Development Alternatives

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Mangrove Conservation and Management: Enhancing Livelihood Opportunities for Mangrove Dependent Communities in Bhitarkanika Reserve Forest

Agriculture and shrimp farms threaten the mangrove forests of Bhitarkanika.

2012 - 2013

UNDP IUCN care FAO UNEP WETLANDS INTERNATIONAL UDENRIGSMINISTERIET DANIDA DANMARKS UDVIKLINGSSAMARBEJDE Norad SWEDEN

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Summary

Orissa is often referred to as a Biologists Paradise as a result of its rich and productive biodiversity. The Bhitarkanika mangrove wetlands, the second largest in India, house a vibrant genetic diversity that unfortunately faces severe anthropogenic threats. Although awareness of the value of mangroves has risen amongst communities, mangroves forests are still degrading at a rapid rate. The current scenario, if left unchecked, has the potential to lead to a loss of livelihoods, income and increased vulnerability of mangrove dependent communities.

This project, *Enhancing Livelihood Opportunities for Mangrove Dependent Communities in Bhitarkanika Reserve Forest* had two objectives

1. To build awareness of the value of mangroves, livelihood opportunities made available to mangrove dependent communities in Bhitarkanika reserve forest

2. Assessment and Monitoring of Mangrove Forest through land-use/ land cover mapping and change detection studies using Satellite Remote Sensing and GIS techniques for effective development and management of mangroves in Bhitarkanika

The interventions are focused in the Chainrakolha and Garta village in the Ragani Panchayat of Rajnagar block, in the Bhitarkanika Wildlife Sanctuary. Within the ten months of the project period (March 2012 – May 2013), the following outputs were achieved:

- Awareness was generated and capacities of local communities were built through workshops, meetings and stakeholders consultations in both villages, consisting of over 500 households.

- A list of supplementary livelihoods that reduce dependence on the mangrove forests was developed and activities of two of these livelihoods were demonstrated.

- Maps depicting the changes in land-use and land cover were developed to highlight the changes in mangrove cover in the region, amongst other things.

1. Introduction and Objectives

In the past few decades, mangroves in India have been subject to a wide variety of threats. An estimate by the World Resources Institute (WRI) reveals that national proportions of mangrove loss vary between 4 to 84 percent. In many states, these threats can be attributed to anthropogenic pressures. The same is true of the Reserve forests in the Bhitarkanika wildlife sanctuary of Odisha. Here the threats include agriculture, shrimp farming, harvesting of fuel wood and timber, grazing by domestic animals, harvesting non-wood forest products, sewage discharge, and garbage disposal. Besides anthropogenic threats climate change looms in the background as a potential threat to the mangrove ecosystem, particularly sea level rise which is anticipated to accelerate in the coming decades.

More than two hundred and forty thousand inhabitants of nearly four hundred villages live within the sanctuary area. Almost eighty-one villages are located adjacent to the mangrove forests (Pattanaik et al., 2008)

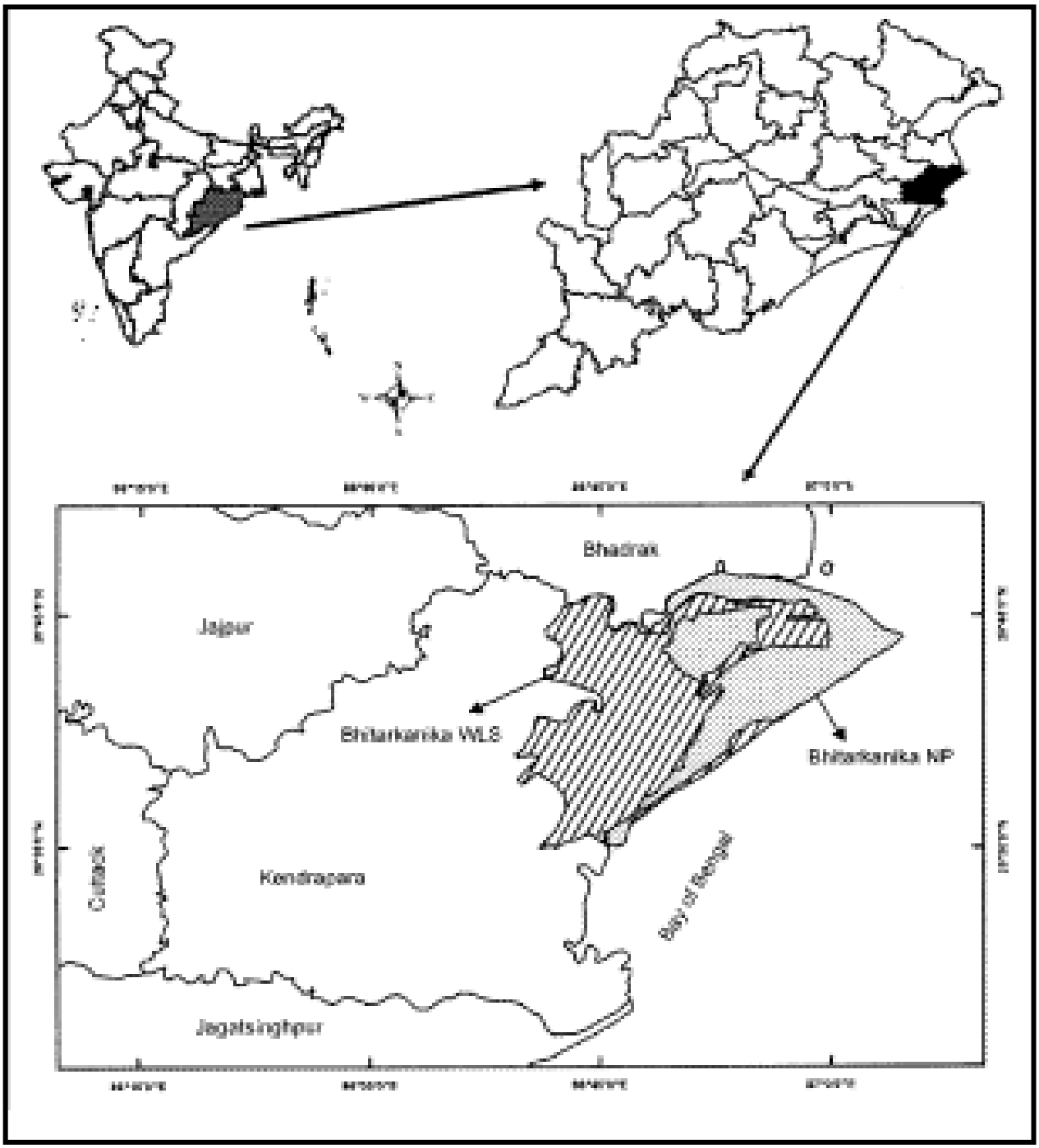


Figure 1. Map of Bhitarkanika mangrove forest and proejct sites

In the panchayats (village councils) of Bhitarkanika a traditional way of life prevails with a high reliance on natural resources for the livelihood and energy needs of communities. This dependence is detrimental to their economic development as well as harmful to the mangrove ecosystem and communities do not have the awareness or institutional support systems to move to alternative livelihoods, or regulate the use of resources from the mangrove ecosystem to ensure sustainability.

The overexploitation of mangrove resources and their destruction for alternate livelihood activities is unsustainable. Additionally, mangroves and the communities dependent on them are threatened by climate change. The current scenario, if left unchecked has the potential to lead to a loss of livelihoods, income and increased vulnerability of mangrove dependent communities.

Thus, this project focused on two crucial interventions to address the sustainable management of mangroves that are the two objectives of the project.

The objectives of this project are to:

1. Increase awareness and capacities of local communities and community-based institutions for the sustainable use of mangrove resources and reducing dependence of communities on mangrove resources by providing supplementary livelihood opportunities. These interventions will also mainstream the potential and felt impacts of climate change impacts and ensure that supplementary livelihoods and empowered institutions move towards climate change adaptation making communities and the mangroves they depend on more resilient in the face of climate change.

2. Assess and monitor mangrove forests through land-use/land cover mapping and change detection studies using satellite remote sensing and GIS techniques for effective development and management of mangroves.

2. Activities

2.1 Baseline assessment of project area including resource assessment, existing livelihoods and intuitions needs assessment and skill mapping and climate change impacts

A comprehensive baseline assessment was developed for both villages, Chainrakolha and Garta, through the Participatory Rural Assessment (PRA) and stakeholder consultations. Please refer to Annex 1 for the detailed survey used. This helped to develop an understanding of the socio-economic situation of the communities and form a basis for developing supplementary, sustainable livelihoods. As a result of this exercise, the need to develop, introduce and capacity build communities to adopt sustainable supplementary livelihoods was strengthened.

98.31% of the households in both villages can be classified as Other Backward Classes (OBC) based on social, educational and economic factors (categorized by the Central Government of India). 15.25% of the families are completely landless, and approximately 47.46% have less than an acre of land to their name. An astounding 91.53% live in temporary houses. Agriculture, fishing and pisciculture are the

predominant livelihoods practiced in both villages, with a large number of individuals (largely men) migrating out of the region in search of manual labor. On average families earn INR 39,000 annually, which is insufficient to cover their basic expenditure; over 50% are in debt. Although most of the community members are aware of the value of mangroves they are forced to depend on them heavily for their daily needs. The results are presented in Annex 2.

Figure 2. Conducting socio-economic and livelihood surveys

An analysis of active government schemes in the region was conducted to identify which livelihoods could be integrated into existing schemes to ensure that local communities benefitted economically and were financially secure over a longer term. There are several existing programmes and schemes from various agencies, focusing on livelihoods and bearing relevance to the financial well-being of the communities. Those that cover the project villages include:

Name of the Scheme	**Purpose of Scheme**
Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)	Communication and Road Project, In –land Pond development, Drain Cum- Road, Culvert etc.
Madhu Babu Pension (MBP)	Old Age Pension
National Old Age Pension (NOP)	Old Age Pension

Gopabandhu Gramina Yojana (GGP)	Roads
Thirteenth Finance Commission (TFC)	Concrete Road, Tube Well and Toilet
Eco Development committee (EDC)	Trainings
Integrated Coastal Zone Management Programme (ICZMP)	In-Land Fishing training through SHG Group, Cattle Vaccine for cow health, Medicinal Plantation , Plantation
Targeted Rural Initiative for Poverty Termination and Infrastructure(TRIPTI)	Education, road, health, telecommunication, water & sanitation, renewable energy
Indira Awas Yojna (IAY)	Housing Project
Nirmal Bharat Abhijan	Sanitation

Efforts will be made, beyond the duration of this project, to link activities and introduced and successful supplementary livelihoods to these schemes.

2.2 Awareness generation activities

Figure 3. Actors perform in the nukkad natak

Development Alternatives (DA) and Bharat Integration Social Welfare Agency (BISWA) organized a three-day mangrove awareness drive, in and around Rangani Gram Panchayat of Rajnagar Block (in Patta Paria, Dola Sahi, Chanrakolla and Rangani villages. The programme was targeted at nine high schools,

fifteen primary schools and twenty-five women Self Help Groups, as well as village leaders and youth; this was spread across seven regions within a thirty-kilometer radius.

A primary component of the awareness programme was nukkad natak (street theatre), performed by SANJOG (a cultural organization based in Bhubaneswar). Street theatre as a form of communication is deeply rooted in Indian tradition. The art form has been used to propagate various social messages and create awareness amongst local communities of critical issues that affect their lives and livelihoods.

The message of the performances was spread throughout the region, through word of mouth, print media and a travelling van armed with a loudspeaker. The effectiveness of the plot was in its simplicity; actors, through their parts, told of the woes faced by the coastal communities as the mangroves around them slowly degraded and eventually disappeared from the landscape altogether. Subsequently, when only one tree was left standing (in the aftermath of a deadly storm), the community is hit by the realization of the true value of the mangroves. They start to regenerate the mangrove forests, vowing to protect them at all costs.

Officials from several local governmental institutions and the State Fisheries Department also attended the show. At the request of the local community leaders DA and BISWA will seek opportunities to continue these awareness-building activities. It is hoped that eventually the youth of the region will take up awareness generation as part of their theatre group activities.

Please refer to Annex 3 for a full report.

Figure 4. Hundreds of children from neighbouring schools came to watch the performance

2.3 Development of supplementary livelihoods document

A multi-stakeholder workshop was held in Bhubaneswar, on 8 March 2013 with the aim of identifying sustainable livelihood opportunities for communities in the Bhitarkanika Wildlife Sanctuary. The workshop built upon existing models that have previously been successfully introduced in mangrove areas, initiatives taken up by the Government of Odisha, and the identification of suitable new, supplementary livelihoods that can be demonstrated to and undertaken by local communities.

The discussions were followed by an informal vote, whereby everyone was requested to write down their first, second and third choices of supplementary livelihoods that should be taken up in the region. The two most popular choices were the making of puffed rice and fish processing. The discussions placed a lot of emphasis on the importance of capacity building local communities to undertake integrated fish farming.

Please refer to Annex 4 for the Record of Proceedings.

Figure 5. The Sarpanch of Ragini Panchayat informed the congregation of the livelihood related issues faced by communities under his jurisdiction of Bhitarkanika mangrove forest

2.4 Demonstration and training of local communities in two supplementary livelihoods

Puffed Rice

Demonstrations of how to make puffed rice were organized by DA and undertaken by Unnayan for the communities of Chainrakolha and Garta in mid-March 2013; 10 village leaders and members representing both communities attended. Unnayan has supported The Mayurbhanja Mahilla Association

(MMA), a registered Women Self Help Group Federation consisting of more than 130 women members from different villages of Mayurbhanj District, in undertaking activities related to the growth of puffed rice as a supplementary livelihood; in addition to this they have developed market linkages to sell the product. The MMA cooperative, buys the rice from the members at INR 30/kg and sells it at INR 35/kg at local and regional markets. A single member can earn an additional INR 30,000 to 35,000 per annum in steady income. The group was shown the puffed rice processing unit and the preparation process was explained in detail. The puffed rice manufacturers demonstrated how they prepare puffed rice from paddy and identified the materials used for the activity. Members from the MMA further demonstrated how mushrooms could also be cultivated in conjunction with the puffed rice. The visiting members of Chainrakolha and Garta have invited the MMA to their villages to demonstrate the puffed rice techniques in detail and advise them on how to uptake this livelihood.

Please refer to Annex 5 for a full report.

Figure 6. Demonstration of how puffed rice is developed from padi

Integrated Fish Farming

Demonstrations of integrated fish farming were organized by DA and undertaken by Gram Utthan, a local NGO, for the communities of Chainrakolha and Garta in mid-March 2013; 9 village leaders and members representing both communities attended. A multiple harvesting and organic method of fish farming, that involves the rearing of ducks and poultry, was demonstrated. The avian excretions enable a faster growth of plankton within the ponds, providing natural feed for the fish. Vegetables are also grown along the banks of the pond and along bunds within the ponds. The vegetables, duck and hen eggs are sold for additional income. Cows are occasionally kept as their excreta provide manure to the vegetable patches and the milk is sold for extra income.

The initial investment to set up a one acre large pond costs INR 60,000; the annual income gained from yields on this pond will be on average INR 144,000, not including the supplementary funds provided by selling vegetables, duck and hen eggs and milk. Farmers explained that prior to their implementing integrated fish farming, they were traditional fishermen. Using traditional methods they were only able to net 500kg of fish per acre, now they are able to produce on average 3000kg of fish per acre of pond. Collectively, with intial support from Gram Utthan, they have also set up poultry and dairy processing units.

Please refer to Annex 5 for a full report.

Figure 7. Integrated fish duckery ponds

2.5 Development of land-use and land cover change detection maps

In order to assess the status of mangroves in Bhitarkanika Wildlife Sanctuary a land-use cover study was carried out. The mangroves of the region have faced and still face significant pressures from agriculture,

shrimp farming, harvesting of fuel wood and timber, grazing by domestic animals, harvesting non-wood forest products and waste disposal. To promote effective monitoring and management of the mangroevs land use/land cover mapping and change detection was carried our using Satellite Remote Sensing GIS techniques.

In order to achieve this, high resolution satellite images from December 2006 and February 2012 were purchased from NRSC. These were studied along with maps from ORSAC, MSSRF's Atlas of Mangroves and Wetlands of Odisha and other previous studies. Based on the images and ancillary maps land use/land cover maps were derived.

A field survey to determine changes and identify pressures was conducted in the region. Although no substantial change was found in the region as a whole, loss of mangrove was observed in some patches near the two project villages. Whilst in the satellite derived maps of 2006 these areas appeared as mangroves, in the 2012 snapshots the mangrove cover appears to be shrinking and the surrounding sparse vegetation/fallow land increases in spread. The ground survey revealed shrimp farms in these areas, confirming the conversion of mangrove land to alternative uses.

Please refer to Annex 6 for maps.

3. Challenges

- The location of the two villages proved a challenge as a significant amount of time and effort was spent in travelling back and forth. In addition, the road to the village floods often and it is dangerous and difficult to access the villages by boat.

- It was hard to integrate the women into project activities, as being a predominantly patriarchal society the women were either afraid or unwilling to participate.

4. Lessons Learned and Future Sustainability of the Project

- **Piloting and integrating the livelihoods into the schemes/ programmes of the state:** Programmes and schemes like TRIPTI, NRLM, ICZMP and livelihoods like integrated fish farming, puffed rice, box honey; fish processing (fish pickle and papad making) should be integrated to encourage future sustainability of livelihoods and ensure income security.

- **A greater number of awareness and capacity building programmes need to be designed, with the view of facilitating stakeholder interaction:** It was noticed through the awareness programmes that communities were already conscious of the value of mangroves and the importance the ecosystems serves in their lives. What was apparent however, was that the communities often felt that they lacked the option to not depend on the mangroves for their daily lives and were unaware of how and whom to approach to change this. Through the awareness programmes and capacity development workshops the communities were introduced to new supplementary livelihoods and organizations that could help them

in adopting these. A greater number of these programmes need to be designed, particularly for those villages and communities that are remotely located and often inaccessible.

- **Use of technology:** Regular monitoring of land use and land cover changes needs to be undertaken and the output explained to communities, in order that the mangrove forests can be better managed.

Annex 1

Socio-economic and livelihood assessment survey

1. Basic information

- Name of village
- Name of respondent
- House Number (Address):
- Name of respondent
- Sex of respondent
- Age of Respondent
- Contact (mobile) Number
- Number of family members
- Land holding (ha)
- Type of housing: Kaccha ( ) Pucca ( ) Semi Pucca ( )
- Electricity connection: (Y/N)
- Caste (tick): General SC ( ) ST ( ) OBC ( ) Others ( )

2. Human Capital

S No	Name	Age	Sex (F/M)	Education Status[1]
1				
2				
[1] primary, secondary, graduate, any other :vocational training				

3. Economic Status

- Type of ration card : APL ( ) BPL ( ) Antyodaya ( )
- Which of the following does the household possess?

Television ( )	Radio ( )	Tractor ( )
Water Pump ( )	Sewing Machine ( )	Mobile / Tel ( )
Cycle ( )	Motor Cycle ( )	Other vehicle ( )
Others -specify		

- Income Source:

Occupation	1°	2°	No. of people involved	Kind of involvement (activities)	number of months	income annual	Factors affecting occupation

1. illiterate, 2- literate only 3- Primary educated, 4- Secondary/higher secondary, 5- Graduate, 6- Post Graduate, 7- Below school going age

				M	**F**	**for which they are involved**		**market variability**	**seasonality**	**climate variations**
Fishing										
Selling forest produce										
Traditional crafts etc										
Agriculture										
Sand-mining										
Services										
Business										
Animal husbandry										
Labour										
Other										
Any other information:										
Note: 1^{o} : Primary (main) 2^{o}: Secondary										

- **Detailed Information**:

1	**Fishing**	**Practice followed**	**River/ coastal region**	**Type of net used**	**Yield**	**Market**
Perceived impacts on river ecosystem :						
What is done with inadvertent catch (e.g. turtles, gharial)**? Other Comments:**						

2	**Agriculture**	**Land holding (ha)**	**Type of Crops**	**Yield (kg)**	**Farming practices (e.g. mixed cropping etc)**	**Assets (pumps/tractors etc)**
Farming Practices (e.g. mixed / agro-horti/forestry etc)**:** **Type and quantity of fertilizer used:** **River bank cultivation:**						
Perceived impacts on river ecosystem :						
Other Comments:						

3	**Livestock**	**Types**	**Total no**	**Purpose** (e.g. for milk / meat /	**Yield**	**Place of**

				manure / gas)		**grazing**
Perceived impacts on river ecosystem :						
Other Comments:						

4	**Sand-mining**	**Number of camels / tractor- trolley/ trucks**	**Amount mined**	**Selling rate**	**Licensed? (Y/N)**
Perceived impacts on river ecosystem :					
Other Comments:					

5	**Business**	**Nature of business**	**Market (client)**			
Other Comments:						

6	**Wage labour**	**Employed by (employer/scheme)**	**Daily wage**	**No. of days**	**Distance to work site**	
Other Comments:						

4. Benefits Accrued from Forests / River

Products	**Usage**	**Domestic Y/N**	**Commercial Y/N**
Food items (specify)			
Fuelwood			
Herbs			
Resin			
Grasses			
Others			
Any other information:			

- Use of River ecosystem for what purpose (please tick)
  - Domestic purposes (drinking, cooking)
  - fishing

- o Washing clothes
- o Bathing
- o Livestock grazing
- o Agriculture
- o Other activities

5. Traditional Skills (e.g. handicrafts)

Type	**material availability**	**unit development time**	**Unit selling price**	**sale rate (units sold per month)**	**marketability**
Any other information:					

6. Lean Period for Primary Occupation

Period during which there is lack of employment	**What do you do during this period?**	**Y/N**	**Comments**
	Migrate to city for work		
	Handicrafts		
	Collect forest produce		
	Nothing		
	Other (sand-mining etc)		
Any other information:			
When primary occupation fails what do you do?			

7. Debt Profile

Have you incurred a debt in the last 2 yrs? From where? For covering which expenses?

Institutional Support Systems

Type of Organization/Group	**Name of Group**	**Number of Members from household**	**Activities / Role**	**Perceived Benefits**
Farmer /fisherman group				
Cooperatives				
Traders or Business Association				
Neighborhood/ Village committee				
Political group or				

movement				
Cultural group or association (e.g. arts, music, theater, film)				
Finance, credit or savings group				
Water management group				
Youth group				
NGO or civic group				
SHG				
Mahila Mandal				
Other groups				
Any other information:				
Note : Perceived benefits could be with respect to: • Improved household's current livelihood and income • Improved access to services • Important in times of emergency/in future • Benefits the community • Enjoyment/Recreation • Spiritual, social status, self-esteem				

Access to Information

- What are the most important sources of information about what the government is doing (such as fishing, agricultural extension, workfare, family planning, etc.) and about market?

Governance

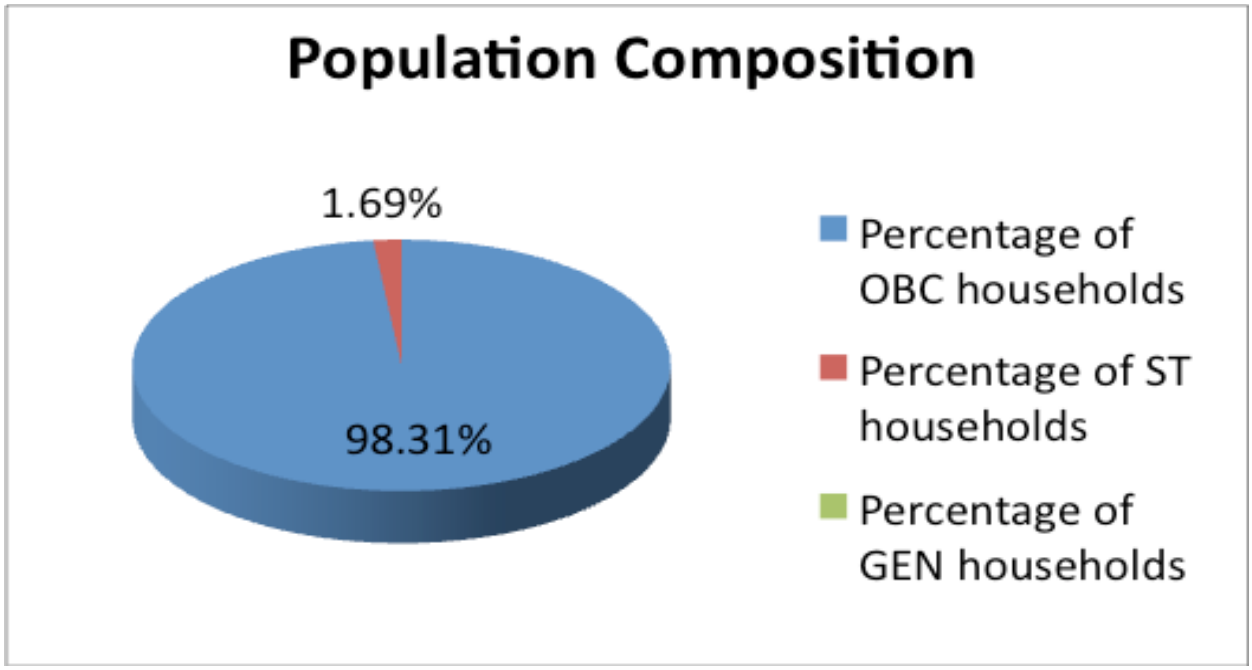
- In your opinion, in the past year, what are the 2 most important things the Panchayat has done for the village?

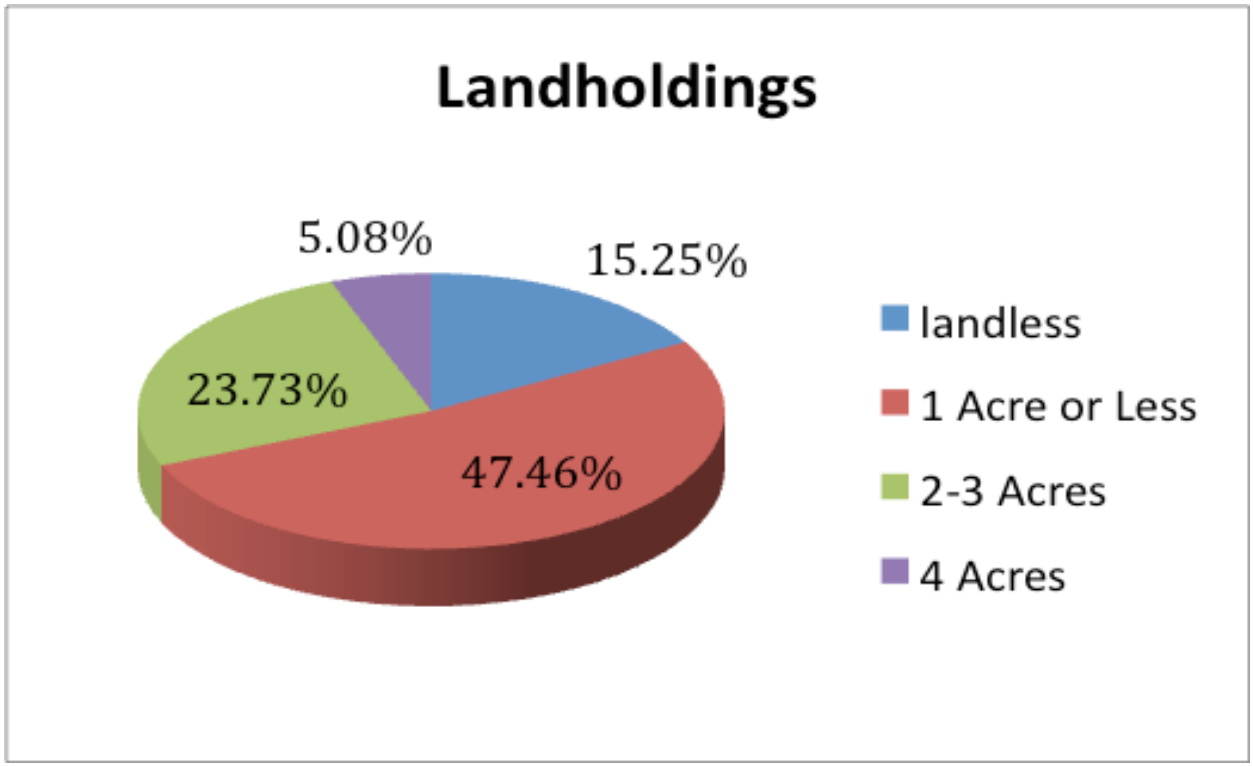
Community Aspirations

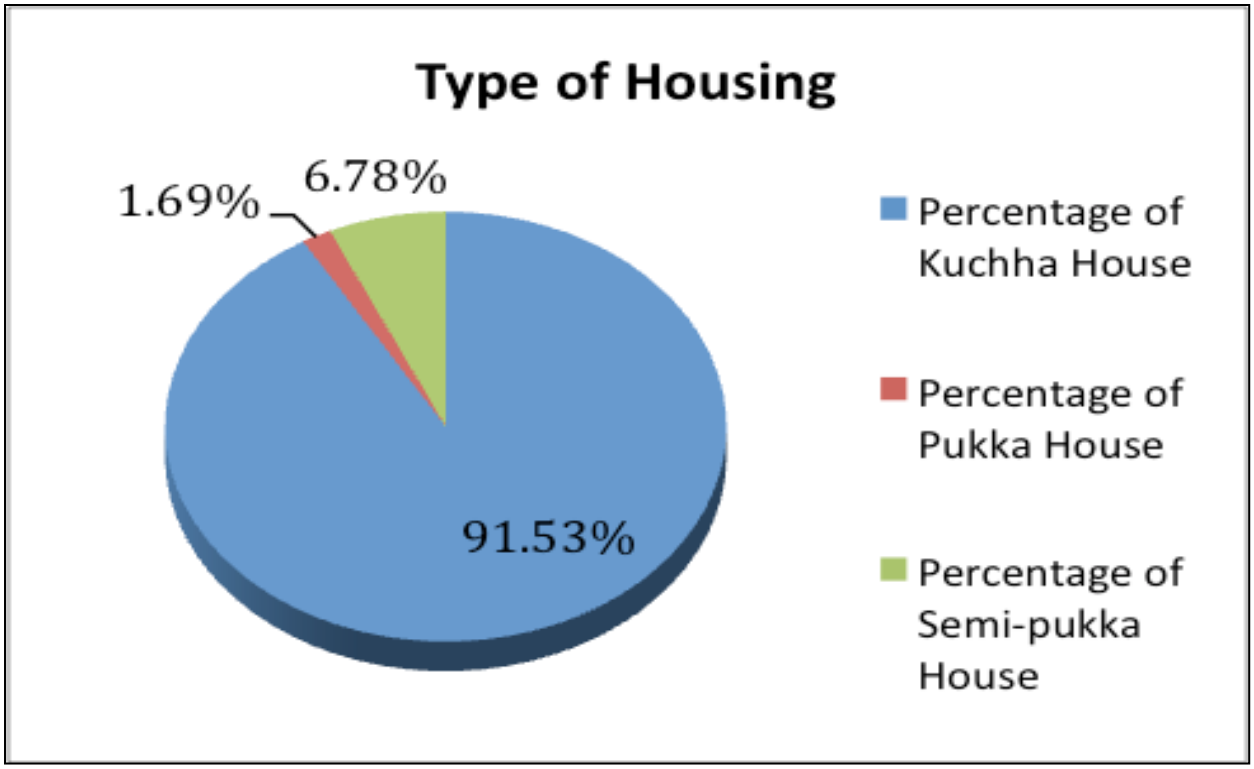
- Is your current earning sufficient to cover all expenses? If no, how does it impact you?
- Are you satisfied with your current occupation? If not, in what way would you want to do it differently? Would you rather take up a different occupation?
- If there are savings beyond your expenses, what would you rather spend it on?
- Would you want your children to take up your line of occupation? Why?

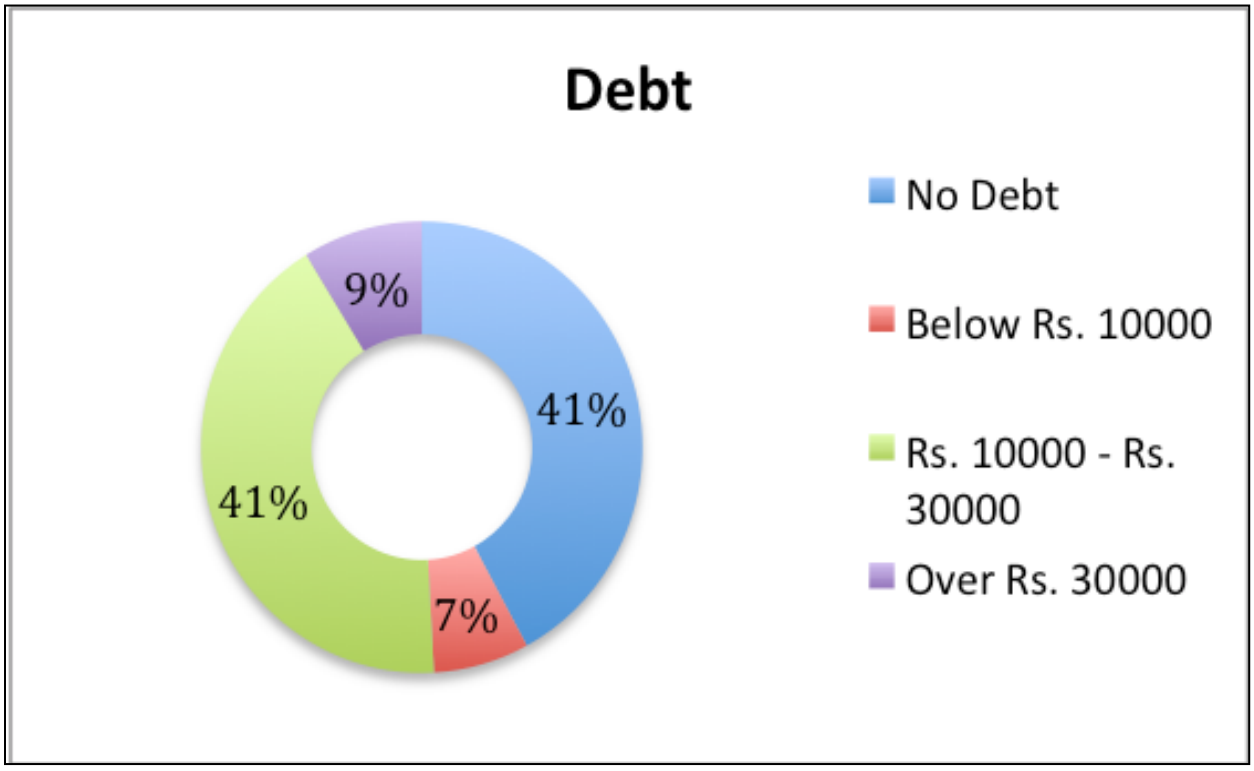
Annex 2

Baseline assessment of Chainrakolha and Garta villages

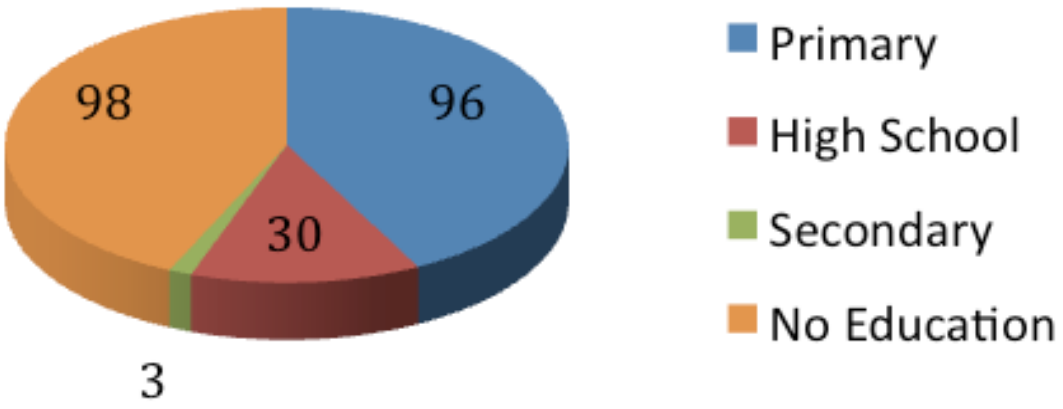




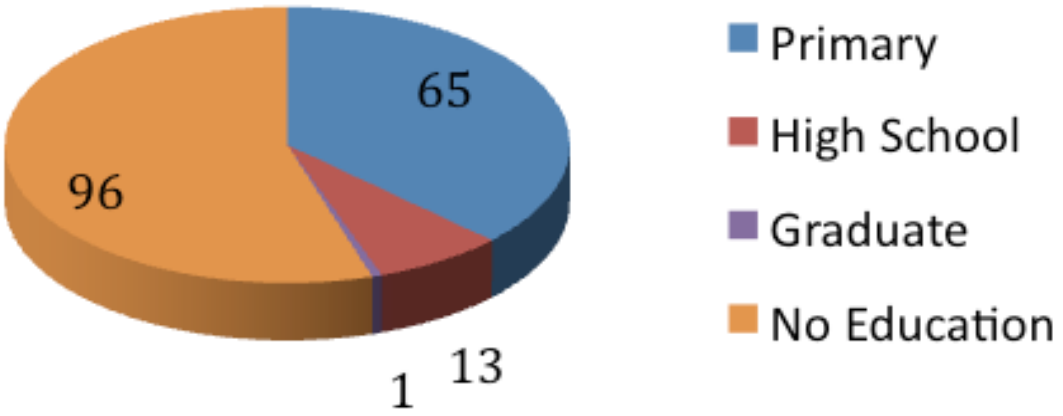

Type of Housing
1.69%
6.78%
91.53%
Percentage of Kuchha House
Percentage of Pukka House
Percentage of Semi-pukka House

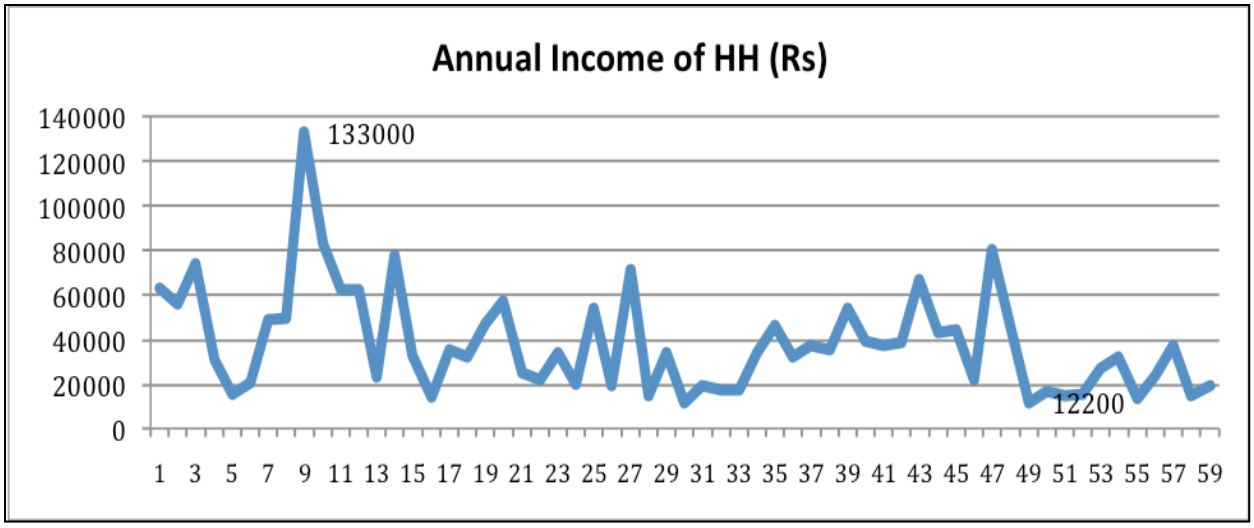

Debt
9%
41%
41%
7%
No Debt
Below Rs. 10000
Rs. 10000 - Rs. 30000
Over Rs. 30000

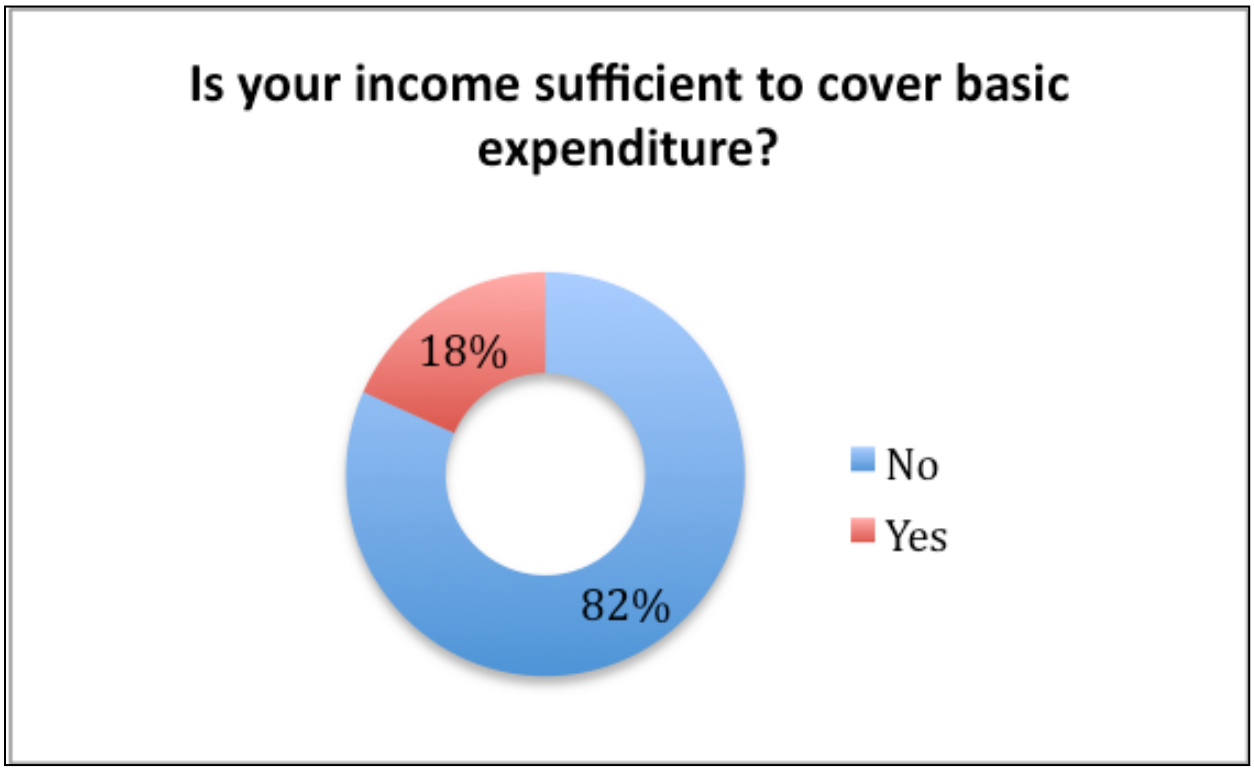
Status of education among 227 individuals in Chanarkollha

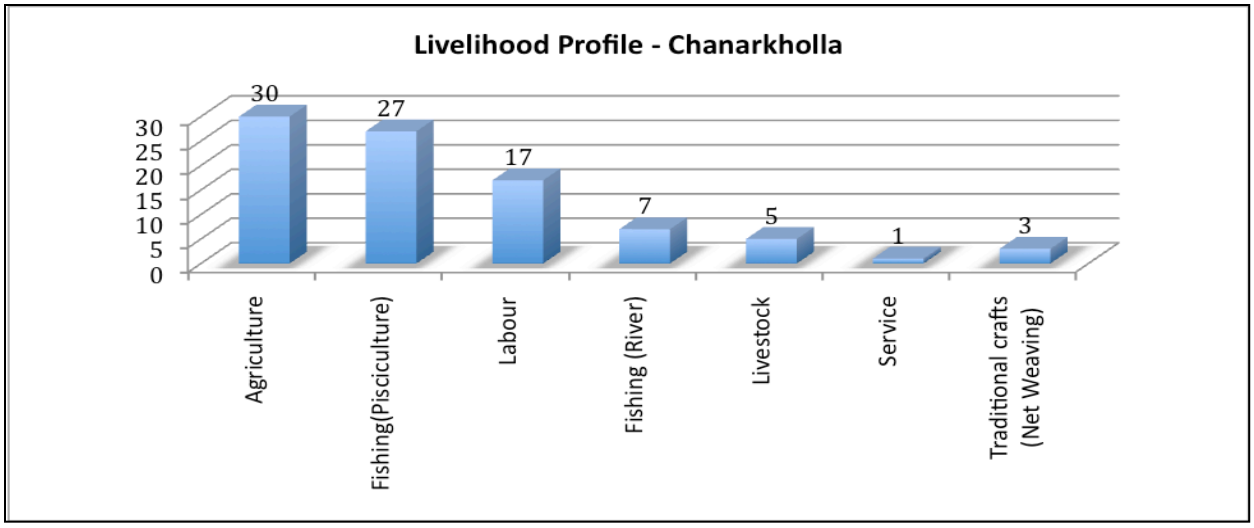


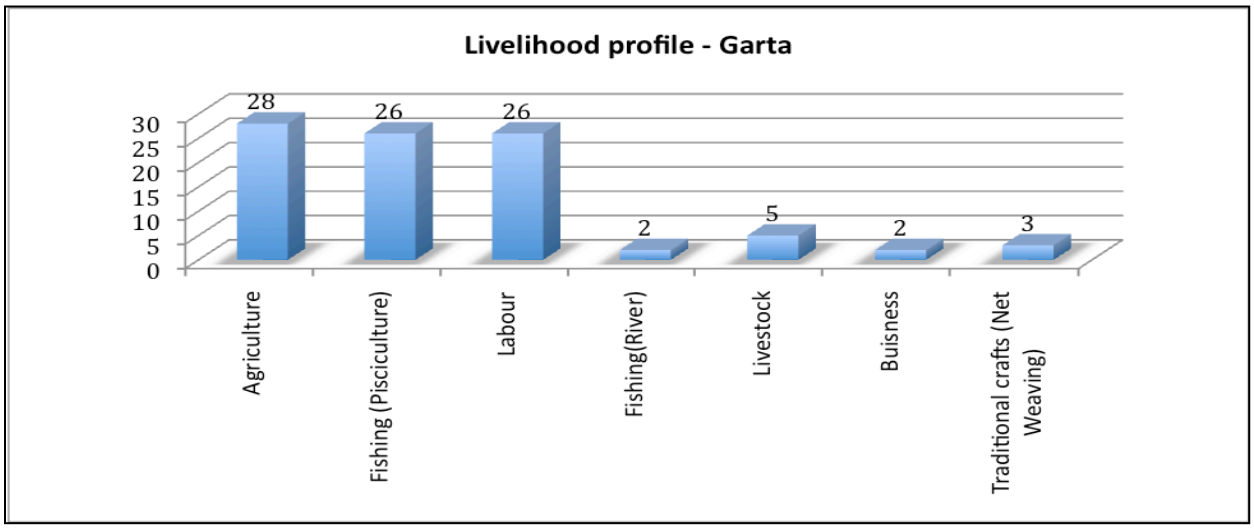
Status of education among 175 individuals of Garta




Annual Income of HH (Rs)
140000
120000
100000
80000
60000
40000
20000
0
133000
12200
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59


Is your income sufficient to cover basic expenditure?
18%
82%
No
Yes


Livelihood Profile - Chanarkholla
30
27
17
7
5
1
3
0
5
10
15
20
25
30
Agriculture
Fishing(Pisciculture)
Labour
Fishing (River)
Livestock
Service
Traditional crafts (Net Weaving)


Livelihood profile - Garta
28
26
26
2
5
2
3
0
5
10
15
20
25
30
Agriculture
Fishing (Pisciculture)
Labour
Fishing(River)
Livestock
Buisness
Traditional crafts (Net Weaving)

Annex 3

Awareness generation: Nukkad Natak (street theatre)

DAY- ONE

28.01.2013: Patta Paria

The day began with the announcement of the cultural programme to be held in Patta Paria village. The announcement was done in and around Patta Paria village and its surrounding areas. After the announcement all the performers of SANJOG reached at the venue for their performance. The programme was inaugurated by the Ward Member, Shri Sudhakrushna Maiti with Subash Patra and other dignitaries of the village. The programme was held at Patta Paria School at 5:00 p.m. With rendering of devotional & patriotic songs the programme was started. After one hour when people gathered near the venue the play titled as "MAHABTYA RA PARA DINA" was started. The programme was watched by more than 300 people of 5 surrounding villages. The play continued till 7.15pm. In the end of the programme feedback from the audience was taken. During their sharing most of the audience gave their opinion that they have understood the importance of Mangrove forest. They also took an oath that they will never make the remaining mangrove forest to be degraded and they will aware families not to cut mangrove plants in future and think about alternative.

DAY- TWO

29.01.2013: Dola Sahi

The second day of the awareness programme was started with early announcement of the programme in Dola Sahi village and its surrounding areas. The venue and timing of the play was announced through loudspeaker by moving around Dola Sahi and its peripheral areas. The programme was started at 4.30pm at the school campus by rendering devotional songs. The programme was inaugurated by the Ward Member Shri Basudev Pradhan. Two Fisheries Department officials from Rajnagar, Sri Chittaranjan Jena and Baladev Jena attended the programme. The programme continued till 7.15 p.m. More than 500 people attended the programme. At the end of the programme there was feedback session regarding the play. Most of the audiences were found to be anxious on the future programme and they realized about the importance of mangrove and its conservation. After the feedback session the programme ended with vote of thanks.

DAY- THREE

30.01.2013: Chanrakolla School Campus

The Third day and the last day of the programme were planned in two places i.e Chanrakolla School campus and Rangani market. The first programme was held at Chanrakolla School at 12 noon. Before the programme there was an announcement in the area regarding the place and timing of the programme. The programme was attended by the President of the school Shri Tapan Mandal along with the Sarapancha of Rangani Gram Panchayat Shri Sudhir Pal, Shri Laxmikanta Jena and all teachers of the school. The programme was aimed to create awareness among school children on mangrove

conservation and its importance in coming days. The programme ended at 2:00 p.m. with the feedback session. During the feedback session most of the audience shared about the message passed to them through the play and agreed to protect their forest which will be degraded if they will not conserve it. They told that it was a good idea to create awareness among school children as they are the generation who will take forward the message of conservation of mangrove forest. They thanked the organizations for their effort for creating awareness among communities and school children.

Date: 30/01/2013 Place: Rangani Market Complex Campus

The second show of the day was held at Rangani market complex at 4:30 p.m. The programme was started with the inaugural speech of Sarapanch Shri Sudhir Pal. The programme was attended by representatives from NGO RCDC Shri Dhaniram Sahoo and Shri Parsuram Mallick.

The programme continued till 6:30 p.m. and was watched by more than 600 people. At the end of the programme feedback was taken from the audience. Most of the audience appreciated the effort of organizations (MFF, IUCN, DA and BRIC) and SANJOG for creating awareness among communities on conservation of mangrove forest in their areas. They requested the host organizations to organize such awareness programme frequently in their areas. At last with a patriotic song the programme was closed by giving vote of thanks by Shri Ramachandra Mahapatra of BRIC.

Annex 4

Multi-stakeholder workshop for the development of supplementary livelihood options

The primary objective of the workshop is to identify sustainable livelihood opportunities for communities in the Bhitarkanika Wildlife Sanctuary (BWLS) area. These would draw on existing models that have been successful in areas similar to the mangroves, initiatives taken by the Govt. of Odisha in this area and the identification of new livelihoods that can be validated and scaled up. The overall approach followed is multi-stakeholder and participatory, which aims to have intense engagement with key individuals and organizations working on livelihoods in context to BWLS. Hence, the workshop aims to identify and prioritise livelihoods which can be demonstrated on field as well as for scale-up and uptake of feasible livelihoods in the region. Also to identify resource persons for the promotion and demonstration of viable livelihood options in BWLS.

Introductory Session

Mr. Anand Kumar, Associate Director, Development Alternatives (DA) gave the opening remarks and initiated the workshop by welcoming the participants followed by Ms. Nisha D'Souza, IUCN. Both of them highlighted the importance of mangrove in age of climate change.

It was then, followed by key note address, which was given by Shri Manoj Mohapatra(I.F.S), Divisional Forest Officer(D.F.O), Rajnagar stressed upon different aspects of the communities residing in the Bhitarkanika Sanctuary area. He pointed out some serious issues on poultry, duckry which are causing problems for the flora and fauna of Bhitarkanika. He also mentioned about the agriculture pattern adopted by the local communities which needs to be changed by looking into the present scenario. He made a point on marine fishing and said that fish productivity has gone down and the process of catching fish has to be changed as present fishery net size and shape are causing problems for fish growth. He pointed out that while the sanctuary area is known for its Hilsa fish for generations together and by catching Hilsa fish the families around sanctuary area used to get good livelihoods, this is now completely stopped. Mr. Mohapatra also mentioned that due to frequent changes in Govt schemes and programmes, there is no sustainable plan. He also pointed out that timber mafia is completely stopped as there is no timber around the habitations. While shrimp farming is a real pressure on mangrove forests as massive acres of land is converted into shrimp farming and causing huge land degradation and biodiversity lose in the area, the forest departments are conducting regular raids in the area to stop this . Around 40% people depend upon forest and its product. Their food and shelter security is very less and due to poverty they depend upon forest and river. He told that their economic condition can be improved by utilizing local resources.

Session 1: Mangroves for Conservation and Management

After introductory session the first session was on 'Mangrove Conservation and Management'. In this session the DA-MFF initiative in the Bhitarkanika region was discussed. Where, Ms. Sachi Singh from Development Alternatives gave an overview of the project in the intervention area, what are the sustainable livelihoods that can be take-up for the Mangrove region. Whereas, Ms. Rashi Gupta from

Development Alternatives gave an overview of the land-use land cover mapping done for the study area through satellite imagery and discussed the changes in mangrove cover over the past 6 years (2006-2012) around the intervention area in The Bhitarkanika region. The study stated that overall in the Bhitarkanika region there was no substantial change however changes have been observed around the intervention area. Certain Mangrove areas now appear as open/agricultural land. Through the field survey it was found that shrimp farms exists in the change areas.

It was then open to the floor for discussion. There were many interesting points that came up during the session, like:

Dr. Pattanaik, Former Director, CSWRI suggested Eco-Tourism and Handicraft promotion as supplementary livelihood option

Sarpanch of Ranagani Gram panchayat Shri Sudhir Chandra Pal told about the situation of sanctuary area and the people residing there. He told that people residing in the area depend on agriculture for 4 months and rest 8 months they do fishing, migrate or do labor work. Agriculture is also purely depending upon rain as there is no facility of irrigation. The other option of fishing was providing income before sanctuary was declared, but that has been stopped now because of law. So there is no alternative for the local communities. He suggested that any income generating activities can be taken in the area but marketing linkages plan has to be in place as that is the main obstruction for the localities. He suggested for fish and agri-business related activities in the area

Mr Gopal Mohapatra from OFSDP suggested that there should be Farm based (Paddy) and Non-Farm based (Badi/Achar) activities planned for the area like. He also told that any activity which is providing the minimum wage should be taken in the area suitable to the local market. He told about different Govt schemes which can provide income and employment opportunities

Mr. Tapan Padhi from Child Rights, Odisha organization suggested on low cost farming. He suggested about share cropping, vegetable cultivation like chilly, poultry

Ms. Sailabala Padhi from Center for Environment Studies (CES) suggested that Bhitarkanika is the best place for sea weed cultivation due to high saline water availability. She told about the demand of sea weed and how easily it can be done by women. She presented a video on the preparation of sea weed and told that Govt of Odisha is promoting sea weed cultivation

Shri Ambika Nanda, Odisha State Head-UNDP told about the role of Panchayat and its members in promoting different sustainable income generating activities. He told that the PRIs must have to take the leadership to carry forward the activities initiated by external agencies

There were also different suggestions from other participants on alternative livelihood options. Suggestions were for changing of cropping patterns, saline water resistant crops, mushroom cultivation, puffed rice, adoption of new technology for fish and aquaculture, poultry with new advanced technology, integrated rice-fish farming, medicinal plants plantation, vocational training and animal husbandry, etc.

The session came to an end by making people understand how critical/sensitive the issue of sea-weed, Mr. Ishwar from IUCN explained people and asked them not to promote any new species in the highly sensitive area like Bhitarkanika without understanding the nitty-gritty and disturbing the flora and fauna of the nature.

Session 2: Presentations of Livelihoods being implemented in the area

The first presentation was by Mr. S. Swain from *M.S. Swaminathan Research Foundation*. He presented how the organization is providing alternative livelihoods to forest dependent communities by adopting 4Cs method i.e. Conservation, Cultivation, Consumption and Commercialization. However marketing was seen as the biggest challenge for products.

The second presentation was by Mr. Suresh Bisyoi from *Regional Center for Development Corporation (RCDC*) where he focused was on livelihood research, disaster management and climate change. The organization presented on Integrated Rice Fish farming and Integrated Pisciculture which can be taken as alternative livelihood option for individuals and Groups. The third and last presentation was given by Ms. Rashmi from *Unnayan* organization on puffed rice. During the presentation it was found that how a woman member of a household can generate profit of Rs.600/- by working out only 2-3hrs in a day. She also presented about the golden grass craft which can provide income to the local communities.

Way Forward

Dr Ishwar from IUCN, in his concluding remarks wished to know the community views on whether they are interested on taking of sea weed as a livelihood options or not as it involves negative impacts on environment in long run. But he clearly, stated that no new species should be introduced in the region and as far as sea-weed is concerned people and the Odisha government should not promote it as it is a highly controversial topic and is sensitive to the Bhitarkanika region.

And in the concluding remarks by Mr. Prafulla Dhal, of BRIC, highlighted resource dependency syndrome and pointed out the reasons on mangrove degeneration in Bhitarakanika and how the livelihood approach can change the situation. He pointed out that, there are many government level initiatives including ICZMP, Odisha Livelihood Mission, MGNREGA and many other can play vital roles in sustainable mangrove in Bhitarkanika if convergence of programs be made possible. In the end the prioritization of livelihood options were made by the participants and villagers and finalized 8 different options on priority order.

During the final stage of the workshop the participants were requested to write at least three best suitable livelihood options for mangrove dependent communities. At last with the vote of thanks the workshop came to an end.

Annex 5

Livelihood demonstration: Puffed rice

The team led by Shri Sudhir Chandra Pal, Sarapancha of Rangani GP reached UNNAYAN where the Mayurbhanja Mahilla Association (MMA) members welcomed the visitors. Here the target community (people from Chainrakolha and Garta villages) understood **the process and functioning of the system** which included the women SHGs federations, economics of puffed rice and marketing, value addition and expansion of the business and the sustainability factors.

Women SHGs Federations

The Mayurbhanja Mahilla Association (MMA) is a registered Women Self Help Group Federation consisting of more than 130 women members from different villages of Mayurbhanj District. The women members started puffed rice activity as an alternative livelihood options that can generate money for them with 2-3hrs of labor, after realizing that rice is available abundantly in the area and . UNNAYAN organization has provided the initial supports and encourages them for puffed rice business. Initially the federation stared with 24 women members and now 130 women are doing puffed rice business.

Economics of Puffed Rice and Marketing

When started MMA suffered loss for one year as it has to make its presence in the market. MMA purchased puffed rice @ Rs. 12/- per kg from the women and sold @ Rs. 11/- per kg. Loss of around Two rupees loss (including travelling and packaging expenditure) was in the initial period on selling of one kg puffed rice. But MMA did not lose confidence and after one year it started to gain benefit. Initially each woman was supposed to provide puffed rice from 5kg raw rice.

Now each member is providing puffed rice from 50 kg of raw rice in a month. After the initiation of the business with the help of UNNAYAN, another funding agency OXFAM supported an amount of Rs. 5lakh for the same activity. OXFAM also provided materials and building for the entrepreneurship. For the puffed rice business a woman member is getting a profit of Rs. 490/ in- use / investment 1 quintal paddy which is cost to Rs. 1090/- per Qtl. from 1 Qtl paddy one gets 70kg of rice which produces 56kgs of puffed rice. Apart from puffed rice selling one gets benefit by selling of husk and small pieces of rice (khuda). MMA purchase the puffed rice from the sellers @ of Rs. 30/-per kg and sells it on @ Rs. 35/- per kg.

Value Addition and Expansion of the Business

Initially, UNNAYAN helped in marketing linkages and after 3 years MMA members stared their own business by multiple activities other than puffed rice. MMA has its own marketing manager who looks into the marketing matter. Apart from puffed rice making the members also stared other seasonal activities like Mushroom farming, Tentuli Achar, Agarbati making etc. For the fuel usage they depend on grass, straw, husk and wood. Woman members are mostly engaged in all the process of puffed rice business while the male members also help them like by assisting on fire making, rice frying and fuel

wood collection. During rainy season the production rate drops due to bad weather which affects the making of rice into puffed rice. One member earns between Rs. 30-35,000/- in a year by doing puffed rice business.

Sustainability Factors

After the discussion the team made a visit to the puffed processing unit and understood the preparation process. The puffed rice manufacturers showed how they prepare puffed rice from paddy and what are the materials used for the activity. During field visit women members also showed the preparation of Agarbatti and Mushroom cultivation.

The Mayurbhanja Mahila Association (MMA) is now a self established cooperative society managed by the women only. The Association has appointed Marketing Manager, Accountant, and Store Manager to take care of the entrepreneurship. The Association has developed a very good supplementary livelihood opportunity for the rural women.

After having an understanding of whole process, the MMA members sat again with the visitors for doubt clearing. At the end of the visit the visiting team thanked all the members of MMA and UNNAYAN who made possible for the exposure. The visiting members expressed their happiness and requested MMA members to make a visit to their respective villages for further training and orientation on the subject. They hoped that after returning to their villages they will try to follow whole process of puffed rice making at their home first and then they will go for business mode.

Livelihood demonstration: Integrated fish farming

The organization named Gram Utthan works on integrating fish farming. The people from the intervention area were exposed to the work. Hence, the main objective of the field visit was that the people from the intervention area, gain practical knowledge from the well experienced integrated fish farmers

Mr. Bansidhar Das from Gram Utthan displayed the application process of floating & shrinking feed. He demonstrated the test of PH & plankton level in pond water. Then he described about the processes for more fish production. Heavy stocking & multiple harvesting is the key process of more fish production. Farmers should drop 3000 yearlings instead of spawn, fry or fingerling in 1 acre of water spread area during June or July for excellent growth. From 4^{th} month they should start monthly harvesting & again they should drop same number as well as same species of year lings in the pond, the head count number will be maintained same in the pond throughout the year. Before seed stocking, farmers should adopt improved technology on pond management, seed management, feed management & health management. If one invests Rs. 60,000/- in 1 Acre of pond (seed purchasing, maintenance, feeds etc), he will get 20 Qntl fish which market value is Rs. 100/- per kg means he will get 2 lakh by selling. One will get monthly net income of Rs. 12,000/- from 1 Acre of fish pond.

Integrated fish farming includes duck rearing which helps as a manure for the pond, then poultry-as excreta from hens helps to the growth of fish very quickly as it provide enough plankton (natural feed)

for the fish, the communities who had come for the visit were also exposed to the different form of high protein base fish feed, medicines for different disease, soil & water test laboratory. Also importance of vegetable cultivation was told the farmers as integration of horticulture & vegetable cultivation on the pond embankment is a profitable activity. Proper utilization of pond bund as well as adjacent area for vegetable cultivation gives weekly income to the farmers throughout the year.

Duck Rearing

Ducks are known as the living manure of pond ecosystem. One duck releases 40-45 kg excreta in a year, which helps to create plankton (Natural feed) for fish. They help to improve dissolve oxygen level due to their swimming habit & also keep the pond environment clean. A khaki Campbell duck lays 260- 280 eggs per year, which is the daily income of a farmer. By investing of Rs.199/- per duck one will get Rs. 1270/- in a year. In 1 acre size of pond 80-120 ducks can be farmed. If one goes for integrated fish and duckery he will get 500-600 eggs, 200-250 kg of meat and 12-16 Qntl fish.

Dairy

One acre pond requires 4000 kg fresh cow dung per annum for manuring & cow gets green grass from pond embankment area. A milking cow gives daily income to the farmer & provides nutrient food to the family health. If one goes for integrated fish and dairy farming then he will get income from milk and 16-18 Qntl fish. Three cows provide cow dung for 1 acre size fish pond.

Poultry

Poultry can be added with fish farming activity on the embankment area. The excreta from hens helps to the growth of fish very quickly as it provide enough plankton (Natural feed) for the fish. For 1 acre of fish pond one can get plankton from 200-240 hens. If one goes for integrated poultry and fish farming, he will get 18-20 Qntl fish apart from meat and eggs. Banaraj variety hen gives 180-200 egg per annum & that becomes the daily income of farmers.

Azola and Vermi compost

The farmers visited Azola cultivation & vermin compost bed. They learned the construction, management & utility of vermin compost as well as Azola.

Farmer's knowledge center

Farmers visited Kalyani Farmers Knowledge Center, established by Gram-Utthan & gained practical knowledge about different form of high protein base fish feed, medicines for different disease, soil & water test laboratory

Vegetable cultivation

Integration of horticulture & vegetable cultivation on the pond embankment is a profitable activity. Proper utilization of pond bund as well as adjacent area for vegetable cultivation gives weekly income to the farmers throughout the year.

Experience sharing

The farmers interacted with two farmers Ghanshyam Nayak and Laxman Nayak of Itapokhari village under Rajkanika block & visited the integrated fish farming activity taken out by them. The farmers asked about their expertise on fish farming. They told that, they were in practice of traditional fish farming method with the production range up to 500 kg/ per acre through single netting practice. Late they came in contact with the Livelihood project coordinator, Gram- Utthan & availed capacity building training from CIFA, Kausalyaganga & KVK, Ranital Bhadrak through Gram-Utthan. Besides that they also availed nursery as well as culture pond preparation, pond management, seed management, feed management & multiple harvesting from Gram-Utthan time to time. They established dairy & poultry unit by the help of GramUtthan. They are getting extra remuneration out of that. Now they could able to produce 3000 kg fish per acre.

Doubt clear session

At 1.30 p.m. the farmers returned from the field and completed lunch. After lunch again they assembled together at Gram Utthan training hall & shared their field visit experience very nicely. They put several questions for doubt clearance. Mr. Das, Project coordinator, Gram-Utthan cleared the doubts of the farmers in a systematic manner. However due to time constraint all topics could not be covered which required further training. Mr. Das also briefed about the financial support the organization is providing to farmers. The farmers repay back the loan amount on monthly installment basis with a minimum interest rate.

Response from Villagers participated in Exposure Visits to the Integrated Fish Farming Project:

Subodha Patra form Garta village said that “We did not know how fish farming is used for such a big trade and we have enough interest in doing such fish farming as we are from the fishing community. We need DA-BRIC team should help us in doing this business as an alternative source of our income so that our dependency on the marine fishing can be reduced. One of the participants Bimal Pradhan said that, we have practice in traditional fishing but we don’t have integrated apporach and we need marketing linkage and loan supports to start up the trade soon’. The Sarapanch of Rangani Gramapanachyat said that “we thank DA-BRIC and MFF team for helping us to know the trade and understand our area, its eco system and its problems visa vice organizing awareness camps through nuked dance and exposure visits to successful livelihood areas. I commit from the Rangani Panchyat people that we will take all steps to utilize the government funds and other means to preserve and conserve the mangrove ecosystem and undertake alternative livelihoods for our income. We request DA-BRIC team to help us at least for next two years like this. Also we need more training on Integrated Fish Farming in our own localities. We seek support from BRIC and Gram Utthan for more training in future”.

Conclusion

After having an understanding of whole process, at the end of the visit the visiting team thanked all the members of Gram Utthan who made possible for the exposure. The visiting members expressed their happiness and requested Gram Utthan members to make a visit to their respective villages for further

training and orientation on the subject. They hoped that after returning to their villages they will try to follow whole process of integrated fish farming.

Annex 6

Land use/land cover changes in Bhitarkanika Mangrove Forest

MANGROVE CONSERVATION AND MANAGEMENT

ASSESSING MANGROVE COVER CHANGE IN BHITARKANIKA WILDLIFE SANCTUARY, ODISHA

BACKGROUND

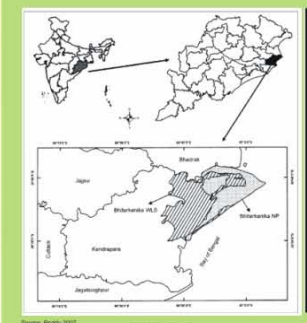
In order to assess the status of mangroves in Bhitarkanika Wildlife Sanctuary, a land use-land cover study was carried out. This study is part of a larger project that focuses on increasing awareness and capacities of local communities and community based institutions for the sustainable use of mangrove resources and reducing dependence of communities on mangrove resources by enhancing alternative livelihood opportunities.

In the last few decades the survival of mangroves has been subject to different threats and anthropogenic pressure. Bhitarkanika Wildlife Sanctuary of Odisha is one such area, where the threats include agriculture, shrimp farming, harvesting fuel wood and timber, grazing by domestic animals, harvesting non-wood forest products, sewage discharge, and garbage disposal. While Mangroves provide essential services that have the potential to enhance livelihoods, the over-exploitation of mangrove resources and their destruction for livelihood activities such as agriculture and aquaculture is unsustainable. Additionally, mangroves and the communities dependent on them are threatened by climate change. The current scenario, if left unchecked has the potential to lead to a loss of livelihoods, income and increased vulnerability of mangrove dependent communities.

To promote effective development and management of the mangroves, land-use/land cover (LULC) mapping and change detection was carried out using Satellite Remote Sensing and GIS techniques. The study monitors changes in the mangrove cover and investigates the pressures.

STUDY AREA

Bhitarkanika Wildlife Sanctuary, Kendraparha district, Odisha. Chanrakolha and Garta villages in the sanctuary were the focus of the study.



Location map

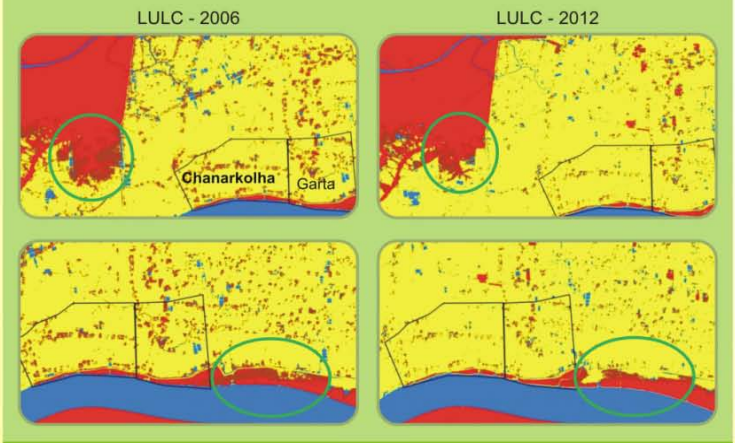
Satellite false colour composite of Bhitarkanika

METHODOLOGY

Satellite image of Dec 2006 and Feb 2012 → Past and present land cover mapping → Comparison of land cover maps to detect change → Field survey to determine real change and identify pressures

CHANGE DETECTION ANALYSIS

Magnified snapshots of land use/land cover maps



Comparison of the 2006 and 2012 maps reveals changes in land cover pattern. The areas encircled in green show change as the mangrove area in 2006 appears shrinking in 2012 and the surrounding sparse vegetation/fallow land increases in spread

Land use/land cover (LULC) maps of Bhitarkanika, derived from satellite imagery.

CONCLUSION

Although no substantial change was found in the region, loss of mangrove was observed in some patches near the two villages, as shown encircled in the snapshots (far left). While in the satellite derived map of 2006 these areas appear as mangrove, in the 2012 snapshots the mangrove cover appears shrinking as the surrounding sparse vegetation/fallow land increases in spread. The ground survey revealed shrimp farms in these areas, confirming the conversion of mangrove forest to other land use.

Mangroves for the Future
INVESTING IN COASTAL ECOSYSTEMS

Development Alternatives