plants started bearing fruits.

To substantiate the fruit tree plantation, the villagers were trained in vermicompost preparation. In 2009, both the villages produced more than 50 tonnes of vermicompost. Most of it was used in the individual fields. However in 2010, around 2 tonnes of vermicompost were sold at the rate of Rs 10 per kg and

Box 10: Vegetable Cultivation in Community Livelihood Strengthening

Vegetable cultivation by the community members and subsequent sale of the vegetables in the local weekly market is the most successful activity in the project. Thirty households from Balgaon and 20 households from Lapti participated in the activity. The causal factors of the success are demand in the local market and comparatively immediate returns on investment.

Until 2008, before the project started, vegetable cultivation was hardly taken up by the local community members as an income generation activity. In the DST funded project, the activity was conducted through women SHGs. Seeds were provided as per the requirement and interest of the participants. Training programmes on seed treatment, cultivation, processing and marketing were conducted. The trainings have been conducted by the agriculture and horticulture department field staff. Coordinated efforts of the CDC staff and the community members have made vegetable cultivation an important income generation activity. In one year this activity generated on an average 20 man days of work thus contributing to employment generation. Average household income from vegetable sale is more than Rs 4500 per year. This is almost double the annual income of a family.

Photo Credit: Vishaish Uppal

Products of improved farming introduced by CDC

26 kg worms were sold at the rate of Rs 200 per kg. Nine families were involved in the sale of compost manure and worms. Nine families sold the manure and the worms resulting in earning almost double their annual income from non-agricultural activities.

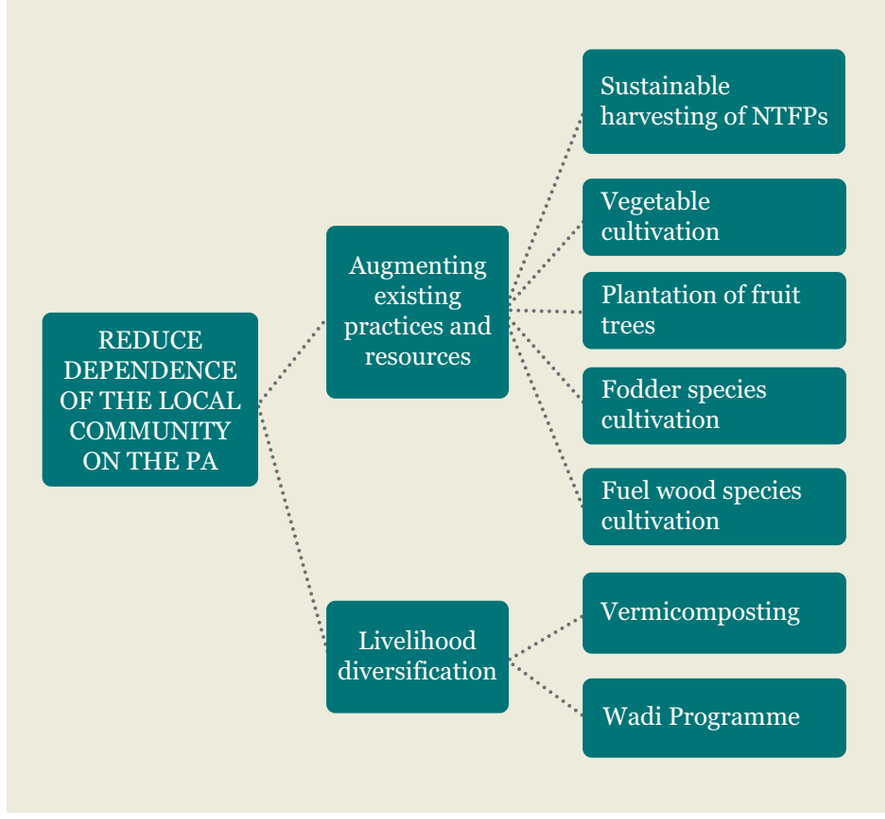
The Wadi programme is a livelihood strengthening approach in which nutritional and other needs are addressed. Under the Wadi programme, Subabul (*Leucaena lucocephala*), Bamboo (*Dendrocalamus strictus*), Harra (*Terminalia chebula*),

Vermi compost pits introduced by CDC

Photo Credit: CDC

Dhanwa (*Lagerstroemia parviflora*), Chironji (*Buchanania lanzan*) and Drum stick (*Moringa pterygosperma*) are planted in the courtyard by the participating families. The survival rate of the saplings was 80 per cent. The horticulture department was consulted for technical guidance and input support.

Diagram 10: Green Livelihood Model of Community Development Centre



Women in Lapti village making biomass briquettes introduced by CDC as energy conservation intervention

Photo Credit: CDC

10.3 CONCLUSION: INTERVENTION IMPACT

Community Development Centre introduced commercial scale vegetable cultivation in the project villages. Due to consistent monitoring and help by the field staff of Community Development Centre, over the period of three years, vegetable cultivation and sale in the local market has become a significant income generation activity in the project villages. Income generation activities introduced by the CDC have provided an incentive to conserve the resources and focus on improved farming through vermicomposting and water conservation.

Plantation of fuelwood and fruit trees and NTFP value addition has also led to conservation awareness about sustainable management of resources locally.

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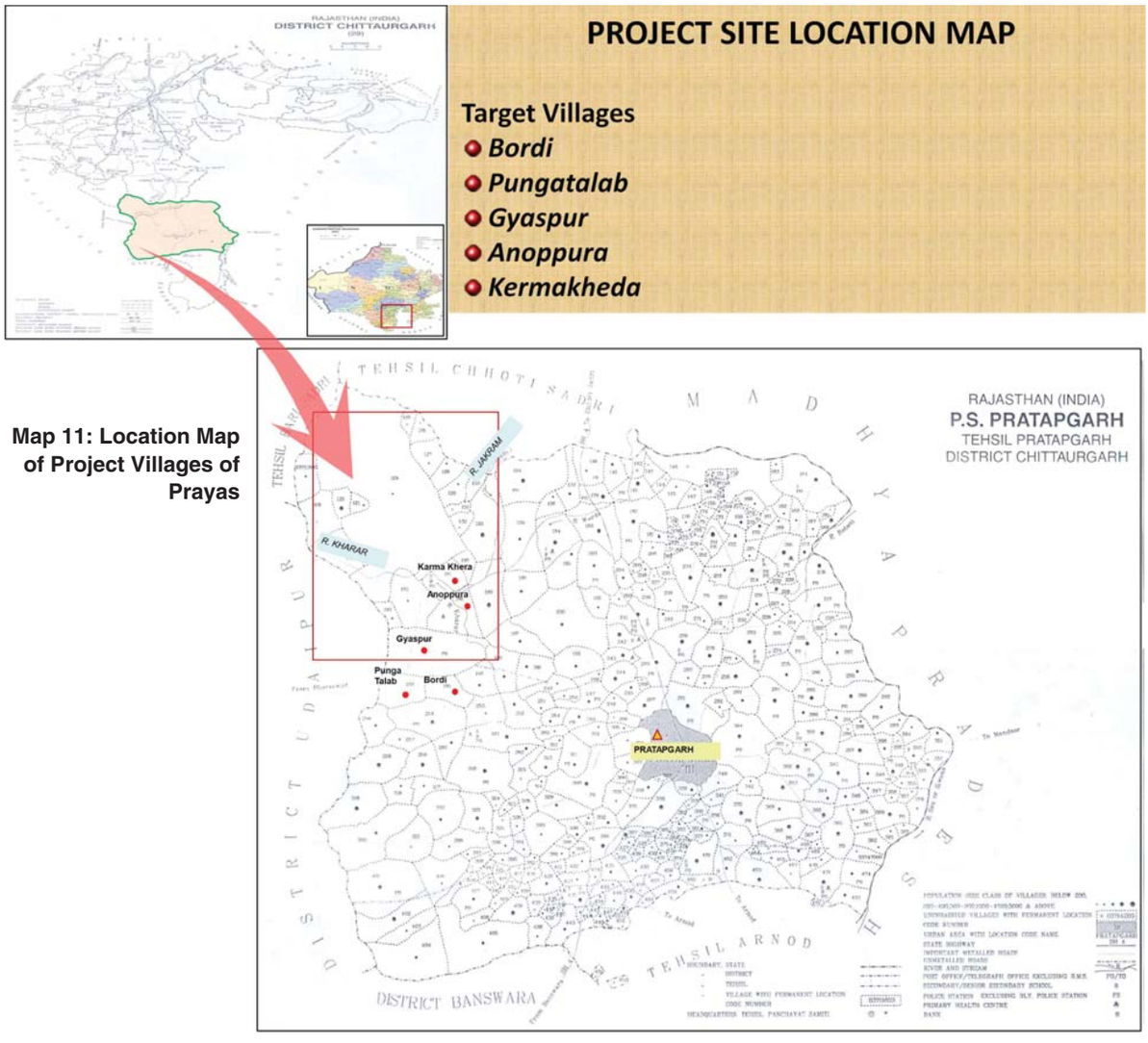
Chapter 11
LIVELIHOOD DIVERSIFICATION AND CONSERVATION

Sitamata Wildlife Sanctuary has an area of 422.95 sq kms and is situated in the south-east portion of Pratapgarh district, Rajasthan. The topography of the area is undulating because of the confluence of three different geological formations - Malwa Plateau, Vindhyachal Hills and Aravali Range. The average elevation ranges between 280 and 600 metres above msl with an average rainfall of 756 mm annually. The thickly wooded sanctuary is crisscrossed by seasonal rivers Jakham, Karmoi, Sitamata, Budhho, and Tankiya. Tree species that dominate the landscape include Teak, Tendu, Salar, Bel and Amla. The sanctuary provides rich pastures for a variety of deer including the four-horned antelope (Chousingha). The sanctuary is also home to animals like wild boar, leopard, pangolin, fox, jackal, hyena, porcupine, jungle cat and nilgai.

Prayas is a Rajasthan based voluntary organisation. Its work area is Pratapgarh District, in particular villages around Sitamata Wildlife Sanctuary in the district. In the network programme on People and PAs, Prayas worked in five villages bordering the sanctuary. The predominant community in the project villages is Meena, a tribal community. The villages are totally dependent on the forests for fuelwood and fodder.

Fodder cultivation introduced as a livelihood strengthening activity by Prayas

Photo Credit: Vishaish Uppal



Map 11: Location Map of Project Villages of Prayas

11.1 AREA, PEOPLE AND LIVELIHOOD

The project has been implemented in five villages namely Bordi, Gyaspur, Punga Talab, Anoppura and Karmakheda bordering Sitamata Wildlife Sanctuary.

The project villages are inhabited by the tribal community Meena. Every household has some livestock i.e. cow, buffaloes, goat, bullock and poultry. Main occupation in the project villages is farming and animal husbandry. Villages are heavily dependent on the forest for fuelwood and collection of NTFPs like Tendu leaves, grass, Mahua and Dolma to supplement their income.

The local community is aware that over harvesting of forest produce is resulting in the degradation of their forest areas. However, conservation can only be assured when viable livelihood alternatives are provided to the local communities. Introducing income generation activities based on the local resources and strengthening select existing livelihood practices was the way out. Most villages

Table 10: Activities of Prayas

Activities	
Strengthening existing practices	Cultivation of fodder species like Dhaman, Rajko and Barseem Grass Pulse processing Water harvesting structures Fruit tree plantation
Introducing New Practices and Technology for Livelihood diversification	Safed Musli cultivation Bamboo nursery and preparing bamboo articles

bordering the sanctuary depend on sale of fuelwood, bamboo and timber for income. Therefore, interventions like promoting bamboo cultivation, medicinal plants and fodder species using appropriate technology were the most viable options to reduce dependence on the forest.

11.2 LIVELIHOOD IMPACT OF PRAYAS INITIATIVES

Pulse processing is a household activity in the project villages. It is usually done with the help of a traditional stone grinder. As a livelihood strengthening intervention, a dal mill was provided to the three women SHGs as a common facility to process Urad in the Kharif season and Gram in the Rabi season. This has led to a 20 per cent increase in the annual income of the SHG members.

Photo Credit: Vishaish Uppal

Women SHG members run the pulse processing unit in the project villages of Prayas. The unit was introduced by Prayas as a livelihood improvement intervention

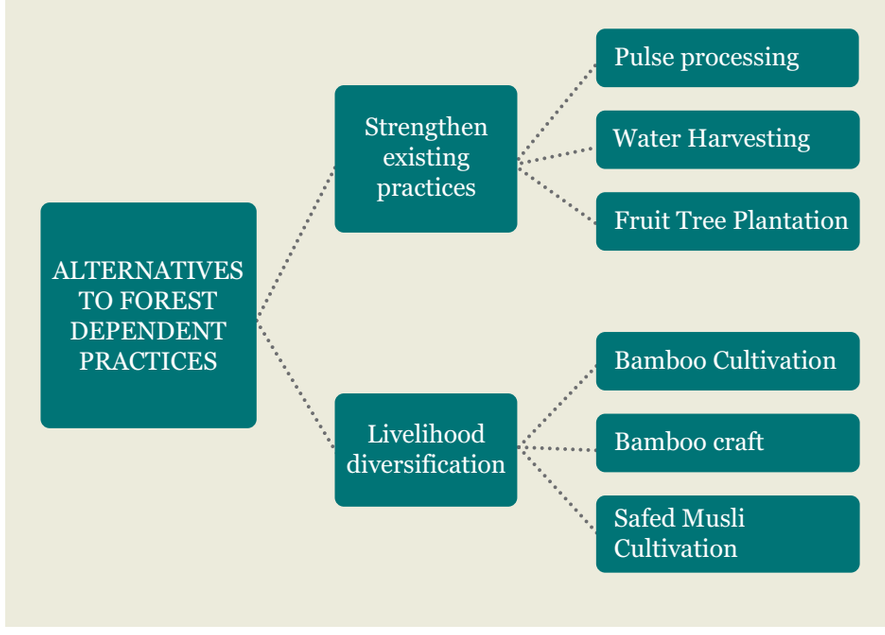
Photo Credit: Vishaish Uppal

Bamboo nursery developed by the community in a project village bordering Sitamata Wildlife Sanctuary. Prayas has introduced bamboo plantation as livelihood strengthening activity

For livelihood diversification, Prayas also set up Bamboo nursery by involving youth from the project villages. The saplings raised in the nursery have been distributed to the project villages. In the first year of Bamboo plantation, 65 per cent survival was observed. Training on Bamboo craft was also carried out. A village based artisan group is now involved in making of articles like baskets, door mats and other utility products using improved tools. On an average, each artisan household reported 15 per cent increase in their annual income from the sale of bamboo articles.

As a part of livelihood strengthening activity, plantation of fruit trees was promoted. The survival rate of the saplings was reported to be 80 per cent. It was observed that majority of the households cared for the saplings by fencing the plants to protect them from stray cattle. To ensure that the fruit tree plantation becomes a sustainable activity, a pit-cum-box type water harvesting structure was also created close to the each fruit plant. These structures were being prepared on the upper ridge of the pit in which the fruit plant was planted. It was observed that due to water harvesting measures, moisture was conserved for a long time and plant growth was vigorous.

Diagram 11: Green Livelihood Model of PRAYAS



Box 11: Medicinal plants cultivation and fodder cultivation as livelihood diversification activities

Medicinal plant cultivation: Safed Musli (*Chlorophytum borivilianum*) is a medicinal plant known for its aphrodisiac properties. Certain Saponins and alkaloids constitute its active principle. Tuberous roots of the herb are in regular demand from pharmaceutical companies. Safed Musli cultivation was suggested by the community members in the stakeholders consultation conducted in the initial period of the project. Two training programmes on Safed Musli cultivation under the guidance of experts from the extension programme of the agriculture department were organized to cover topics like sowing time, watering, harvesting practices etc. Twenty-five community members participated in the trainings. As a follow up to the training, each participant was provided 8 kg of seed material to take up Safed Musli cultivation.

Photo Credit: Prayas

Safed musli cultivation has been introduced as livelihood diversification intervention by Prayas in the project villages bordering Sitamata Wildlife Sanctuary

Fodder cultivation: In the stakeholder consultation the community members also suggested that they would prefer fodder cultivation as one of the project activities. It was in almost everyone's interest as all community members have cattle. Three species were identified for fodder cultivation. Out of these, Dhaman grass was broadcasted in the common pasture land whereas Rajko and Barseem were cultivated by the participant community members in their own land. The fodder was only used for household consumption. One hundred and twelve families participated in the fodder cultivation. Area under cultivation per household was 200m² area. The germination rate of the seed was reported to be 80 per cent. Average harvest per household was in the range 8 to 14 quintal of grass. Nutritious fodder resulted in increase in milk production. Substantial number of households have continued stall feeding the cattle. Overall, this activity has been well accepted since it has helped in increasing milk production and therefore family income.

Prayas also initiated a bee keeping activity for the youth. This however was not successful due to a heavy casualty of bees because of a large presence of bee-eater birds in the area.

11. 3 CONCLUSION: INTERVENTION IMPACT

Local community members in the project villages of Prayas are dependent on Sitamata Wildlife Sanctuary for fuelwood, fodder and small timber. Through the network project, Prayas has provided alternative to fodder extraction from the forests. Fodder cultivation is important for stall feeding the cattle. Stall feeding the cattle is important from the point of view of regeneration of forest flora.

Income generation activities like pulse processing, bamboo craft, Safed Muesli cultivation has helped in diversification of livelihood practices and income augmentation of households.

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Chapter 12
LIVELIHOOD STRENGTHENING THROUGH MILLET VALUE ADDITION AND SRI TECHNIQUE OF CULTIVATION

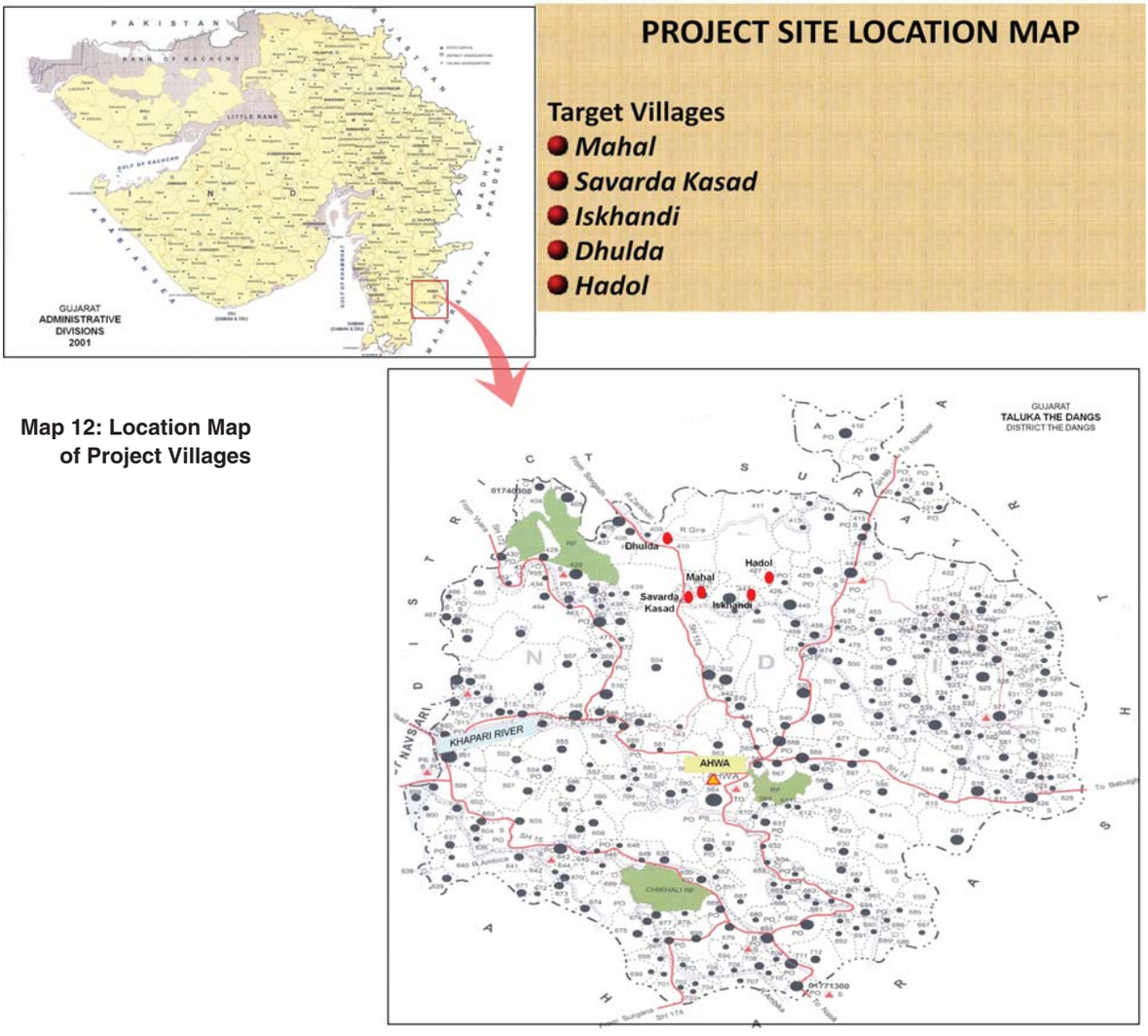
Purna Wildlife Sanctuary is located in Dangs, Gujarat. The district Dangs is located in the southern part of Gujarat with the Sahara Hills in the east and the plains of Gujarat to the west. It is the northernmost limit of the Western Ghats, a biodiversity hotspot. There are four distinct river valleys viz., Giro, Purna, Capri and Zambia in the area that emerge in the hills of the Western Ghats and flow towards the west. Out of the total geographical area of 1764 sq km, dense forests constitute 1008 sq km, 84 sq km of these forests have been declared as the Purna Wildlife Sanctuary.

The Dangs is one of the richest biodiversity areas in the Western Ghats and comprises of a number of floral and faunal species. About 550 species of plants including *Tectona grandis, Wrightia tinctoria, Dendrocalamus strictus, Dalbergia latifolia, Albizzia procera, Terminalia crenulata, Acacia catechu, Adina cordifolia, Saccopentalum tomentosa, Lagerstroemia parviflora* are found in Dangs. The faunal diversity includes *Panthera tigris, Presbytis entellus, Panthera pardus, Felis rubuginosa, Ratufa indica dealbatus, Tetracerus quadricornis, Cervus unicolor, Mutiacus muntjak, Axis axis*, a number of reptiles, birds and insects species, out of which many are threatened and endangered species.

WWF-India has worked in five villages situated in and around Purna Wild Life Sanctuary. The villages identified for project activities were Mahal, Savarda Kasad, Dhulda, Hadol and Dhongi Amba. It is a predominant tribal region and the main tribal groups are the Bhils, Konkanas, Kunbis and Warlis. The land

Community members setting up a nursery of trees

Photo Credit: WWF-India



Map 12: Location Map of Project Villages

allocated for the *dangis* is called malki or private land. The traditional agricultural practice prevailing in Dangs even today is low intensity subsistence agriculture.

12.1 AREA, PEOPLE AND LIVELIHOOD

Four tribal communities namely the Bhils, Kokanas, Warlis and Kunbis form a majority of the population of the project villages. Their important livelihood activities are agriculture, collection of forest produce and wage labour in the neighbouring districts in the lean cultivation season. On the flat lands, paddy is cultivated whereas a variety of millets is cultivated on the hill slopes with shallow soil layer.

Although agriculture is the primary occupation, it only meets the subsistence needs. A very small percentage of households sell crops grown for cash income. A very large number of people migrate to the sugar mills and paper mills located at Songadh. At least two persons per family leave their homes right after the festival

Table 11: Major Activities

Activities	
Introducing Technology for Livelihood diversification	Bakery unit and nagli (Millet) value addition
Alternative to existing destructive / exploitative practices	System of Rice Intensification Vermi composting Nursery raising and plantation Vegetable cultivation
Capacity Building	Training Programmes on nagli processing, management of bakery unit, SRI, vermi composting

of Dussehra for about six months in search of jobs. On an average it was found that the migrant members of the families bring back home a cash income of Rs 15-20,000/annum. WWF-India worked on developing livelihood strengthening activities and improving the agricultural practices to get better yields. Vermicomposting, SRI technique was introduced in the villages. Women were also organized into SHGs for nursery raising and Nagli (*Eleucine coracana*) value addition. Training and capacity building was done to enable women to bake nagli products, raise timber and fruit trees as well as engage in vegetable cultivation. Suran, Ratalu, Safed Musli were also cultivated for augmenting cash income. A bakery unit was set up in village Mahal for value addition of nagli. Women SHGs were trained in preparing biscuits, papads, breads using locally grown nagli.

12.2 LIVELIHOOD BENEFITS AND CAPACITY BUILDING

Most of the activities in this project were demonstration activities where the main objective was to familiarise the villagers with new simple technologies.

A group of farmers was trained in SRI-based rice cultivation. In the third year of SRI implementation, it was observed that on average per acre yield has increased. The increase was reported to be almost 25 per cent. In terms of net figures, it increased by 3 quintal additional over the usual 18 quintals per hectare.

Photo Credit: WWF-India

Household level vermi compost unit introduced by WWF as livelihood strengthening activity in a project village bordering Purna Wildlife Sanctuary

In case of vermicomposting, each household produced an average of 100 kgs of vermicompost in the first year. Almost a third of the number of households participating in this activity continued vermicomposting on their own without any external support.

Nursery-raising and afforestation was conducted as a part of strengthening the natural

Box 12: Millet value addition: A case of Nagli (Finger millet, *Eleusine coracana*) based bakery unit

Nagli is a staple crop of farmers in the hilly tracts of Dang district. Given its nutritional importance and prevalence in the project area, it was significant that Nagli-centred intervention be a part of the project. It was decided that a bakery unit essentially based on use of Nagli be set up. After consultation with women of project villages, it was decided that women of Mahal village would run the bakery unit. A SHG of twelve women has been formed for this activity in Mahal. Training programmes on preparation of Nagli biscuits, papad, and nankhatai were organized. Gram Seva Trust, Vyara conducted the training on value addition of millets and other products. The training covered how to make different bakery items, use of an oven, set the temperature, costing and marketing of products. Three youths have been trained for marketing of the nagli products. From exposure point of view, village women were taken to Pune, Ahwa and Valsad to look at operational aspects of bakeries, type of products and their demand in the market.

The women were also taken to the bank for operating accounts especially to deposit and withdraw money and regular update of passbook. Resource persons for the training programmes were from Gram Seva Trust, Vyara, local bakeries in Valsad and WWF-India.

Photo Credit: WWF-India

Kneading Ragi Flour in bakery set up by WWF as livelihod diversification effort in a project village bordering Purna Wildlife Sanctuary

After successful completion of the training programme and the exposure tours, the bakery unit has been set up involving trained women. It took some time for the women to run the bakery unit on their own. Using a gas oven was a challenge but it was overcome through regular support and mentoring by WWF. Use of temperature gauge, better regulator, and iron sheets were introduced to prevent burning of products. A weighing scale was also given and the women were taught how to use it to measure raw products as well as final products.

In February 2010, the SHG has started making Nagli biscuits, papad, and nankhatai. They have also learnt how to make other bakery items like cup cakes, bread and pao which can also be sold locally. The group has opened a bank account and is also selling products locally on a regular basis. Now the SHG is running the bakery unit to its full capacity. The SHG members have signed an agreement with WWF that they will use and maintain the unit properly and will keep the unit functional. On an average 4-5 kg of nankhatai, 2-3 kgs of papad are made every week. All the products are sold in the local market. Indeed there is an increase in cash income from the bakery unit. Each member of the SHG earns at least around Rs 250 a week when they are baking products (2 hrs/day). Thus, using leisure time for additional income using local produce with value addition has really benefited the women in the project area.

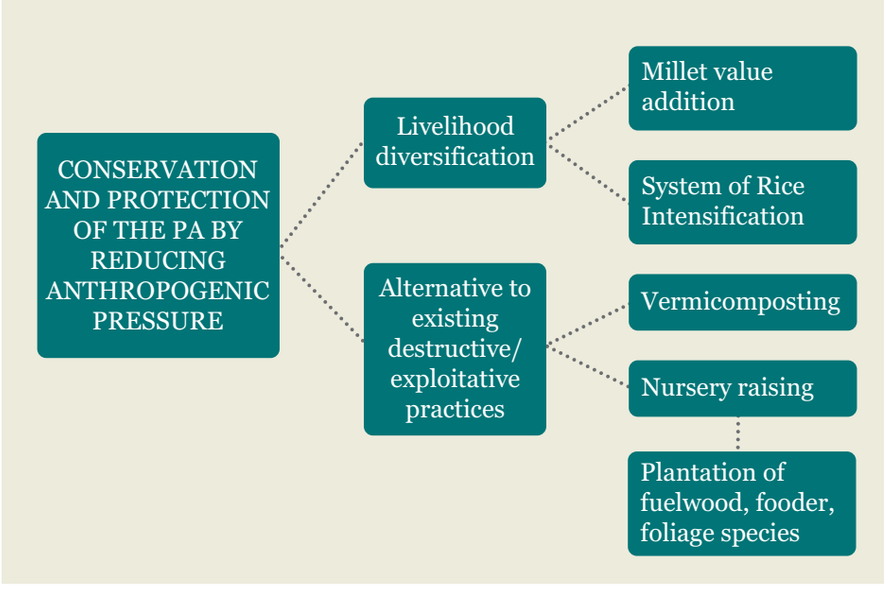
The SHG members meet every month and collect money which is deposited in the bank. The group is not registered yet, but the members have opened bank account in the nearest branch of State Bank of India which is located in Ahwa. The bank account is in the name of Mahal Kot Mahila Sakhi Mandal. In December 2011, the group had a balance of Rs 20,000 in their account.

Photo Credit: WWF-India

Rice cultivation by SRI technique introduced by WWF in a project village bordering Purna Wildlife Sanctuary

resource base of the project villages. Nursery-raising has provided employment to 10 families in the project villages. Two nurseries were set up in the project villages. More than 200 households in the project villages volunteered to take up afforestation. At the end of the monsoon season, it was observed that the survival rate was 70 per cent. In addition, cultivation of Safed Musli, Suran and Ratalu was taken up. This helped in augmenting cash income from sale in the local markets as well as supplementing their daily diet.

Diagram 12: Green Livelihood Model of WWF



12.3 CONCLUSION: INTERVENTION IMPACT

WWF-India's work in the villages bordering Purna Wild Life Sanctuary is focused on providing workable and viable income generation options to reduce dependence of the local community on the forests. The effort to provide fruit trees like Mango and Guava along with timber species will augment income in coming years. Focus on improved agricultural techniques like SRI and vermi compost has also improved the productivity of the land and reduced fertiliser use. The nagli product bakery successfully run by the women SHG is a significant development which has enabled the women to run and manage an enterprise independently. These interventions have provided alternative sustainable livelihood options for the local community.

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Chapter 13
STRENGTHENING LIVELIHOODS THROUGH HANDICRAFTS FOR THARU COMMUNITY

Suhelwa Wildlife Sanctuary is an important link in the Terai Arc Landscape. It consists of 5 wildlife ranges, of which the western most range with its good transboundary connectivity with the forests of Nepal is of critical importance to the long-term conservation of the sanctuary. Located in Shravasti, Balrampur and Gonda districts of Uttar Pradesh, Suhelwa Wildlife Sanctuary was declared as a sanctuary in 1988. Occupying an area of 452 sq km, the sanctuary is covered with Saal, Sheesham, Khair, Sagaun (teak), Asna, Jamun, Haldu, Phaldu, Dhamina, Jigna and Bahera trees. The fauna found in the sanctuary includes Leopard, Tiger, Bear, Wildcat, Boar and various birds.

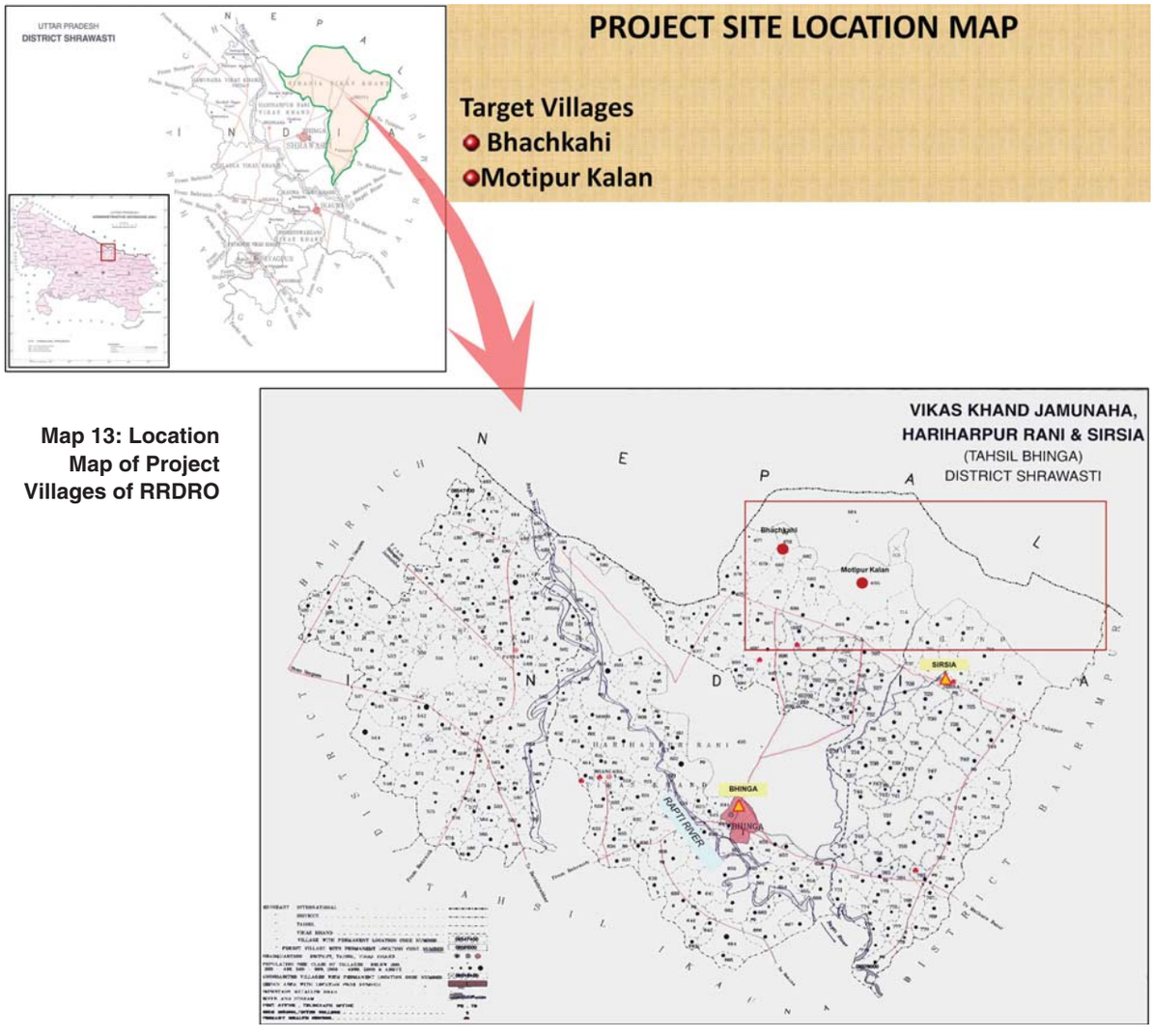
Raghvendra Rural Development and Research Organization (RRDRO) works in the terai region of Uttar Pradesh. As a part of the network programme on People and PAs, it worked in two villages bordering the Suhelwa Wildlife Sanctuary. The project villages are inhabited by the Tharu tribe that has traditionally subsisted on forest resources.

13.1 AREA, PEOPLE AND LIVELIHOOD

The project area comprised of hamlets of Motipur and Raniyapur in Motipur Kalan Gram Panchayat in Sirsia block of Sravasti district in Uttar Pradesh. The community members are mainly engaged in agriculture. Their main crops are Wheat in the Rabi and Paddy and Maize in the Kharif seasons. With increased family members and the breakup of the joint family system, land holdings have become small and fragmented. Agricultural produce does not suffice

Tharu women from project villages around Suhelwa Sanctuary

Photo Credit: RRDRO



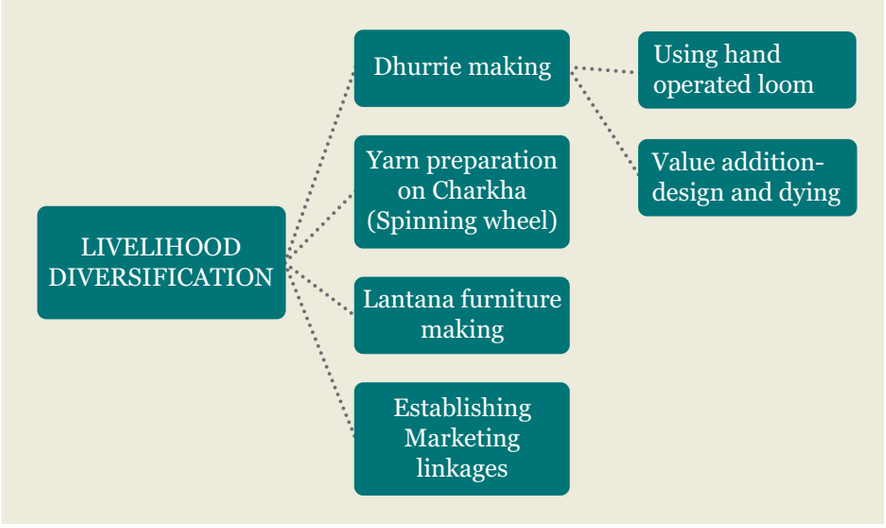
Map 13: Location Map of Project Villages of RRDRO

beyond household needs. Between agricultural cycles, Tharus migrate to work as wage labour on construction sites in cities and other projects like road construction, dam construction in neighbouring Uttarakhand state. A minor irrigation dam, Motipur Bandha, is very important for the economy of the project area as it is the only source of irrigation in an otherwise rain fed area. It is also a source of fish and snails which are an important part of diet for the Tharus.

Table 12: Activities of RRDRO

Activities	
Livelihood diversification	Yarn preparation on Charkha (Spinning wheel) Dhurrie making Lantana furniture
Capacity Building	Training Programmes on Yarn preparation, Dhurrie making and Lantana furniture Marketing linkages SHG formation

Diagram 13: Green Livelihood Model of RRDRO



During the initial survey, it was found that the forest is increasingly stressed by fuelwood and grass extraction and extraction of NTFPs. In the absence of other livelihood sources, these activities are proliferating, leading to increased disturbance to wildlife and destruction of habitat.

RRDRO followed the livelihood diversification approach. It introduced dhurrie (cotton mat) making and Lantana (*Lantana camara*) furniture making as major interventions. Lantana is an invasive species encroaching open areas in the project villages.

13.2 LIVELIHOOD IMPLICATIONS OF RRDRO EFFORTS

The entire project was focused on the livelihood diversification approach. Three activities were introduced in the project villages seeing the potential of available natural resources and abundant availability of Lantana weed encroaching agricultural field. These activities were yarn preparation, *dhurrie*-making and preparation of Lantana furniture.

Traditional Baskets made with *moonj,* a local grass, by Tharus

Photo Credit: RRDRO

A month-long training programme on yarn production using spinning wheel was organized to train the Tharus for *dhurrie*-making with improved design for better market acceptability. Over time, this activity has been well accepted by Tharus as a major income generation activity.

Training programmes were also organized for the preparation of articles (Basket, chair etc.) from Bamboo, Lantana and Cane. RRDRO arranged linkages for design and marketing support and to ensure long-term handholding for continuation of the activity. Further, linkages have been made with TRIFED for marketing support. Opportunistic use of Lantana in the area has helped to reduce its spread on agricultural land and in providing an additional source of income to the Tharu community.

Box 13 : *Dhurrie*-making as livelihood diversification

Rationale of introducing *dhurrie*-making as livelihood diversification is premised on four causes: (1) The intervention should not rely directly on the forest resources, (2) It should be replicable, (3) Potential to be supported by tribal welfare institutions of Government of India and, (4) Be a good adjunct to the ecotourism industry, which is being promoted by the State Government and other private organizations.

In the project area, over the three years, it has emerged as a viable livelihood alternative. *Dhurrie*-making is not a Tharu tradition though they use grass and make utility articles. Intensive training programmes organised by RRDRO have resulted in a group of 12 villagers getting trained to such an extent that they can work as master trainers.

Photo Credit: RRDRO

Dhurrie making is an intervention of RRDRO in the project villages bordering Suhelwa Wildlife Sanctuary

In the first year of intervention, RRDRO organized a master trainer from Allahabad to train the group to set up the handlooms, make yarns and weave *dhurries* using simple design. Two handlooms were also set up in the village so that the participants get hands on experience. Over time, all participants have become skilled not only in *dhurrie*-making but also in repairing the loom. The trained group is now able to switch over from simple designs to complex designs like stripes on tiger skin and range of shapes and products like a round mat for meditation. The group members are now able to set up the loom on their own. With the help of marketing support from TRIFED, in 2011 the group has earned net profit of Rs 90,000. The group has now officially constituted into a SHG with a bank account. The earning of 2011 has been invested in purchasing raw material. These are clear indications of *dhurrie*-making turning into a sustainable income generation activity for the Tharus.

13.3 CONCLUSION: INTERVENTION IMPACT

Dhurrie-making is introduced in the project area as an alternate livelihood activity. Though some of the pressures on the sanctuary like fuelwood collection will not be mitigated immediately, the Tharu community is being benefited and can be encouraged to participate in conservation activities and also promote eco tourism which will help to create a market for their product. Lantana furniture-making, on the other hand, is directly contributing to conservation purpose. It is expected that with the increasing demand for Lantana furniture, the invasive species will get increasingly removed.

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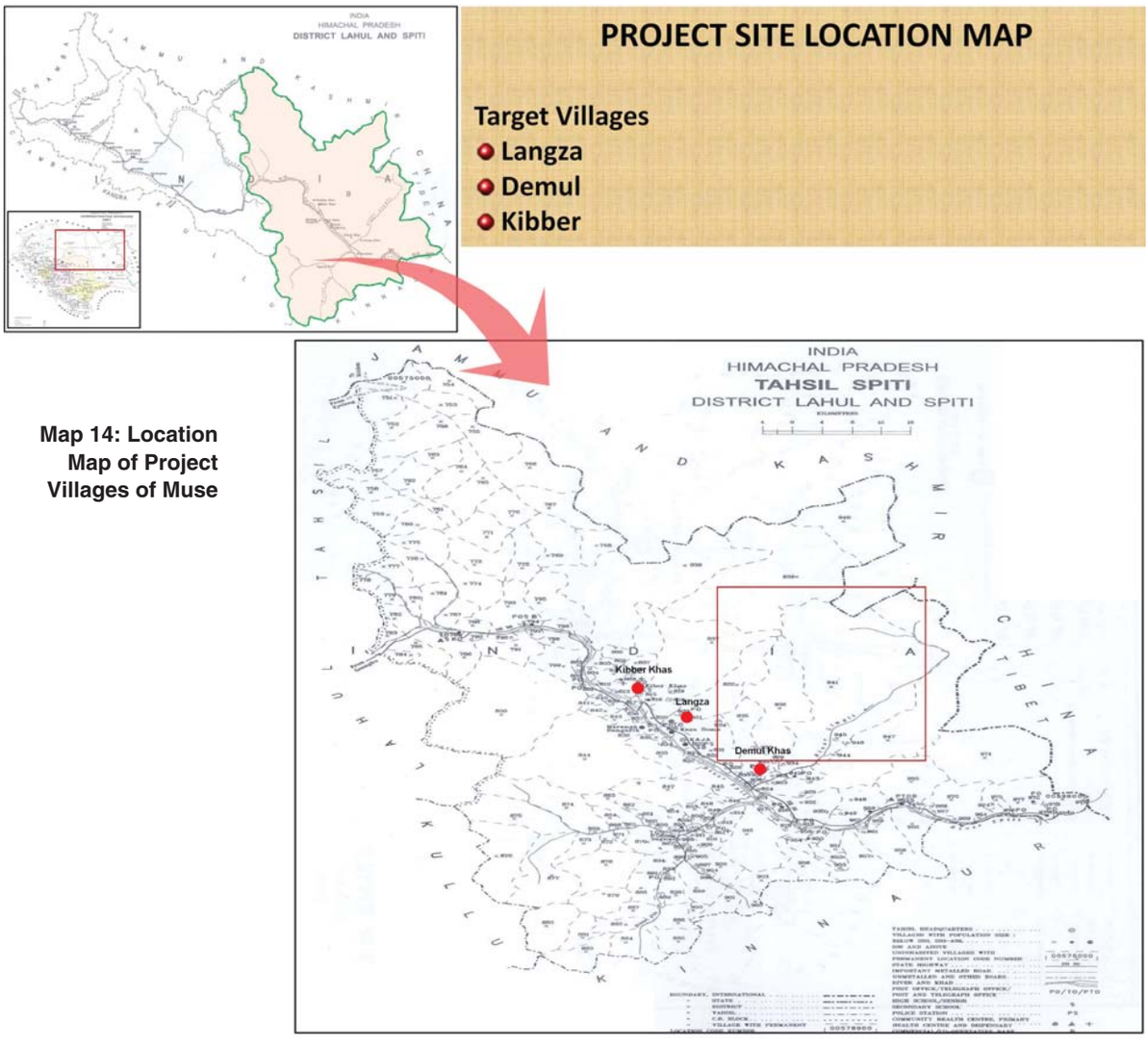
Chapter 14
REVITALIZING TRADITIONAL ACTIVITIES FOR SUSTAINABLE LIVELIHOODS

Kibber Wildlife Sanctuary (KWS) located on the left bank of the Spiti river and is linked by roadway via the villages of Lhalung, Langza and Kibber. It is spread over an area of about 1400 sq km and is segregated in an outer buffer zone and an inner 'core'. It is the only sanctuary in the country which is situated in a cold desert area. It is at an average altitude of 15,000 feet. The sanctuary covers an area of approximately 800 sq km. Being a high altitude sanctuary, KWS is home to a variety of rare animals like the Ibex, Blue sheep, Red fox, Tibetan woolly hare, Himalayan Wolf *(canis lupus laniger)*, Lynx, Pika, Tibetan wild ass and the majestic but elusive Snow leopard. A sighting of the Snow leopard is very rare partly due to its elusive nature and part due to its dwindling number. But signs of its presence, killed prey, pug marks, scat and spray, are omnipresent. The birds that are found here include the Himalayan Snow cock, Himalayan billed chough, Bearded eagle and Griffons. The sanctuary also offers a great view of the region's peaks - *Chau-cahu Khanamo* and *Chau-chau Khang Nilda*.

MUSE is a Himachal Pradesh based voluntary organisation working in Spiti district. As a part of the network programme on People and PAs, it worked with local communities in three villages in Spiti district. Spiti is a cold desert with an arid landscape and limited vegetative growth. It lies at a height well above 3000m above mean sea level. The temperature can dip to minus 30°C in the winter. Such hostile conditions do not offer much for sustenance to the inhabitants and due to a lack of rain, even agriculture is limited to one crop a year. Under such harsh conditions MUSE tried to address the alternative livelihood issues in the project villages by linking the interventions to the project area's natural and cultural resources.

Langza, the project village of MUSE near Kibber Wildlife Sanctuary

Photo Credit: Vishaish Uppal



Map 14: Location Map of Project Villages of Muse

14.1 AREA, PEOPLE AND LIVELIHOOD

While the sanctuary is largely uninhabited, there are a few villages placed within that are largely dependent on the sanctuary for fodder and fuel. The villages identified for the project activites were Langza, Kibber and Demul.

Kibber Wildlife Sanctuary and the target villages are on the highland pastures of the Spiti Valley. They are cut off from the rest of Spiti for close to six months of the year, making even accessibility to basic amenities and income generating avenues extremely difficult.

Livestock and agriculture constitute the mainstay of the economy of the Spiti community. However, as land holdings are small coupled with limited cultivable land, it is difficult for agriculture to contribute substantially to the economy of the region. Cash-based income generating opportunities in Spiti are scarce.

Table 13: Activities of MUSE

Activities	
Strengthening existing practices	Revival and value addition of barley and black pea Technological up-gradation of traditional tools/equipment like improved baking units for clay craft and woolen handicraft
Livelihood diversification	Installation of solar geysers, safe drinking water facilities as a means of enhancing incomes for local youth through eco-tourism

Agriculture and grazing pastures are heavily dependent on winter snowfall and snowmelt as this is the only source of irrigation. Unlike other villages along the river valley which can alternatively use river water for irrigation, these villages are completely dependent on spring water and snow melt, increasing the scales of dependence and susceptibility of agriculture and livestock to drought.

14.2 LIVELIHOOD IMPLICATIONS OF MUSE INTERVENTIONS

In case of strengthening existing livelihood practices, MUSE worked on revival of *Kala Matar* (black pea) and Barley cultivation. The area under cultivation of these two crops has decreased over the years due to migration, reduced time and area available for cultivation. Eleven families in both the villages volunteered to revive cultivation of barley and black pea. MUSE provided operational support like procuring seed material from the nearby KVK in the district and financial help in arranging irrigation facilities. At the end of the cultivation season in the year 2010 and 2011, all participating families harvested a reasonable quantity of produce from both the crops. The produce was used partly as seed material for the next cultivation season and partly for home consumption. Some produce was also used to prepare snacks which could be sold to tourists.

Barley and Kalamatar products for marketing to tourists as an initiative towards livelihood strengtheing

Photo Credit: WWF-India

Box 14 : Improved baking units for clay craft for livelihood strengthening

In the initial period of the project, meetings were held with the villagers to assess the existing status of the crafts in the village and the skill levels available. Some villagers, especially the home stay providers suggested that handicrafts could be sold to the tourists. They showed some of the products they had already developed. A local committee was set up to undertake and coordinate the various activities focusing on improved baking techniques, tools and designing for quality products. After discussions with the villagers, it was decided to focus on reviving the mud craft in the village.

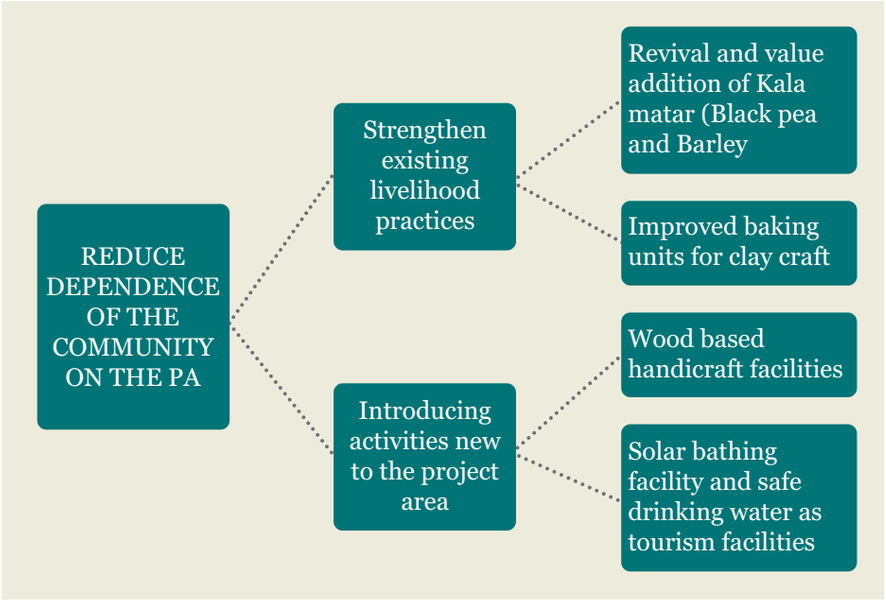
There are traditional potters in the project village. A brief survey was conducted with the existing artisans. Discussions and a preliminary workshop with the mud craftsmen in the village revealed that they had clear knowledge of raw material sourcing and development of traditional products. However, they needed skills and training on baking as well as assistance with better techniques and machines for baking. The village craftsmen wanted to adopt the potter's wheel as they found it to be more efficient than their traditional system. In May 2009, a mud craft workshop was held with 10 mud craftsperson in the village. The workshop helped assess training needs in terms of quality and design of the mud craft products. As a follow up, an intensive 10 days training programme was organized by MUSE in association with Andretta in Palampur, HP. The artisans were trained in improved techniques and tools for preparation of mud, use the potters' wheel, glazing, making moulds and baking. As a result, a decentralized pottery unit was set up at Spiti in 2011. Additionally as a means to prevent the sale of fossils in Spiti, developing fossil replicas in mud which travellers could buy instead of a real fossil is also being experimented by MUSE. The replicas have come out very well and have market acceptability. So far the pottery unit has developed 15 products which are sold through Ecosphere's craft shop. Ecosphere is the external but local stakeholder who was consulted for marketing of the products and linking up with the tourism industry. It is estimated that a household can easily earn between Rs 5,000 to Rs 10,000 per year as an additional income through such alternative livelihood opportunities to locals. The activity is successful as it has been integrated with the tourism industry.

Photo Credits: Muse

Products of mud craft developed by Muse as a livelihood initiative

Pottery and woolen articles made by villagers in the project village of Muse near Kibber Sanctuary

Diagram 14: Green Livelihood Model of MUSE



As a nonfarm activity, pottery was introduced in the project villages as a livelihood diversification activity after consultation and interest shown by the community members. Initially ten community members took mud craft pottery training and MUSE established a market linkage for their pottery products. MUSE has tied up with Ecosphere, a social marketing agency for the marketing of the handicrafts prepared by the community members. MUSE has also initiated efforts to revive traditional wool-based handicrafts. Women groups have been asked to make socks, leg warmers, stoles etc which is sold locally to the tourists in Spiti.

As part of livelihood diversification efforts, MUSE conducted orientation programmes on village based ecotourism for the community members. To substantiate tourism efforts, solar water heating is installed and is linked to

Solar water heater on the common bathing facility introduced by Muse to improve tourism facilities in the project villages

Photo Credit: Muse

common bath and toilet facility in Langza village. Community people have developed mechanisms for sharing and re-filling water. They are jointly responsible for the maintenance of the facility. In addition a water filter was installed at the Spiti office. Awareness was created among tourists to refill their bottles and not used packaged bottles as the disposal of the bottles is causing a lot of problems in Spiti. A nominal fee is charged and this activity is sustaining itself because of the tourists.

14.3 CONCLUSION: INTERVENTION IMPACT

MUSE worked on the hypothesis that it is possible to reduce the resource extraction pressure on the forests by the local communities if alternate livelihood options are provided to the community members. For this purpose, MUSE introduced pottery and mud craft, revival of *kala matar* and barley cultivation, its value addition, engaging women in woolen handicraft as livelihood options. Community members in the project villages have picked up necessary skills of pottery and woolen craft. The solar bathing facility installed to provide warm water for bathing for the tourists and villagers has reduced use of fuelwood to heat water for bathing and other chores. Thus MUSE interventions have directly reduced extraction pressure on the forests and are contributing towards conservation.

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Chapter 15
CONCLUSION AND THE WAY FORWARD

The Network Programme on People and Protected Areas was implemented between 2008 and 2011. It covered 13 Protected Areas representing different biogeographic regions of India. Most of the Protected Areas selected were from diverse ecosystems, relatively less known and also had limited funding for working with communities. This network programme provided an unique opportunity to WWF-India and SEED, DST to work with local voluntary organisations which are dealing with complex issues related to conservation and livelihoods. The programme has been implemented in partnership with 12 voluntary organisations working in 13 different Protected Areas spread across the country. The programme has covered over 3500 households, engaged with 66 existing village level institutions and created 40 new groups/institutions involving around 20 tribal groups including Primitive Tribal Groups like *Chenchus* and *Katkaris*.

Salient outcomes of the network programme[1] from the conservation point of view have been:

- Sustainable resource use and value addition of NTFPs have led to better conservation practices
- Reduction in fuel wood extraction and fodder collection from PAs in a few project sites due to adoption of energy efficient units and fodder development.
- Decrease in use of chemical fertilizers from preparation and usage of vermi-compost and vegetative compost.

From the economic point of view, prominent achievements have been:

- Development of diverse models of sustainable livelihood for local communities staying around PAs has enabled livelihood diversification and enhanced household income
- Development of several new products like Mahua jam, Tamarind cake, Ragi biscuits, mud pottery, coir mats and herbal medicines in almost all project sites
- Establishment of linkages between local institutions and different marketing partners.

In the context of social achievements of the network programme, it is noticeable that interventions of the partners of the network programme have resulted in,

- Empowerment of local institutions to lobby with government agencies for better facilities in their villages
- Reduced drudgery of local community members, especially women from fuelwood and fodder collection
- Empowerment of women groups to manage enterprises on their own and,
- Better relations of local communities and institutions with the forest department, agriculture department, horticulture department, technical institutes, banks and marketing agencies

[1] Salient outcomes of the Network Project in detail are mentioned in the annexure (Annexure II to IX)

Some prominent technological interventions of the network programme have been,

- Solar bath facility has led to reduction of 12 tons of fuelwood per household annually (Himachal Pradesh).
- 50 per cent reduction in fuelwood consumption from the usage of improved chulhas in Maharashtra.
- SRI techniques and vermicompost usage in Dangs (Gujarat) has improved crop productivity by around 15 quintals per hectare.
- Cutting of tree branches has been stopped by Chenchus for collection of tamarind and amla allowing better tree growth (Andhra Pradesh).
- Collection of Mahua flowers using nets has reduced forest fires incidents in Odisha.
- Sustainable harvesting and sale of honey by Chenchus in Andhra Pradesh has increased household incomes by around 20 per cent annually.
- Mahal Kot Mahila Sakhi Samiti self help group running a bakery enterprise in Dangs, Gujarat.
- Empowerment of Tharu Banvasi Self Help Group in Uttar Pradesh for self management of credit, intra group loaning and self procurement of raw materials.
- Biomass briquettes/bio-globules training provided through Forest Department in all 18 villages in Senchal Sanctuary, West Bengal.
- A total of 100 community herbal garden users established in Tamil Nadu for the sale of medicinal herbs.
- Improved production of crops has improved food security in some project sites.

In retrospection, the network programme of People and Protected Areas implemented between **2008 and 2011** has successfully achieved the objectives set up at the start of the programme.

In all the case discussed above, it should be concluded that for effective management of PAs and securing local livelihoods, the following factors/ approaches with **local institutional arrangements** are crucial for people's empowerment as well as to ensure sustainability of field based interventions:

- **Decentralized functioning** transforms institutional mechanisms and enables people to be effective participants and beneficiaries of development programmes.
- **Gender sensitive technology development** ensures in meaningful participation and sustainability of the programmes.
- Eco restoration and employment generation through **judicious use and transfer of appropriate technology package with involvement of people at all levels** from planning to implementation stage ensures post intervention sustainability. Need is to adopt **"systems management approach"** for technology absorption with social and managerial inputs.
- **Gender sensitive planning at the local Panchayat level** with gender/sex-segregated information to support S&T-based developmental efforts in the rural production system.
- **Technologies** should be such that they would **upgrade traditional skills** and capabilities; be **innovative** and capable of **easy assimilation**; generate significant and assured added value to existing methods of operation; generate employment and use local resources; be **capable of replication and adoption.**
- Technologies should **blend harmoniously with existing eco-systems** leading to tangible improvements in the living conditions and self sustained development of the people as well as PAs.

- To make any intervention successful, other areas of interest and **support activities to provide basic facilities** like drinking water, health and sanitation, nutrition, family planning, adult education and social security etc. should also be taken care of.
- **Importance of S&T base (science based VOs) in the actual area for effective technological intervention**/to develop location specific technology package taking into account the perceptions of people.
- **Involvement of local motivator as active "change agent" or "natural carrier" of technology** through awareness and demonstration and hands on training.
- **Strong institutional linkages between S&T based field groups/VOs, R&D institutions with an extension machinery to disseminate the proven technological package at grassroots** which empowers and enable community to seek local solutions and have face-to-face interaction with scientists.
- **Equitable sharing** of benefits amongst different stakeholders.

THE WAY FORWARD

A lot of interest has been generated by the network programme implemented by SEED division of DST, WWF-India and the partner voluntary organisations in the period 2008-20. SEED division and WWF-India have received requests from various voluntary organisations asking to be part of this process. This has been mainly due to the outcomes of the network programme has clearly shown increased incomes, decrease in dependence on natural resources and an improved relationship with PA authorities.

It is thus decided that it would be useful to scale up this initiative and cover more Protected Areas in additional biogeographic zones and ecologically rich areas through a second phase of the network programme. The second phase of the network programme will also encompass following concerns:

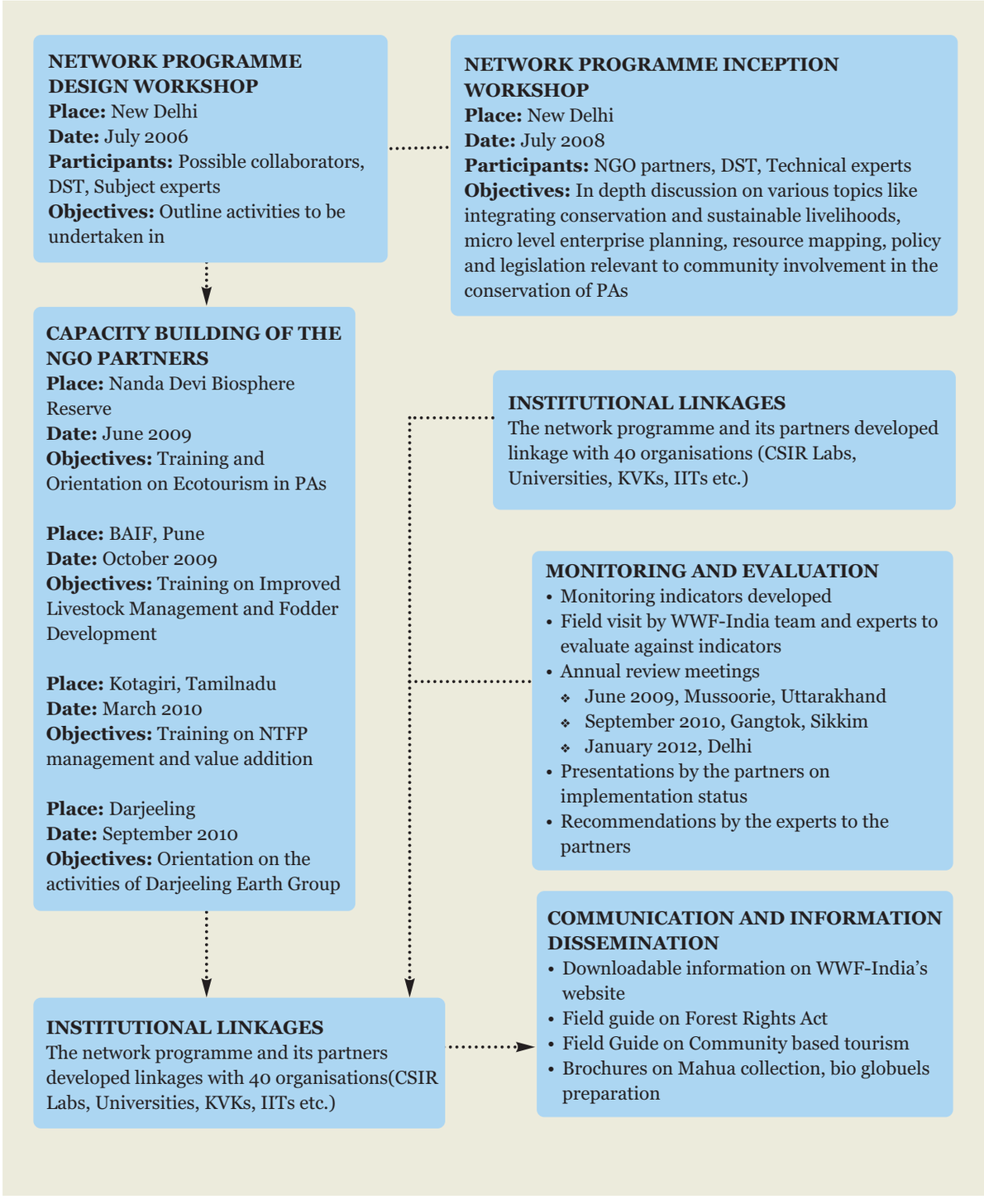
- Human-wildlife conflict issue around PAs and addressing it in selected sites
- Impacts of climate change on livelihood security
- Understanding energy requirement needs and providing alternate solutions at village level
- Undertaking capacity building of PA staff for improving relations with the local community
- Introducing technology alternatives for livelihood diversification, clean energy systems and conservation of PAs.

Around 20 new Protected Areas and potential partners have been identified for the 2nd phase across the country. Care is taken to include states and ecological regions which were not covered under the network programme earlier. Over 20 tribal groups especially Primitive Tribal Groups like *Kadars, Baigas, Kattunayakans* and *Kurumbas* as well as few OBC groups will get involved in the 2nd phase.

Photo Credit: CARD

Meeting of SHG initiated by CARD in Khatiakudi village

Annexure 1 Operational framework of the Network Programme



Annexure 2

Major Focus Areas of the Project Partners

Categories	Number of Partners	Activities
Handicrafts	5	Paper bags making, rope and mat from coir, bamboo articles, Dhurrie making, Lantana furniture
Energy	4	Biogas, Dhaba Digester, biomass briquette, bio globules, improved stove, solar energy
Agriculture and cultivation related	8	Nursery raising, plantation- fuelwood and fruit species, vegetable cultivation, vermi composting, medicinal plants cultivation, millet cultivation, SRI, Organic farming, forest home gardens, mushroom cultivation, floriculture, herbal home gardens
Animal Husbandry and Fodder cultivation	5	Fodder cultivation, animal medics, AI, improved feed and health care
Drinking water	3	Safe Drinking water facility
NTFP	3	Collection, Value addition, cultivation – honey collection, gum collection and processing etc.
Ecotourism	2	Ecotourism training, Village Biologist groups
Millet, Pulse, Cereal and Oilseed Processing	7	Revival and value addition of Kalamatar and Barley, Value addition of Nagli
Others	2	Fishing nets, Machine repair, Seaweed cultivation

Annexure 3

Livelihood Diversification Activities Undertaken by the Project Partners

Partner	Activities Before the Project	Activities Introduced in the Project	
AERF	- NTFP Collection - Agriculture - Tourism	- Biomass packaging - Water purifying system - Nursery for fodder and fuel wood species	- Biogas and Dhaba digester
CARD	- Fishing - Agriculture	- Coir rope making - Kewra mat making	- Coir mat making - Seaweed cultivation
CCD	- NTFP collection - Wage labour	- Fodder plantation - Herbal home garden	- NTFP cultivation and processing
CDC	- Agriculture - Wage labour - Collection of Tendu leaves	- Fruit tree plantation - Vegetable cultivation - Fodder and fuel wood cultivation	- Vermi compost - Honey collection - NTFP value addition
DEG	- Agriculture - Animal husbandry	- Fodder cultivation - Vegetative compost - Vegetable cultivation	- Floriculture - Bio globules/biomass briquettes
MUSE	- Agriculture - Animal husbandry	- Ecotourism - Wool based handicrafts - Solar bathing and water purification system	- Mud based crafts - Revival of Kala matar and Barley
PRAYAS	- Agriculture - Animal husbandry	- Safed Musli cultivation - Fodder cultivation - Fruit tree plantation	- Bamboo handicrafts - Pulse processing
RC	- Agriculture - Sale of fuel wood and NTFPs - Wage labour	- Nursery raising - Sale of improved chulhas - Briquette making - NTFP Processing and Sale - Vegetable cultivation - Village Biologists as ecotourism guides	- Forest home gardens - Fodder plots - Oil extraction Unit
RRDRO	- Agriculture - Grass extraction	- Dhurrie making - Lantana furniture making	- Spinning yarn
SAKTI	- Agriculture - Wage labour	- Fishing nets - Honey collection - Machine repair - Leaf plate making - Gum collection and processing	- Tamarind and Amla processing
SU	- Agriculture - Sale of fuel wood - Mushroom cultivation	- Biopesticide - Agroforestry - Lac cultivation	- Vegetable cultivation - Fruit tree cultivation
Vasundhara	- Agriculture - Animal husbandry - NTFP collection	- Millet processing, value addition - Oil expeller unit - Mahua processing and value addition	
WWF-India	- Agriculture - Wage labour	- NTFP cultivation - SRI cultivation - Nursery raising - Millet processing and value addition	- Vermi compost

Annexure 4

Geographical and Social Coverage of the Network Programme

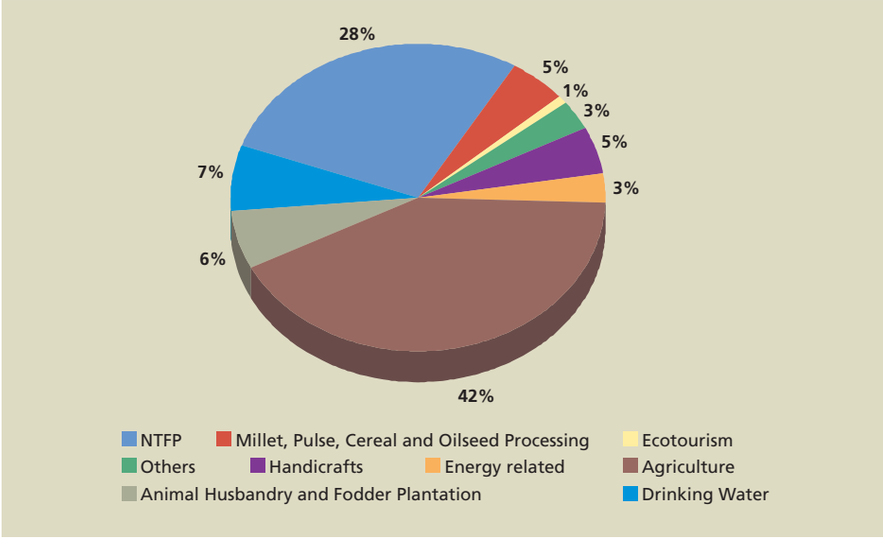
Sl. No.	Protected Area	Local Community	ST/SC/OBC/
1.	Baisipalli WLS	Sabara (Kondh)	ST
2.	Nalabon WLS (Chilika Lake)	Kandara Baura	SC ST
3.	Dalma WLS	Bhumij	ST
4.	Senchal WLS	Lepcha, Bhotiya	ST
5	Sitamata WLS	Meena	ST
6	Sanjay Gandhi NP	Warli, Malharkoli	ST
7	Bhimashankar WLS	Mahadev Koli	ST
8	Purna WLS	Warli, Konkani, Kunbi	ST
9	Kibber WLS	Bodh	ST
10	Suhelwa WLS	Tharu	ST
11	Kanha NP	Gond	ST
12	Grizzled Giant Squirrel WLS	Paliyan	ST
13	Srisailam WLS	Chenchu	ST

Annexure 5

Science and Technology Interventions at Household Level

Intervention	No. of HHs	%
Handicrafts	192	4.8
Energy related	139	3.5
Agriculture	1677	42.0
Animal Husbandry and Fodder Plantation	237	5.9
Drinking water	271	6.8
NTFP related	1107	27.7
Millet, Pulse, Cereal and Oilseed Processing	212	5.3
Ecotourism	33	0.8
Solar Water Bath	20	0.5
Others	103	2.6
Total	**3991**	**100**

Interventions at Household Level - Per cent Distribution

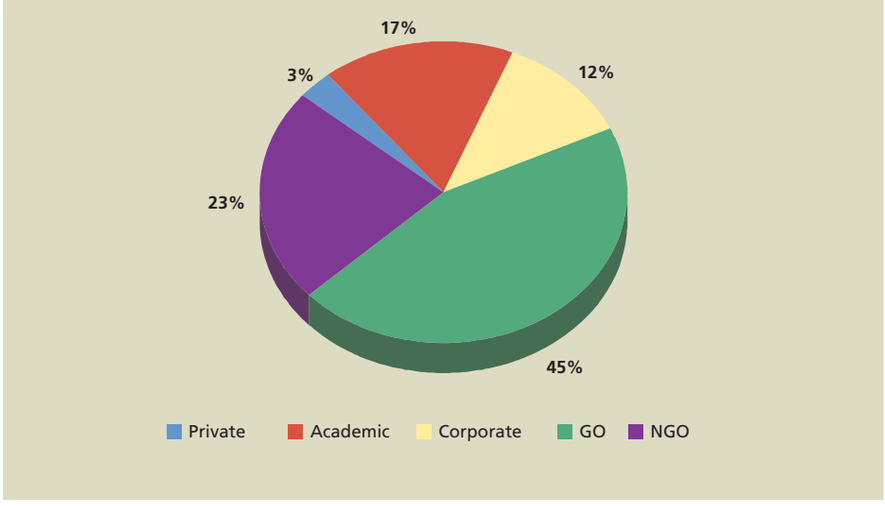


Annexure 6

Institutional Linkages of the Network Programme

Sl. No.	Type	Number of linkage
1.	Academic	7
2.	Corporate	5
3.	Government (GO)	18
4.	Non Government (NGO	9
5.	Private	1
	Total	40

Institutional Linkages



Institutional Linkages of the Network Programme in detail

Sl. No	Type	Name of the Institutions	Name of th Partner and Nature of Support
1.	Academic	Agriculture Training Center of Uttar Banga Krishi Viswavidyalaya	PRAYAS: Green fodder cultivation
2.	Academic	American College, Madurai	CCD: NTFP collection survey
3.	Academic	Delhi University and Berhampur University	CARD: Consultation regarding marketing of sea weed
4.	Academic	Forest research Institute, Dehradun	RRDRO: Natural dyes
5.	Academic	Gandhigram University, Tamilnadu	CCD: Agriculture training
6.	Academic	Madurai Kamraj University, Madurai, Tamilnadu	CCD: Training on NTFP processing
7.	Academic	Orissa University for Agriculture and Technology, Odisha	Vasundhara: Training on in situ mushroom cultivation and production of Mahua value added product
8.	Corporate	Aurore Systems, Pondicherry	MUSE: Sourcing solar geysers
9.	Corporate	Himalaya Drug Company, Bangalore	CCD: Buy back of the NTFP products
10.	Corporate	Kalinga Rope, National Coir, Jyoti Coir, Odisha	CARD: Raw material supply and purchase of finished product
11.	Corporate	Naga Biotech, Tamil Nadu	CCD: Buy back of the NTFP products
12.	Corporate	Urja Foods, New Delhi	MUSE: Value addition of Kalamatar and Barley
13.	GO	Appropriate Rural Technology Institute, Pune	RC: Improved chulhas, Kiln charcoal making / briquettes making
14.	GO	Chilika Development Authority, Odisha	CARD: Financial support for the construction of the work shed
15.	GO	Coir Board, Odisha	CARD: Set up Coir making unit (CARD)
16.	GO	Corporation Bank, Madurai	CCD: Loan to Gram Mooligai Company Limited (GMCL) for NTFP collection
17.	GO	Department of Food and Nutrition, Govt. of India	WWF: Monitoring and quality control of the value added products
18.	GO	Development Commissioner, Handicraft , Uttar Pradesh	RRDRO: Design inputs for Dhurrie making.
19.	GO	Forest Department of Maharashtra	RC: Forest home gardens, nursery raising
20.	GO	Forest Department of Rajasthan	Prayas: Bamboo plantation
21.	GO	Handmade Paper Institute, Pune	AERF: Paper for biomass packaging, training of paper and cloth bags making
22.	GO	Horticulture and Agriculture Resource Project, Ranchi	SU: Training and supervision of fruit trees cultivation
23.	GO	Horticulture Department of Jharkhand State, Jamshedpur	SU:Horticulture training and technical support
24.	GO	Krishi Vigyan Kendra, Darjeeling agricultural techniques	DEG: Demonstration and training on SMVG
25.	GO	Lac Research Institute, Ranchi	SU:Training on lac cultivation
26.	GO	Madhya Pradesh Council of Science and Technology, Bhopal	CDC: Demonstration of Bio Globules
27.	GO	Madhya Pradesh Forest department	CDC: Logistics for community level trainings
28.	GO	Odisha Rural and Urban Producers Association, Bhubaneshwar	Vasundhara: Marketing support for mahua products

continued...

29.	GO	Orissa Rural Development and Marketing Society, Bhubaneshwar	Vasundhara: Marketing support for mahua products
30.	GO	TRIFED, New Delhi	RRDRO: Marketing support of the Dhurries
31.	NGO	Bharatiya Agro Industries Foundation, Pune	AERF: Fodder plantation CDC: Wadi Project WWF: Improving productivity of Ragi
32.	NGO	Bio Centre, Bangalore	CCD: Training on NTFP cultivation
33.	NGO	Centre for Development of Village Discovery, Madhya Pradesh	CDC: Training on NTFP collection, processing and marketing
34.	NGO	Deccan Development Society, Hyderabad	SAKTI: Millet promotion
35.	NGO	Foundation for revitalisation of Local Health Traditions, Bangalore	CCD: Kitchen herbal garden, NTFP collection
36.	NGO	Gram Seva Trust, Vyara, Gujarat	WWF:Training on value addition of millets products
37.	NGO	Koval Foundation, Vizag, Andhra Pradesh	SAKTI: Training on gum cllection and grading
38.	NGO	Sahabhagi Vikash Abhiyan, Odisha	Vasundhara: Oil extraction unit
39.	NGO	Nature Shop, WWF-India, New Delhi	Sale of products of the network programme
40.	Private	Andretta Pottery, Palampur, Himachal Pradesh	MUSE: Set up pottery unit and training of artisans

Annexure 7

Significant Social Accomplishments

No.	Partner Organisation and Social Accomplishments
1.	CARD: Coir rope and mat making are well accepted due to supplementary income generation. The women SHG is following up with the local administration and the Chilika Development Authority for facilities like permanent shed
2.	CCD: Kitchen herbal garden and community herbal garden have ensured better health
3.	DEG: Bio-globules, floriculture and vegetable cultivation have improved community livelihood opportunity while enhancing the conservation of natural resources
4.	DEG: The women make bio-globules in their spare time. Simultaneously, the time saved from lesser trips for fuel wood collection is utilized in other income generation activities like vegetable cultivation
5.	Prayas: Response of the community to cultivation of green fodder and processing of pulses is encouraging. This is reflected in the fact that area under cultivation of pulses and fodder is increasing every year
6.	RC: Drudgery of women has reduced as fuel consumption has gone down, and they are getting vegetables from their backyard from collective farming
7.	SAKTI: Grading of gum and honey has helped fetch higher price in the market
8.	SAKTI: The trainings on grading and weighing have built confidence and better bargaining power among community
9.	Vasundhara: Maa Panthai Cooperative, the women cooperative is functioning to the best capacity of the members. The cooperative has obtained food license certificate from the district administration for product development of NTFPs and agricultural products
10.	WWF: Households trained in vermi composting and nursery raising helped other villagers in setting up vermi compost pits in the second year
11.	WWF: SHG group effectively running a bakery unit and operating a bank account

Annexure 8

Significant Ecological Accomplishments

No.	Partner Organisation and Ecological Accomplishments
1.	AERF: Around 100 kg of fuel wood per month saved from installation of Dhaba Digester
2.	CCD: 30 per cent reduction in dependence on forest for fodder
3.	CDC: The wastage of fuel wood has reduced; collection is less than previous year. Communities are keen to adopt alternatives like bio globules and fuel efficient chulhas
4.	MUSE: Solar water heating system has resulted in lesser extraction of fuel wood for heating purposes
5.	RC: For 150 families, 50% reduction in amount of fuel wood extracted from the forests because of use of fuel efficient chulha. The daily requirement for fuel wood has reduced from 6 kg per family to 3 kg per family
6.	Prayas: Water harvesting pits is helping in conserving water
7.	Vasundhara: Forest fire incidents in the Mahua season have considerably decreased after introduction of nets for collection of mahua flowers
8.	WWF: Villagers have planted tree species on their bunds and homestead land which in future will provide fuel wood
9.	Overall use of vermicompost has reduced fertilizer use and improved soil fertility

Annexure 9

Significant Economic Accomplishments

No.	Partner Organisation and Economic Accomplishments
1.	AERF: Paper bags making as income generation activity has increased annual household income by 15 per cent
2.	CARD: Income generated from coir rope and mat making per month ranges between Rs 1500 and Rs 2000 i.e. almost 20 per cent of the annual household income. 30 households are into rope and mat making.
3.	CCD: Sustainable harvesting of NTFP has led to increase in income by 20 per cent per annum for 50 households.
4.	CCD: NTFP processing has led to increase in household income by 20 per cent per annum
5.	CDC: Vegetable cultivation has led to increase in annual household level income by 15per cent.
6.	CDC: Vermi-compost sale has generated Rs 30 thousand in the last three years.
7.	DEG: Floriculture: Household income increased by 20 per cent per year (DEG)
8.	DEG: 20 per cent saving in the total annual expenses at house hold level due to bio globules replacing fuel wood purchase
9.	DEG: Organic mixed vegetable and square meter vegetable gardening have led to increase in household level income by 15 per cent per year.
10.	MUSE: Pottery has resulted in income augmentation for 9 households, an alternate employment opportunity has been created for them
11.	MUSE: Wool based handicrafts has resulted in income generation for 48 women
12.	MUSE: Solar operated bath and toilet facility are saving a third of the total money spent by the community on fuel wood purchase per year
13.	Prayas: Sale of bamboo handicraft articles has resulted in 10 per cent increase in the income of artisan households per year
14.	Prayas: Cultivation of Rajko and Barseem grass has helped increase family income by 15 per cent per year per household due to increase in the milk yield
15.	Prayas: Pulse processing has created employment opportunity for 40 women
16.	RC: Nursery raising in low cost green houses has increased household income annually by 25 per cent
17.	RC: 20 per cent increase in average annual income of the youths working as nature tourism guides and village biologists in the national park
18.	SAKTI: Sustainable honey harvesting has increased average annual household income by 20 per cent
19.	SAKTI: Sustainable harvesting of gum and its grading has increased average annual household income by 10 per cent
20.	SU: Earnings from the lac collection increased by 25 per cent due to scientific lac cultivation
21.	Vasundhara: Millet processing and value addition has created new employment opportunities for people.
22.	Vasundhara: Mahua processing and value addition has helped improve average annual income at the household level by 10 per cent.
23.	WWF: There is an increase in cash income from the millet value addition. Each household earns at least around 250 rupees a week when they are baking products (2 hrs/day)

Photo Credit: Vasundhara

Marginal farming adjacent to Protected Area

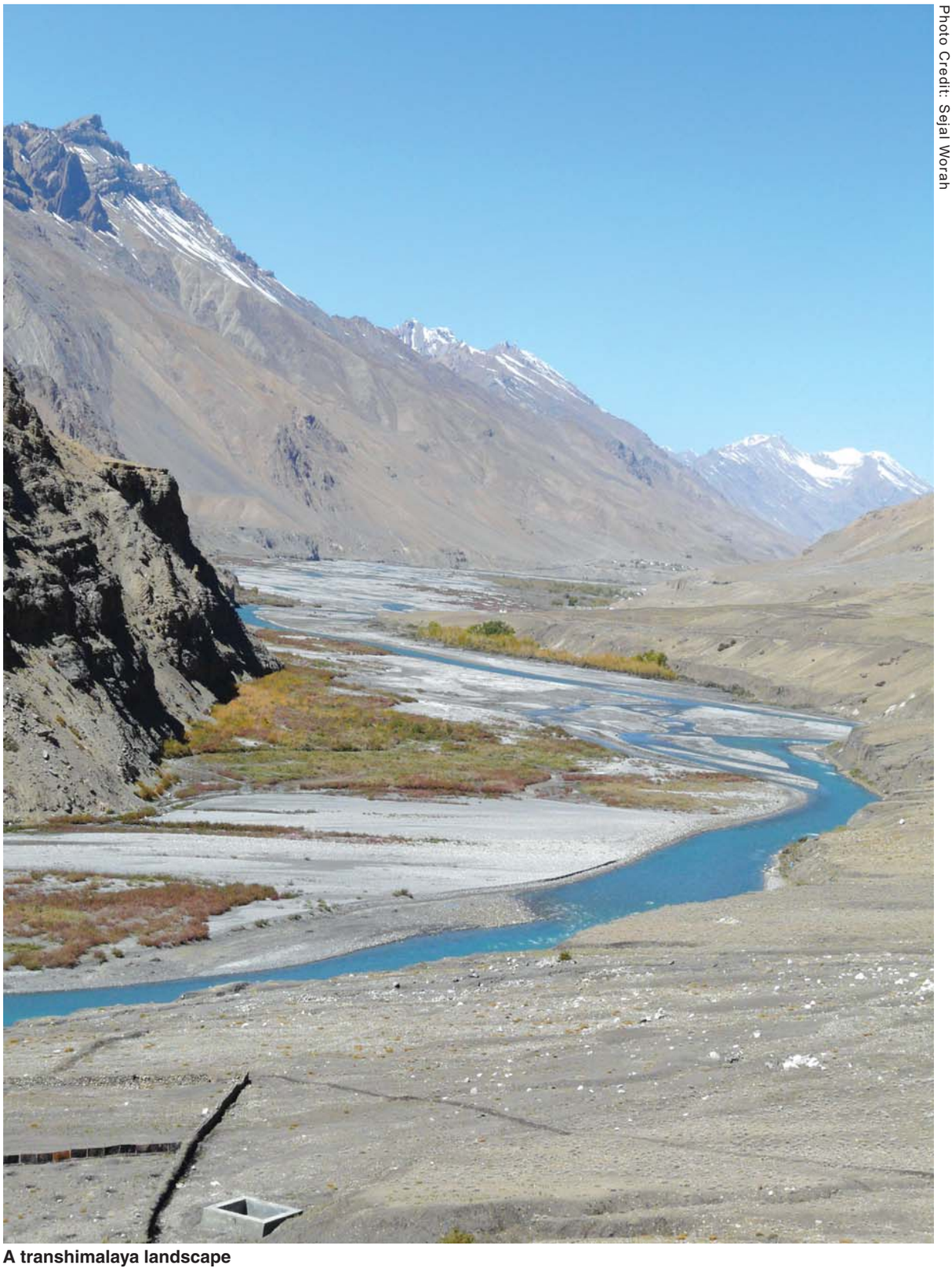


Photo Credit: Sejal Worah

A transhimalaya landscape

SEED, DST

Science for Equity, Empowerment and Development (SEED) division plays a critical role in supporting field action projects aimed at providing technology solutions to issues in rural and urban area for the disadvantaged sections of the society. These initiatives provide an opportunity to motivated scientists and technologist to take-up time bound and action oriented developmental projects with inputs of Science and Technology. The projects/programmes are implemented through S&T institutions, universities and S&T based voluntary organizations under various schemes.

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WWF-India

WWF-India started life as a wildlife conservation organization. It was founded in 1969 as a Charitable Public Trust, with the express objective of ensuring the conservation of the country's wildlife and wild habitats. It is recognized as a premier conservation NGO in the country dealing with nature conservation, environmental protection and development-related issues. At a time when the Web of Life has come under increasing threats, WWF-India's attempts have been to find and implement solutions so that human beings can live in harmony with nature, and leave for future generations a world rich in natural resources and natural wonders.

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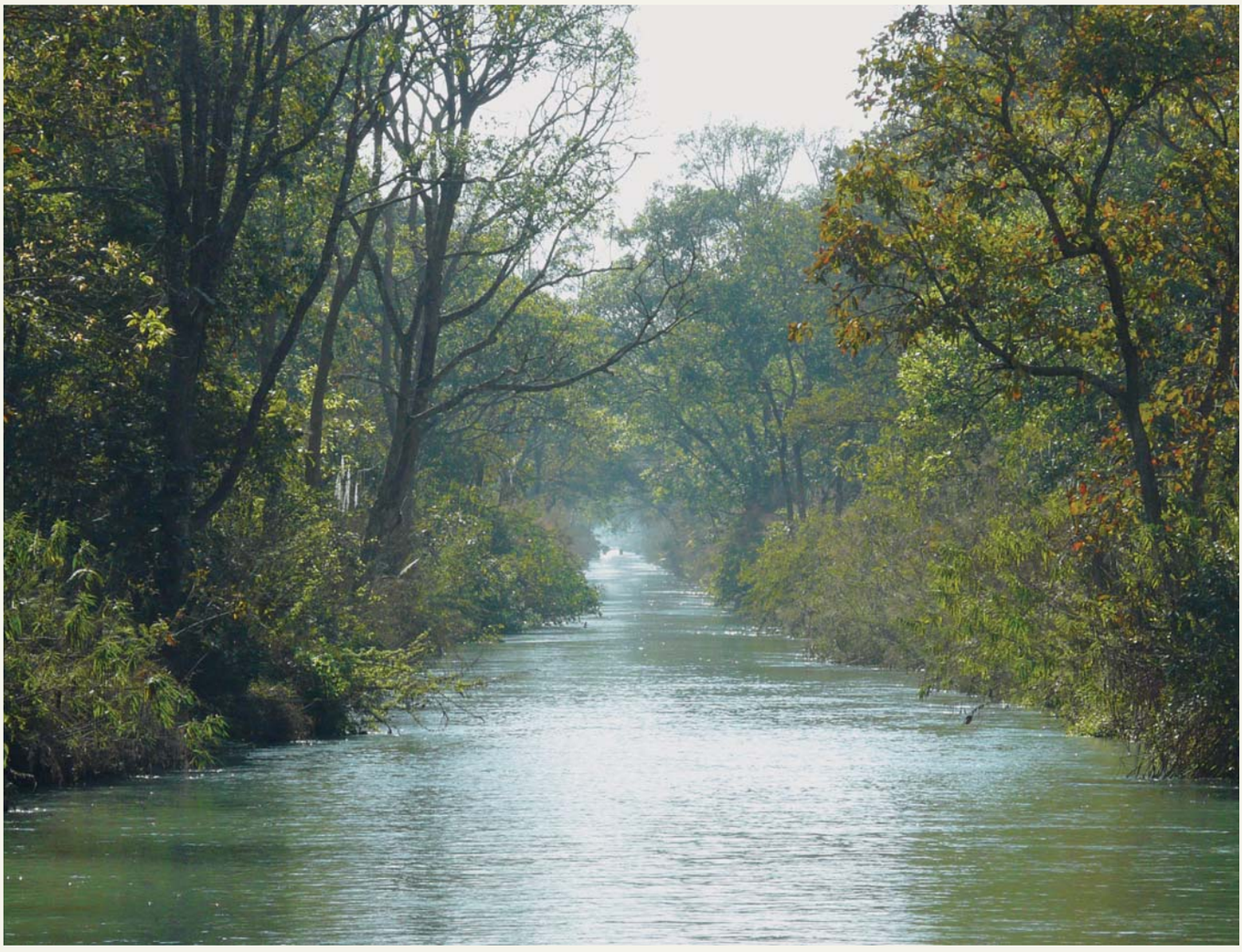
WWF & SEED, DST



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