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Final Evaluation Report (Biodiversity impact)

Integrated Land and Ecosystem Management to Combat Land Degradation and Deforestation in Madhya Pradesh

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GEF/UNDP/Government of India

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Other partner:

Madhya Pradesh Forest Department (MPFD)

Submitted by

Catalyst Management Services Private Limited



Head Office: #36, Vinayaka Layout, Boopsandra Main Road, Bangalore – 560 094, Karnataka, India

Ph: 080-23419616, 09342863530

Regional Office: E-2/244, First Floor, Arera Colony, Bhopal - 462 016, Madhya Pradesh, India

Ph: 0755-4202234, Mob: 08103382233

Email: pramel@cms-india.org Web: <http://www.cms-india.org>

Branch Offices at - New Delhi, Bhopal, Hyderabad, Madurai

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S No	Name of person	Designation	Location
1	Mr. Atul Shrivastva	Project Director - UNDP-GEF and Addi PCCF	Bhopal
2	Mr. Mahendra Yaduvenu	Project Director - UNDP-GEF and Addi PCCF	Bhopal
3	Mr K C Tyagi	CCF	Chhindwara
4	Mr Prashant Kumar Singh	DFO	West Betul Division
5	Mr. Yamuna Prasad Singh	DFO	Sidhi Division
6	Mr. Sandeep	GIS Information, FD	Satpura
7	Lianchawii Chhakchhuak	Programme Analyst	UNDP, Delhi
8	Mr Somit Dev Burman	Project Manager	UNDP, Bhopal
9	Ms Anushree Bhattacharjee	Research Associate	UNDP, Delhi
10	Ms Geetanjali	Project Manager	UNDP, Chhindwara
11	Mr Devendra	Project Manager	UNDP, Betul
12	Mr Nitesh	Project Manager	UNDP, Sidhi
13	Mr Parteti	Deputy Ranger	Tamiya range, Chhindwara
14	Mr Pandhram	Forest Guard	Tamiya range, Chhindwara
15	Mr Sunil Verma	Ranger	Ambada range, Chhindwara
16	Mr Haidar Khan	Deputy Ranger	Ambada range, Chhindwara
17	Mr Purushottam Bobade	Forest Guard	Ambada range, Chhindwara
18	Mr Virendra Shrivastav	Ranger	Pashchim Batkakhapa range, Chhindwara
19	Mr Harchand Salame	Deputy Ranger	Pashchim Batkakhapa range, Chhindwara
20	Mr Rameshwar Kori	Forest Guard	Pashchim Batkakhapa range, Chhindwara
21	Mr Rajendra Parihar	Forest Guard	Pashchim Batkakhapa range, Chhindwara
22	Mr M S Rana	Ranger	Bhaura range, Betul
23	Mr Mahesh Ahirwar	Ranger	Amla range, Betul
24	Mr Subhash Joshi	Deputy Ranger	Amla range, Betul
25	Mr Mukesh Jindal	Forest Guard	Amla range, Betul
26	Mr Shivkumar Uike	Deputy Ranger	Sarni range, Betul
27	Mr Anand Kumar Parmar	Ranger	Gawasen range, Betul
28	Mr Umrao Parsi	Deputy Ranger	Gawasen range, Betul
29	Mr Hasne Alam	Forest Guard	Gawasen range, Betul
30	Mr Sarnam Singh	Forest Guard	Gawasen range, Betul
31	Ms Suneeta Uooke	Ranger	Sidhi range, Sidhi
32	Mr Devnath Potar	Forest Guard	Sidhi range, Sidhi
33	Mr Ramesh Gahlod	Ranger	Churhat range, Sidhi
34	Mr Vishnu Sharma	Forest Guard	Churhat range, Sidhi
35	Mr Ram Krishna Patkar	Ranger	Madwas range, Sidhi
36	Mr Krishna Kumar Kol	Forest Guard	Madwas range, Sidhi
37	Mr Sampat Kumar Dwivedi	Ranger	Mohan range, Sidhi
38	Mr Joshi	Deputy Ranger	Mohan range, Sidhi
39	Mr Umasharan Gowswami	Forest Guard	Mohan range, Sidhi

Under this assignment, a team was put together by CMS to carry out the functions related to preparation and testing of study tools, field work, analysis of findings and report compilation. The details of the team members are shared below:

S No	Name of team member	Designation for the assignment
1	Mr Pramel Gupta	Team Leader
2	Mr N Raghunathan	Natural Resources Management Expert
3	Ms Meena Bilgi	Gender Thematic Expert
4	Mr Nikhil Desai	Monitoring & Evaluation Expert
5	Mr Ashish Bhambhani	Field Research Coordinator
6	Mr Chandrapal Kakde	Field Supervisor
7	Mr Sharad Bonde	Field Investigator
8	Mr Manish Patedar	Field Investigator
9	Mr Subash Patedar	Field Investigator
10	Mr Sandip Tajne	Field Investigator
11	Mr Jayaram Kumble	Field Investigator
12	Mr Sandip Mete	Field Investigator
13	Mr Bhupendra Bele	Field Investigator
14	Mr Abhishek Patedar	Field Investigator
15	Mr Hemant Berahi	Field Investigator

7 Abbreviations

APL	Above Poverty Line
BPL	Below Poverty Line
CMS	Catalyst Management Services
GEF	Global Environment Facility
GIS	Geographic Information System
GP	Gram Panchayat
Ha	Hectares
JFMC	Joint Forest Management Committee
LPG	Liquefied Petroleum Gas
MFI	Micro Finance Institution
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
NGO	Non-Government Organization
NRM	Natural Resource Management
NTFP	Non-Timber Forest Produce
NDVI	Normalized Difference Vegetation Index
OBC	Other backward Castes
PDS	Public Distribution System
PPI	Progress out of Poverty Index
PRA	Participatory Rural Appraisal
SC	Scheduled Castes
SHG	Self Help Group
SME	Small and Medium Enterprise
ST	Scheduled Tribes
UNDP	United Nations Development Programme

8 Programme overview

Background

Financed by the Global Environment Facility (GEF), United Nations Development Programme (UNDP) is implementing the project "Integrated Land & Eco-system Management to Combat Land Degradation and Deforestation in Madhya Pradesh" in partnership with the Forest Department of Madhya Pradesh under Community Forest Management. The programme duration was from Sept-2010 to Dec-2015. The programme area was spread over nine forest divisions of five project districts (Betul, Chhindwara, Sidhi, Singrauli and Umaria). The main objective of the programme was to address the problem of degraded bamboo forest land on micro-watershed basis, through local community participation through sustainable livelihood practices. The programme strategy was to provide an integrated approach of maintaining ecosystem services.

Objective of the programme

The larger goal of the programme was to promote sustainable land management while maintaining the capacity of ecosystems to deliver goods and services (benefitting local livelihoods), under climate change scenario. The specific objective was to promote community-driven sustainable land and ecosystem management at the landscape level through integration of watershed management, joint forest management, and sustainable livelihoods development, so as to balance ecological and livelihood needs.

The following were the activities that took place under the programme:

Rehabilitation of Degraded Bamboo Forests: Under this, in each district the rehabilitation of 3000 to 4000 Ha of degraded bamboo forest was to take place through villagers. For every beneficiary, each year 5 Ha of degraded bamboo forest had to be protected for 4 years leading to a total coverage of 20 Ha for each family/beneficiary. For this, each family was to get a monthly pay of Rs 2,500-Rs 3,500. In total, the target was to rehabilitate 14,500 Ha of degraded bamboo forest benefitting 725 families. After 4 years, these forest areas were to be handed over to the community who will be benefitted by selling the forest produce in a sustainable manner.

Energy Plantation: Under the programme, it was decided that each forest division is required to establish an energy plantation. This had to be done in an area of 220 Ha of which 40 villages were to get the benefit. In this energy plantation, fast growing fuel wood species were to be planted which were to be made available to the community, thereby decreasing the pressure of fuel wood on the forest areas.

Fodder Development: One of the programme activities also required to develop a fodder area in 190 Ha of land. This was to benefit 40 villages. In this, fast growing fodder species were to be planted which were to be made available to the community, thereby decreasing the pressure of fodder on the forest areas.

Development of Home Garden: Under this, it was required to distribute a total of 1,500 medicinal plants in each forest committee which were to be distributed among the villagers. For each family it was decided to give 5-10 plants. Also, training was to be provided to them for taking care of these

plants. Only those species were to be promoted which were locally acceptable. These plants could then be used by villagers to gain returns by selling the produce or used for household purposes.

Watershed Management: Under this, to stop the soil erosion in the forest and non-forest area, different watershed structures were to be built. These included contour trenches, gully plugging, stop dams, check dams, Nistar Tanks, etc. Also, bamboo plantation was to be done in the treatment area. This activity was to be done to treat 3000 Ha of forest and non-forest land.

Capacity Building of Joint Forest Management Committee (JFMC): One of the programme activities also required to build the capacity of 20 members from each forest committee of every forest division. A total of 2,000 members were to be trained to create Master Trainers who were to act as Resource Persons for each committee and give training to other members of the committee.

Establishment of Small and Medium Size Enterprises (SMEs): Under this project activity, small and medium size enterprises were to be developed. These were to be run by the community forest management committee. Exposure tours for training and capacity building of the committees also were to be done. The idea behind this was to generate an additional source of livelihood for the community.

Improving Agriculture and Animal Husbandry Practices: Under this, in each forest division, selected villages were to be developed as model villages in which different good agriculture and animal husbandry practices were to be promoted.

Table 1 - UNDP-GEF project physical target

Activities	Physical target
Rehabilitation of Degraded Bamboo Forests	14500 ha
Energy Plantation	220 ha.
Fodder Plantation	190 ha.
Watershed Management	3000 ha.
Development of Home Garden	6,00,000 Plants
Small & Medium sized Enterprise Business Plan Development	100
Capacity Building of JFMCs Members	2000
Agriculture & Animal husbandry in Villages	30

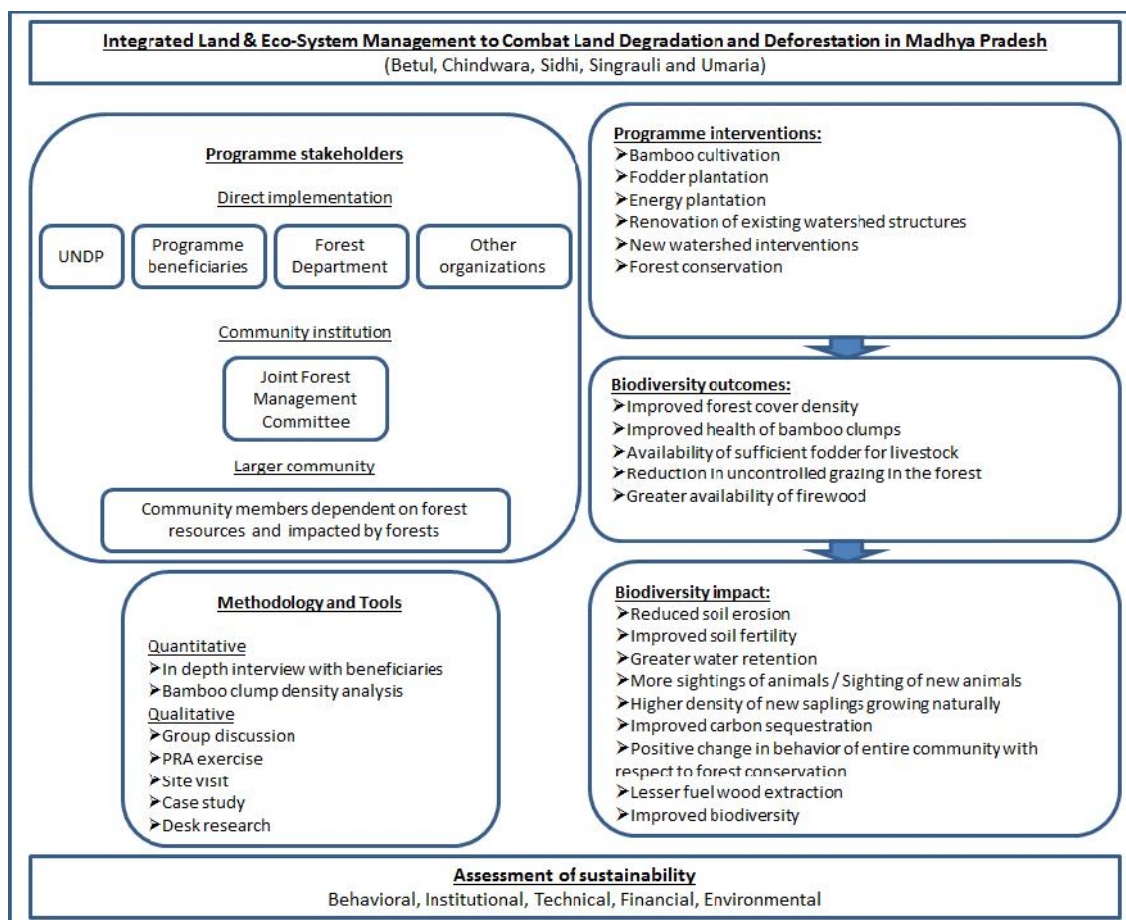
9 Objectives of the study

The objectives of the study include:

1. Conducting an assessment of the biodiversity impact of the programme with reference to the logical framework of the programme
2. Suggesting recommendations based on the study for a possible further scale up of the programme

10 Study framework

Figure 1 – Study framework



The key biodiversity impact indicators assessed in this study are reduced soil erosion, greater water retention, more sighting of fauna / sighting of new fauna, density of new saplings growing naturally, fuel-wood extraction and improved biodiversity. The related social impact indicator assessed is the behavioral change in the community with respect to forest conservation. The relevant interventions studied include bamboo rehabilitation, fodder plantation, energy plantation, renovation of existing watershed structures and new water shed interventions. The assessment of sustainability of impact has been done on five dimensions: Behavioral, Institutional, Technical, Financial and Environmental.

The biodiversity study has been done at an overall programme level as well as at the district level for the three districts of study: Betul, Chhindwara and Sidhi. This has been done as the context is different across the three districts and accordingly, the impact of a particular intervention can also be varied. The selection of these particular districts was based on criteria like the spread of beneficiaries, intensity of intervention and diversity of context. The Study Methodology section gives further details on the methodology used in the biodiversity study.

11 Study methodology

Based on the understanding of the programme, a mixed methods study that combines quantitative and qualitative methods was used. To measure the change in key indicators over the programme period, comparison with the information collected at baseline was planned. But since most of the biodiversity related indicators were not captured in the baseline study, the endline study largely used recall to measure change.

The **quantitative methods** in the study involved conducting an in depth interview with the beneficiaries of the programme. This interview was conducted by a qualified team of Field Investigators who conducted the interview through an Android Operating System based app on tablets. This ensured accuracy and reliability of data captured. The quantitative methods also involved conducting an analysis of the change in density of bamboo clumps as a result of the bamboo restoration programme.

Picture 1 – In depth interview with beneficiary using mobile based apps



The **qualitative methods** included methods employed in the field as well as desk research. The field methods included a combination of Participatory Rural Appraisal (PRA) exercises with beneficiary groups, focused group discussions, visits to intervention sites and case studies. The main objective of the qualitative field methods was to map the perception of the beneficiaries regarding the change which occurred during the programme. An example of a PRA exercise being conducted can be seen in Picture 2.

Picture 2 – PRA exercise in Borapani village, Ambada range, Chhindwara district



Picture 3 was taken during a site visit in the forest area near the Baghaun village in Sidhi range of Sidhi district. The primary purpose of the site visits conducted during this study was to visit the sites of change with the beneficiaries and then capture their perception with respect to the change which has occurred due to the programme interventions. The discussions during these site visits captured the entire journey of change along with the processes which contributed to the change. For example, the discussions included the processes adopted for beneficiary selection, the strength and inclusiveness of the institutions and the sustainability of the change. The perception of the beneficiaries regarding change related to biodiversity served as a very reliable peer verified mechanism of capturing change due to the programme interventions.

Picture 3 – Site visit in Baghaun village, Sidhi range, Sidhi district



The **desk research** involved conducting Geographic Information System (GIS) analysis to ascertain any visible change in the forest canopy in the intervention sites over the programme period. The desk research also involved compiling photographic evidence of key intervention sites and confirming the impact of the intervention at the site with the perception of the beneficiaries.

During the field visit, detailed interactions were also held with the staff of the Forest Department to better understand their perception of the impact brought about by the programme.

12 Sampling

In depth interview with beneficiaries

For the sample selection, statistical significance at the programme level was assumed as that allowed for consolidation of results at the programme level. To get statistically significant results at the programme level, it was required to cover sufficient number of beneficiaries from within the project districts in the quantitative survey. Since assuming the level of significance at 95% would have significantly increased the minimum required sample size, the study assumed 90% significance and +/- 5% margin of error for the selection of beneficiaries.

Based on this, the minimum sample size required worked out to 267 respondents. This was rounded off to 270 respondents. Assuming a design effect of 2 as the sample selection was multi-stage and stratified, the desired sample size worked out to 540 respondents for the in depth interviews.

Based on interactions with the UNDP programme team, it was estimated that the total number of direct beneficiaries in the programme were approximately 700. Since there was a high probability of not being able to locate 540 direct beneficiaries to interview on account of migration, the field team consciously located indirect beneficiaries to make up for the shortfall. An indirect beneficiary, for example, would be benefitting from a watershed intervention through improved soil moisture retention which leads to higher agricultural productivity.

Based on this, the total sample covered was 552 beneficiaries. Picture 4 shows the district wise breakup of the sample size between the Betul (237 beneficiaries), Chhindwara (185 beneficiaries) and Sidhi (130 beneficiaries) districts. The sample size is relatively higher in Betul as there was a larger pool of direct beneficiaries present in Betul to proportionately select the sample from.

Picture 4 – District wise sample size in map of Madhya Pradesh

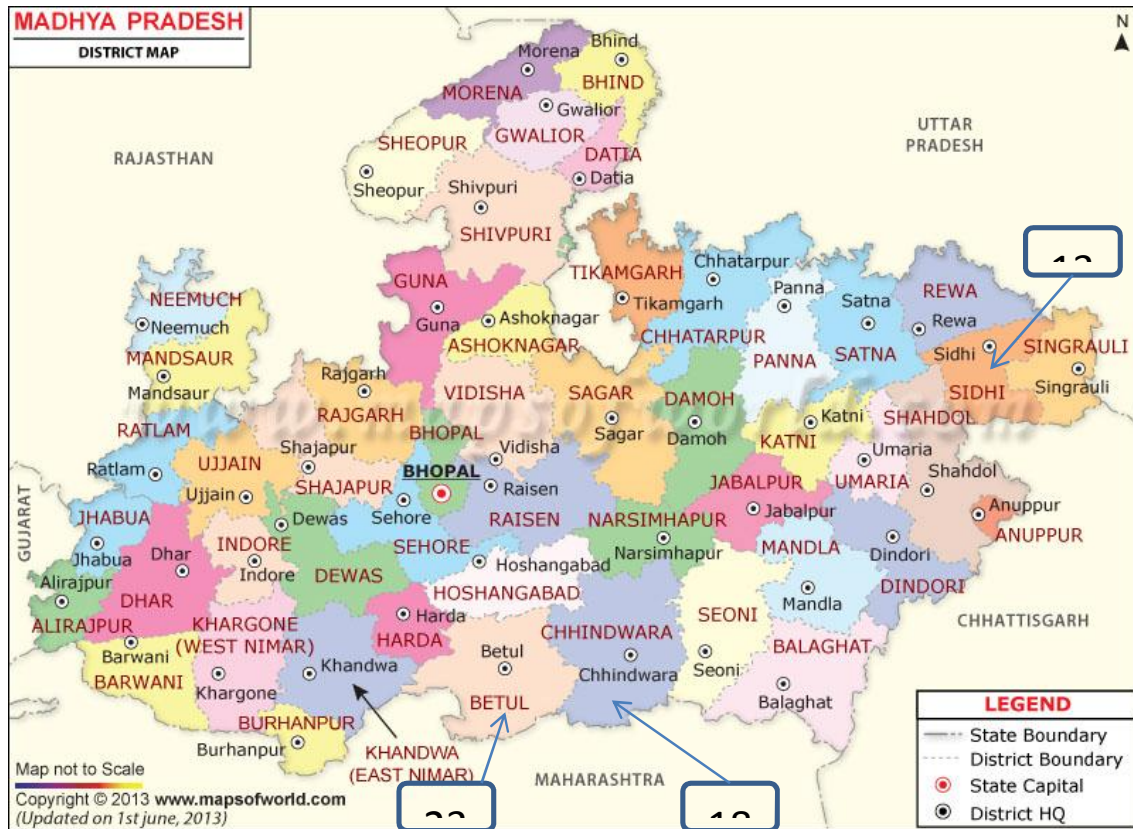


Figure 2 shows the breakup of the sample covered based on district as well as being direct/indirect. It can be seen that section of indirect beneficiaries covered in Chhindwara is high, primarily because of the different kind of watershed interventions carried out there.

Figure 2 – Sample size – Type of beneficiary wise

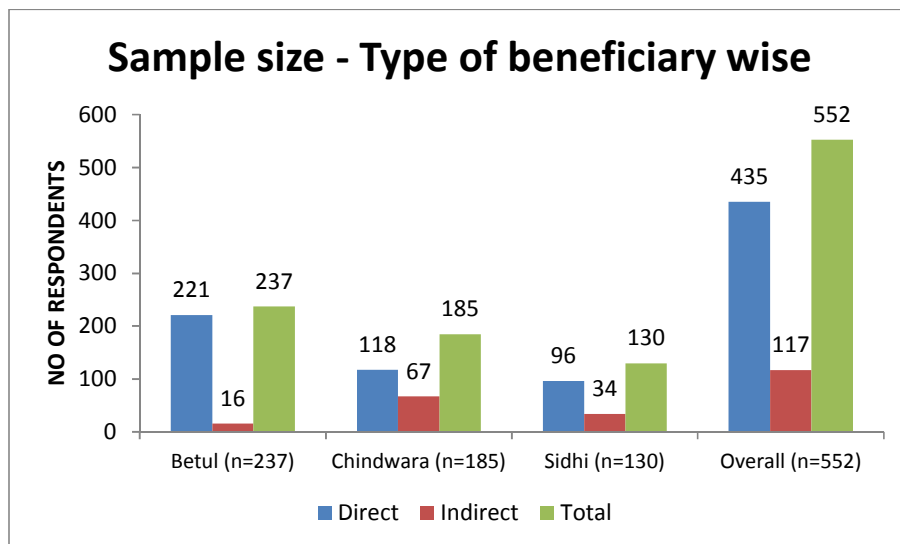
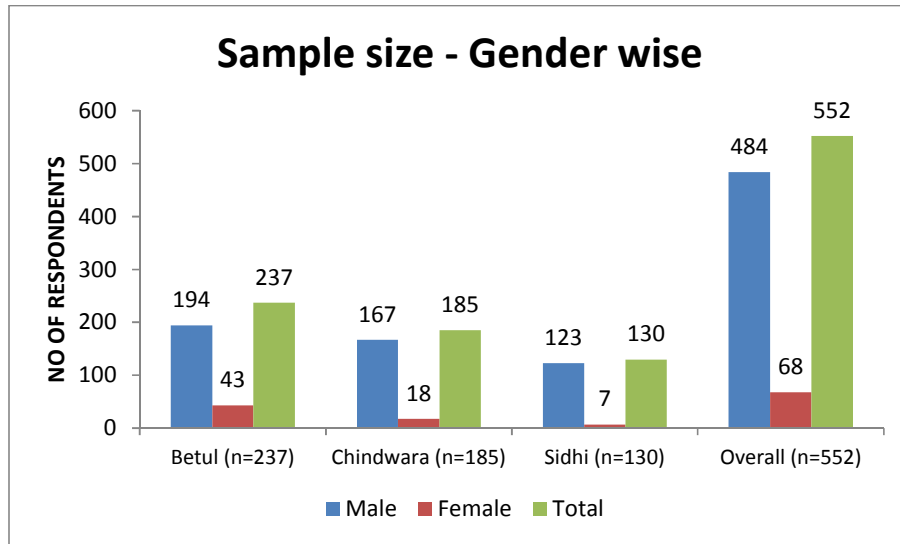


Figure 3 shows the breakup of the sample covered based on the gender of the respondents. It can be seen that the section of female respondents covered is the highest in Betul on account of the

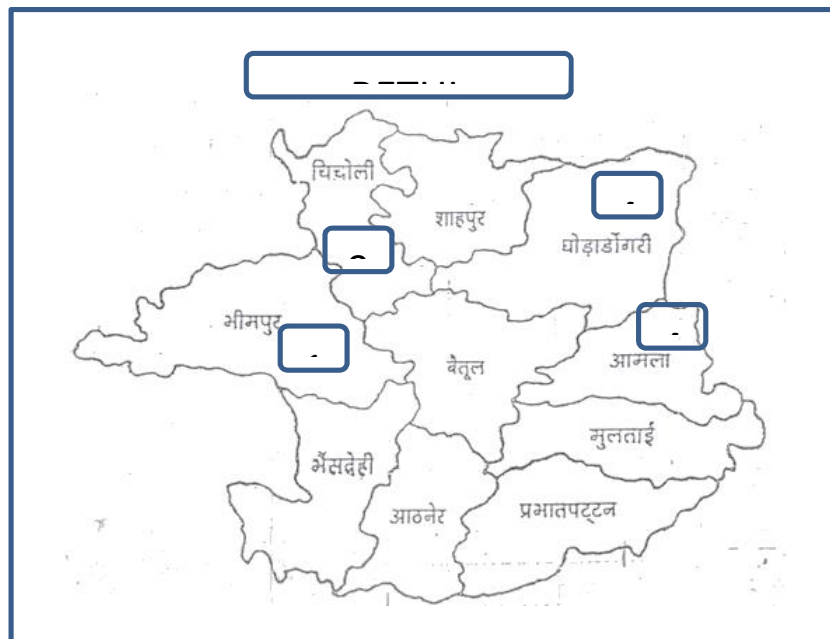
successful running of the silk thread production activity there which employs only women. On the other hand, the section of female respondents is the lowest in Sidhi on account of the limited success of the agarbatti activity there which employs women.

Figure 3 – Sample size – Gender wise



Within Betul district (Picture 5), the sample size of 237 beneficiaries was distributed between Amla (43) Ghodadongri (43), Chicholi (99) and Bimpur (12) blocks. All the forest divisions where the intervention took place (North Betul, West Betul and South Betul) were covered. The ranges covered included Sarni, Bhaura, Tavdi, Savligarh, Gawasen and Amla.

Picture 5 – Block wise sample breakup - Betul



Within Chhindwara district (Picture 6), the sample size of 185 beneficiaries was distributed between Tamiya (86) Harrai (23) and Sausar (76) blocks. All the forest divisions where the intervention took

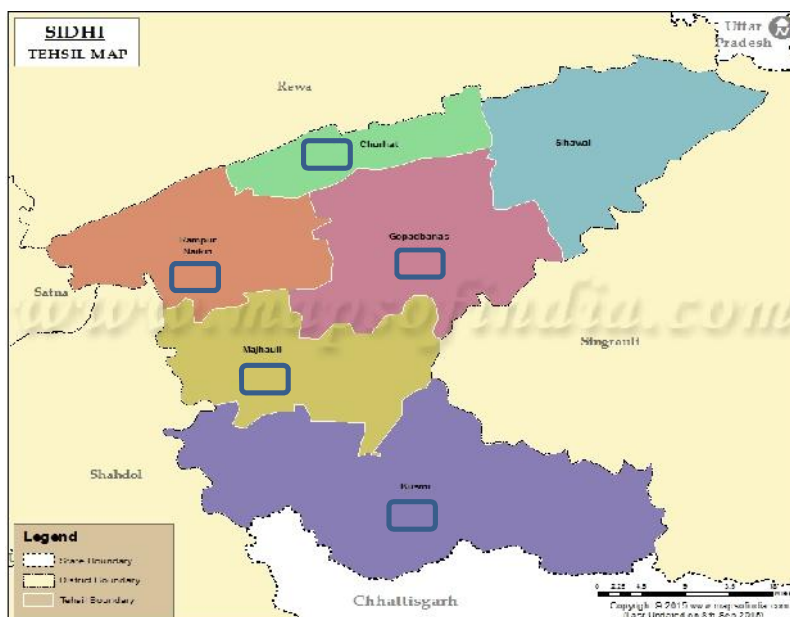
place (East Chhindwara, West Chhindwara and South Chhindwara) were covered. The ranges covered included Tamiya, Jhirpa, Pashchim Batkakhapa and Ambada.

Picture 6 – Block wise sample breakup - Chhindwara



Within Sidhi district (Picture 7), the sample size of 130 beneficiaries was distributed between Churhat (15) Gopadbanas (20), Rampur Naikin (20), Majhauri (35) and Kusumi (40) blocks. The only forest division where the intervention took place (Sidhi) was covered. The ranges covered included Churhat, Sidhi, Madwaas and Mohan.

Picture 7 – Block wise sample breakup - Sidhi



Bamboo clump density analysis

The analysis of change in bamboo clump density was done by comparing the latest findings from counting the clumps with that at the baseline. Within each district, three forest compartments which were part of the baseline study were selected. The next step was to compute the density of the bamboo clumps per unit area. This was done by picking three samples of 10 X 10 metres in each forest compartment.

Within each sample of 100 sq.m., 6-8 bhirras were picked. Within each bhirra, counting was done for the bamboo clumps at different stages of growth: Karlla (new bamboo clump), Mahila (2nd year bamboo clump which is formed from Karla), Pakiya (3rd stage bamboo clump which gets formed on 4th year from Mahila), Thoth and Dry.

Based on this data, the average number of bamboo clumps per bhirra at each stage of growth was computed. This was then compared with the corresponding figures at baseline to derive the change which had occurred. The comparison was carried out only for the first three stages of growth: Karlla, Mahila and Pakiya.

Qualitative study with beneficiary groups

For conducting the qualitative study with beneficiary groups, two teams of senior professionals from CMS attempted to visit one village in each range of the Betul, Chhindwara and Sidhi districts. In some cases, the interactions were held with groups of beneficiaries from multiple villages at a common point. The following are the details of the villages or sites visited for conducting the qualitative study:

S No	Name of village / site	Name of range	Name of district	Type of interaction
1	Borpani	Ambada	Chhindwara	PRA exercise, Site visit, Focused group discussion, Case study, Stakeholder interview (local NGO Vrutti - on orange cultivation)
2	Agarbatti making unit, Tamiya	Tamiya	Chhindwara	Focused group discussion, Case study
3	Bamboo furniture making unit, Kunwabadla	Tamiya	Chhindwara	Site visit, Focused group discussion, Case study
4	Dundhishikhar	Tamiya	Chhindwara	PRA exercise, Site visit, Focused group discussion, Case study
5	Bodalkachar	Jhirpa	Chhindwara	Site visit, Focused group discussion, Case study, Stakeholder interview (PRI representative)
6	Dukarjhela	Ambada	Chhindwara	Site visit, Focused group discussion
7	Parasda	Bhaura	Betul	Site visit, Focused group discussion, Case study, Stakeholder interview - PGVS, GVS (NGOs)

8	Tawadhana	Sarni	Betul	Focused group discussion, Case study
9	Silk thread production unit, Gawasen	Gawasen	Betul	Focused group discussion, Case study
10	Bamboo furniture making unit	Amla	Betul	Focused group discussion, Case study
11	Baghaun	Sidhi	Sidhi	Site visit, Focused group discussion
12	Padkhuri	Churhat	Sidhi	Site visit, Focused group discussion
13	Kusumi	Mohan	Sidhi	PRA exercise, Focused group discussion, Stakeholder interview
14	Piparaha	Mohan	Sidhi	Site visit, Case study, Stakeholder interview

Desk research

A Normalized Difference Vegetation Index (NDVI) analysis of intervention sites was carried out as part of the desk research in the study. The NDVI is a numerical indicator that uses the visible and near-infrared bands of the electromagnetic spectrum, and is adopted to analyze remote sensing measurements and assess whether the target being observed contains live green vegetation or not. NDVI provides a crude estimate of vegetation health and a means of monitoring changes in vegetation over time. ¹

The NDVI analysis covered six intervention sites. The comparison was done over a two year period between 2011 and 2013. Some limitations of this analysis include slight difference in the times at which the corresponding images were taken in 2011 and 2013 and the fact that the exact boundary of the intervention area was not available.

¹ http://www.fsnau.org/downloads/Understanding_the_Normalized_Vegetation_Index_NDVI.pdf
<http://www47.homepage.villanova.edu/guillaume.turcotte/studentprojects/arboretum/NDVI.htm>

13 Detailed findings from the study

13.1 Change linked to programme activities

Bamboo rehabilitation

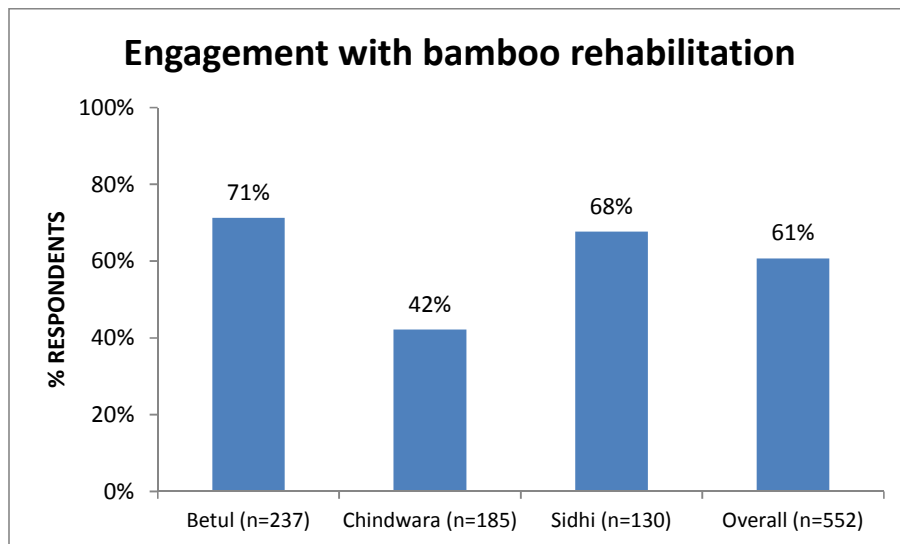
A key intervention of the programme was to engage the community in protection of forests. This also included improving the health of existing bamboo clumps and planting new ones which came under the bamboo rehabilitation intervention. This intervention was carried out intensively for four years with each beneficiary being assigned 5 hectares of land to protect each year for four years, thus ensuring 20 hectares of conservation per beneficiary. As an incentive, the beneficiary was paid Rs 2,500 per month initially which was later increased to Rs 3,500 per month. Additionally, the stated goal with respect to bamboo rehabilitation was also the regular sale of bamboo, the income from which would go to the beneficiary (80%) and the JFMC (20%).

In the qualitative study, the assessment team found that the monthly income from forest conservation has been very beneficial to the beneficiary. This is especially true in areas like Sidhi where a large section of the beneficiaries was landless. If added up, the total income from conservation a beneficiary received over 4 years was Rs 1,44,000 which is a substantial amount. Having a regular monthly income for four years helped the families of beneficiaries overcome their vulnerabilities with respect to irregular income flow. This acted as a very strong financial incentive for the beneficiaries to invest time wholeheartedly in forest conservation.

With respect to the income from sale of bamboo, the assessment team found that the scenario was very different across the three districts. The best case was Chhindwara where one round of selling of bamboo had happened and the beneficiaries had been paid the money from the sale, some as high as Rs 17,200. In Sidhi, one round of sale of bamboo had happened last year but the proceeds from sale had yet to be given to the beneficiaries. There was a lot of resentment regarding this in beneficiaries of Sidhi and there was also a risk of their discontinuing protection of forests in some cases due to this. In the case of Betul, the sale of bamboo was yet to happen and there was a high level of anticipation in the beneficiaries regarding this. Thus, it can be concluded that there has been a much higher impact of income from forest protection than from income from the sale of bamboo, in terms of acting as an incentive to protect forests.

In the quantitative study, the respondents were asked if they had directly engaged in bamboo rehabilitation as part of the programme. It is seen that overall, 61% of the respondents had engaged in bamboo rehabilitation. This figure is slightly on the lower side owing to the fact that the study also covered indirect beneficiaries. If only the direct beneficiaries of the programme are considered, it is seen that 75% of the respondents had engaged in bamboo rehabilitation.

Figure 4 - Engagement with bamboo rehabilitation



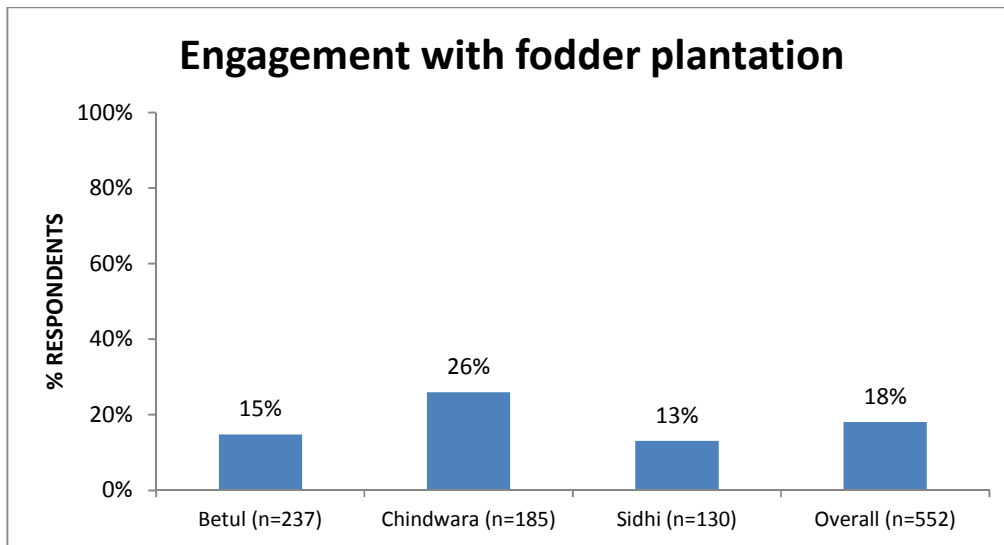
Picture 8 – Restoration of bamboo



Fodder plantation

With respect to fodder plantation (Figure 5), respondents were probed on their engagement in fodder plantation as a programme activity as well as the impact of fodder plantation on them. It is seen that overall, 18% of the respondents reported being engaged in fodder plantation. The engagement in fodder plantation is the highest in Chhindwara (26% of respondents) and lowest in Sidhi (13% of respondents). If only the direct beneficiaries of the programme are considered, it is seen that 21% of the respondents had engaged in fodder plantation. An example of a fodder plantation is shown in Picture 9.

Figure 5 - Engagement with fodder plantation

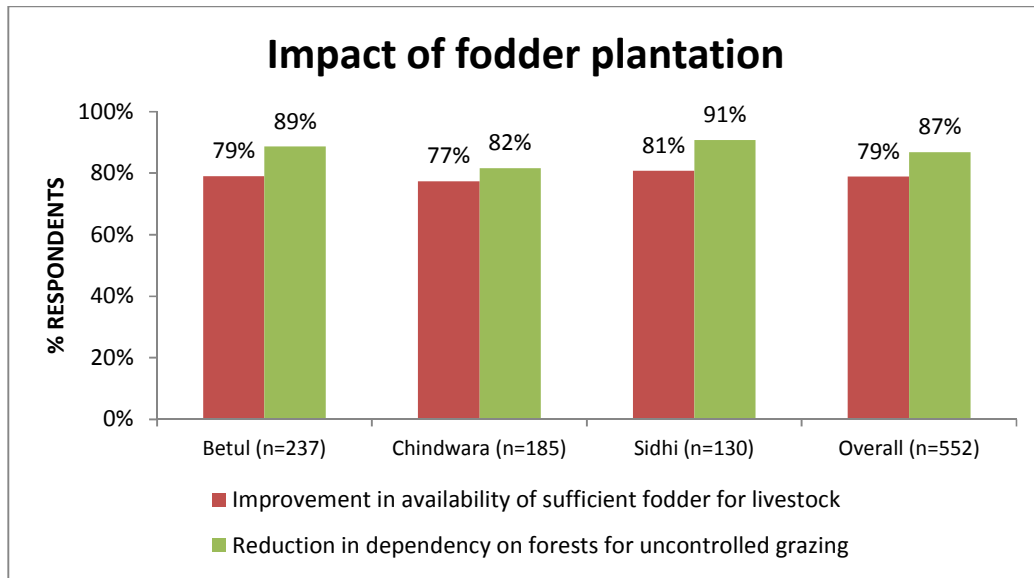


In terms of impact of fodder plantation (Figure 6), it is seen that overall, 79% of the respondents reported an increase in availability of sufficient fodder for livestock during the programme period. If only the direct beneficiaries of the programme are considered, it is seen that 81% of the respondents reported an increase in availability of sufficient fodder for livestock during the programme period.

Additionally, in terms of impact, 87% of the overall respondents reported a reduction in dependency on forests for uncontrolled grazing for their livestock during the programme period. If only the direct beneficiaries of the programme are considered, it is seen that 89% of the respondents reported a reduction in dependency on forests for uncontrolled grazing for their livestock during the programme period.

These findings were also corroborated through the interactions with the beneficiary groups wherein engagement with a small number of beneficiaries in fodder cultivation on common land was leading to increase in availability of sufficient fodder for the livestock of the entire village. Since the plantation was happening on common land, the number of beneficiaries required for the upkeep of the fodder plantation was not high. But the common land under fodder cultivation being large in quantity was able to provide sufficient fodder for the entire village as well as neighbouring villages in some cases. This was also directly contributing to the effective protection of the forests under the programme.

Figure 6 – Impact of fodder plantation



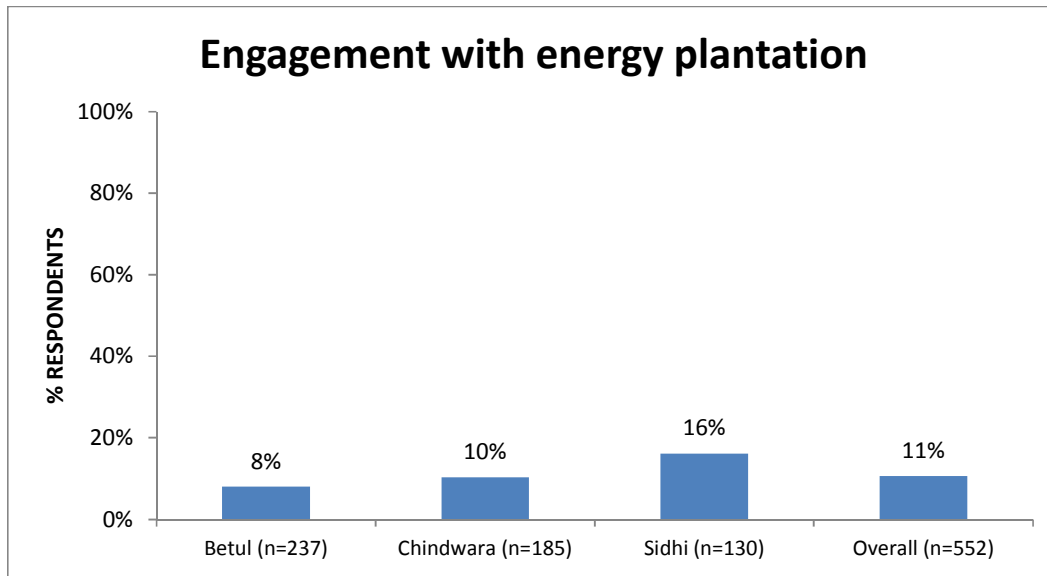
Picture 9 –New fodder plantation



Energy plantation

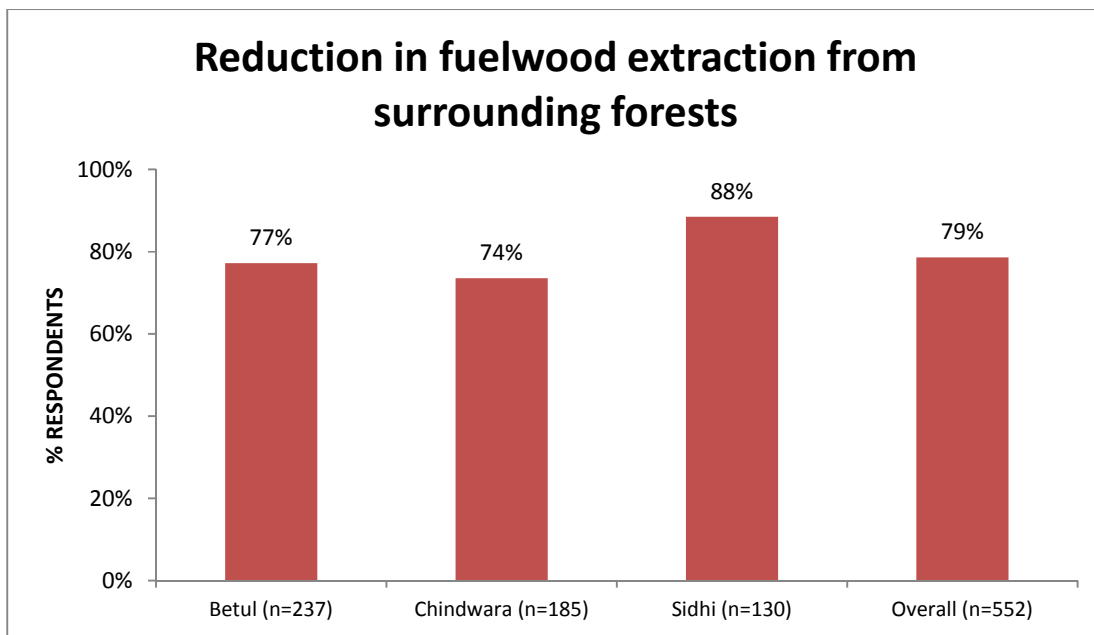
With respect to energy plantation, respondents were probed on their engagement in energy plantation as a programme activity as well as the impact in terms of firewood availability. It is seen that overall, 11% of the respondents reported being engaged in energy plantation. (Figure 7) The engagement in energy plantation is the highest in Sidhi (16% of respondents) and lowest in Betul (8% of respondents). If only the direct beneficiaries of the programme are considered, it is seen that 13% of the respondents had engaged in energy plantation.

Figure 7 – Engagement with energy plantation



It is also seen that 79% of the respondents reported a decrease in fuelwood extraction from surrounding forests during the programme period which was attributed to the programme interventions. (Figure 8) If only the direct beneficiaries of the programme are considered, it is seen that 80% of the respondents reported a decrease in fuelwood extraction from surrounding forests during the programme period which was attributed to the programme interventions. Based on the qualitative study, it was inferred that the energy plantation in many cases was still in its growth stage and hence, the decrease in fuelwood extraction has been almost entirely on account of the protection of the forests.

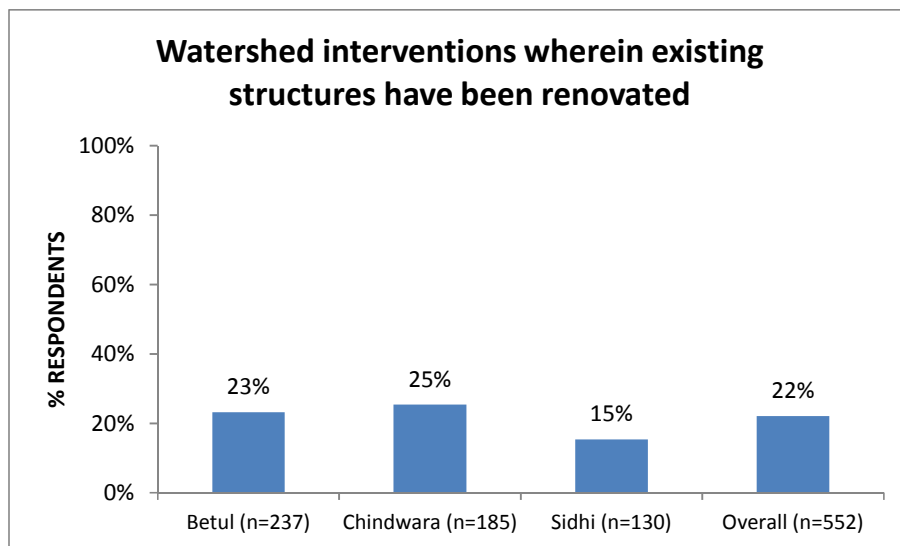
Figure 8 – Reduction in fuelwood extraction from surrounding forests



Renovating existing watersheds

A key activity in the programme was the renovation of watershed structures which were already present. It is seen in the study that overall, 22% of the respondents reported having been associated with watershed interventions wherein existing structures were renovated. If only the direct beneficiaries of the programme are considered, it is seen that 25% of the respondents reported having been associated with watershed interventions wherein existing structures were renovated. An example wherein existing watershed structures have been renovated would be from Borapani village of Ambada range of Chhindwara district wherein the renovation of an existing stop dam resulted in improved moisture content in the soil.

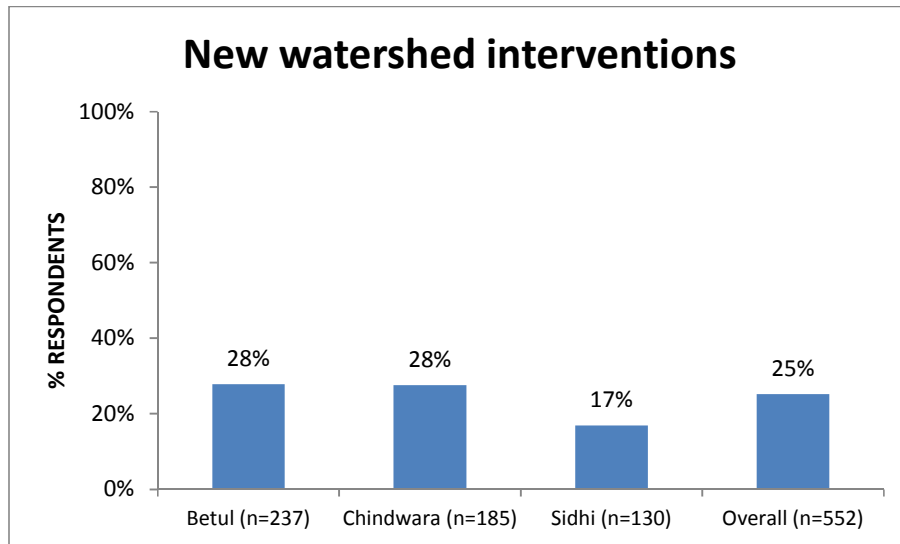
Figure 9 – Watershed interventions wherein existing structures have been renovated



New watershed interventions

With respect to any new watershed interventions, it is seen that overall, 25% of the respondents reported having been associated with any new watershed interventions. If only the direct beneficiaries of the programme are considered, it is seen that 28% of the respondents reported having been associated with any new watershed interventions. The new interventions included mostly loose boulder check structures constructed in streams running through the forest area. These loose boulder check structures serve the purpose of preventing soil erosion within the stream as well as increasing the level of water and moisture retention downstream. The new watershed interventions also included stone bunding at the base of bamboo clumps to prevent soil erosion at the base of the clumps. (Picture 10)

Figure 10 - New watershed interventions



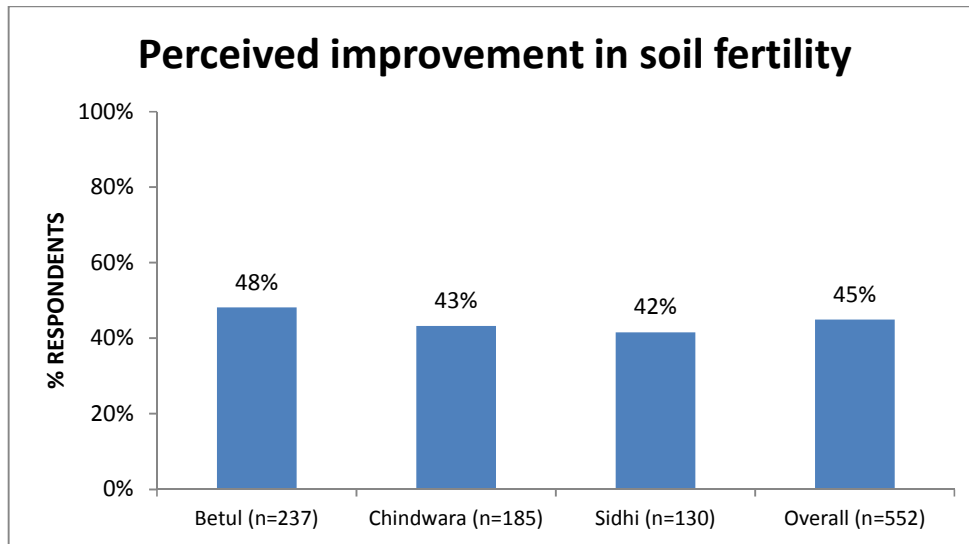
Picture 10 – Stone bunding at the base of bamboo clumps



Improvement in soil fertility

The respondents were asked if in their perception, soil fertility had improved during the programme period as a result of the interventions. It is seen that overall, 45% of the respondents perceived an improvement in soil fertility during the programme period. If only the direct beneficiaries of the programme are considered, it is seen that 47% of the respondents perceived an improvement in soil fertility during the programme period. The improvement in soil fertility was attributed to structures like loose boulder check dams which prevented soil erosion as well as protection of forests which allowed the soil to regenerate and allowed biomass to develop.

Figure 11 – Perceived improvement in soil fertility

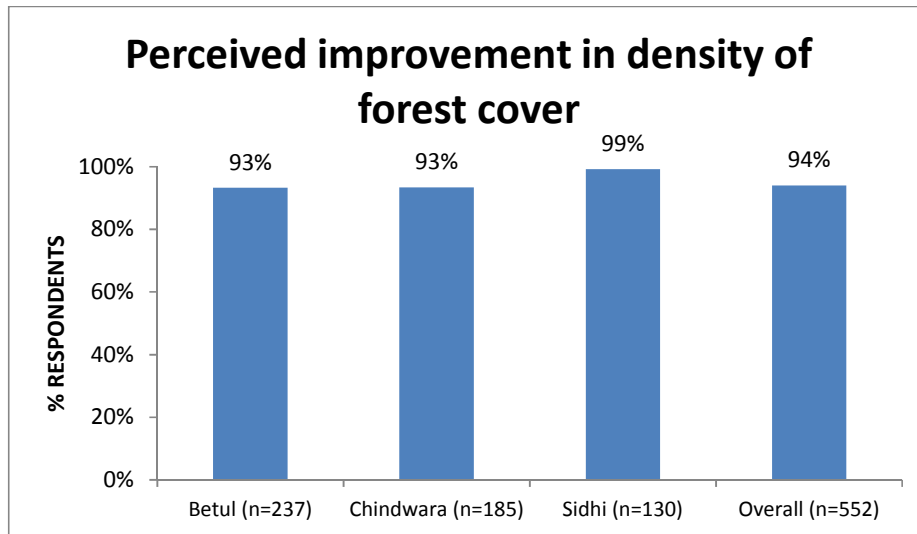


Improvement in Flora

During the in-depth interviews, the respondents were asked if in their perception, the forest cover density had improved during the programme period. This was asked specifically for the protected area of 20 hectares per beneficiary under the programme. It is seen that overall, 94% of the respondents perceived that there has been an improvement in density of forest cover during the programme period. This perception is shared by the highest section of beneficiaries in Sidhi where 99% of the respondents perceived an improvement in forest cover. If only the direct beneficiaries of the programme are considered, it is seen that 96% of the respondents perceived that there has been an improvement in density of forest cover during the programme period.

This is corroborated by the qualitative study wherein it was observed that the level of deforestation in Sidhi has been much higher than that of Betul and Chhindwara. Hence, any positive change in the forest cover was more easily perceptible in Sidhi. The improvement in the density of forest cover was facilitated by the protection of forests by beneficiaries as well as plantation of new trees.

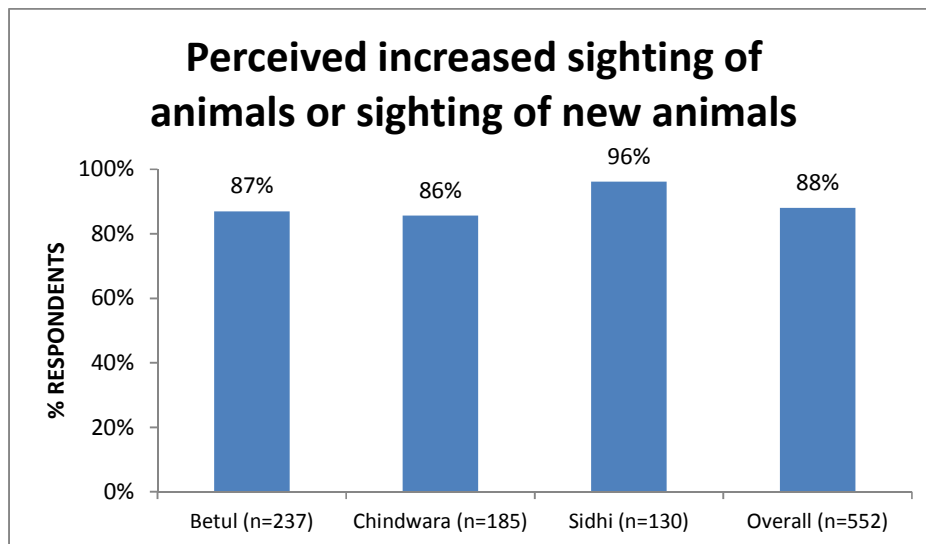
Figure 12 - Perceived improvement in density of forest cover



Perceived increase in sighting of animals or sighting of new animals

To gauge the improvement in fauna, the in-depth interviews with respondents probed whether there have been sightings of more animals or new kinds of animals during the programme period. This was again checked for the protected area of 20 hectares per beneficiary under the programme wherein improved forest cover density and reduced human activity could lead to a greater presence of animals. It is seen that overall, 88% of the respondents perceived that there have been increased sightings of animals or sightings of new animals during the programme period. Like in the case of perception about increased forest cover density earlier, the section of respondents in Sidhi (96%) which reported increased sightings of animals or sightings of new animals is the highest. If only the direct beneficiaries of the programme are considered, it is seen that 90% of the respondents perceived that there have been increased sightings of animals or sightings of new animals during the programme period.

Figure 13 - Perceived increased sighting of animals or sighting of new animals



13.2 Change in key social indicators

Change in behaviour of beneficiaries and community

As part of the qualitative study, it was assessed if there has been a change in behaviour with respect to forest protection in the beneficiaries as well as in the larger community. This was integral to the goal of forest protection in the programme. What was inferred was that the change in behaviour was clearly linked to the financial incentive. For four years, a regular monthly income from conservation for the beneficiaries was a very strong incentive for them to make frequent trips to the forest and protect them. It substituted for any loss being incurred by them in not possibly giving sufficient time to their other livelihood sources.

Over a period of time, the beneficiaries also began seeing the results of their conservation activities and this led to a strong belief in the benefits of forest conservation, at the behavioural level. Once the monthly income was stopped in the beginning of 2015, in many cases, the protection activities continued but the rigour of protection decreased over time. This was due to the fact that the financial incentive left was only the income from sale of bamboo but that has not happened uniformly across all the districts. In light of this, even though the belief of the beneficiaries in the protection of forests was strong, the capacity to rigorously protect the forests from unsustainable use was reduced. Thus, it can be inferred that there was a strongly positive behavioural change in the beneficiaries with respect to forest conservation which was facilitated by the financial incentive linked to it. A case study to support this has been shared in Case study 1.

When the larger community is taken into account, it was inferred through interactions that they largely followed the norms of forest conservation for the forest land protected under the programme by the beneficiaries. After the protection period of four years ended (with a linked financial incentive of monthly income from conservation for beneficiaries), the behaviour of the community towards these protected areas has most probably not changed as they still believe the protection is taking place with the same rigour. A case study to support this has been shared in Case study 2.

Case study 1 - Ownership of forest resources by beneficiaries in Baghaun, Ghumma and Charhai villages, Sidhi range, Sidhi



The conservation and rejuvenation of forests in the Baghaun, Ghumma and Charhai villages of Sidhi range in Sidhi district was unique in terms of the sense of ownership of the beneficiaries with respect to forest conservation. A total of 28 beneficiaries from the three villages were involved in conserving 20 hectares of land each for four years. They were paid a monthly amount of Rs 2,500 earlier which was incremented to Rs 3,500 per month later on. Their efforts led to the successful restoration of highly degraded forest land.

When the assessment team enquired if they would continue the conservation efforts beyond the programme period without any more income from conservation, they said that they will not stop conserving the forests. The key reason cited was that they had developed a deep attachment with the forests, one on the lines of “Mother nature” and hence they will not stop protecting it. They also said that all their prior efforts will go in vain if they stop protecting the forests. Hence, they still visit their respective areas of conservation and protect the area.

Case study 2 - Change in behaviour of community towards forests in Parasda village, Bhaura range, Betul



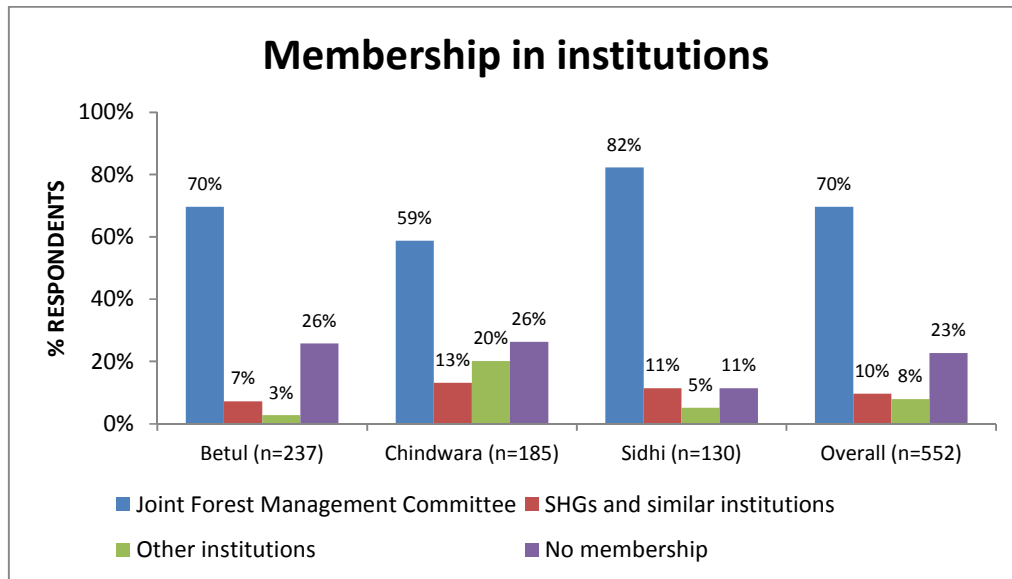
The conservation and rejuvenation of forests in the Parasda village of Bhaura range in Betul district was a good case study in creation of awareness in the larger community with respect to forest conservation. A total of 40 beneficiaries from the village were involved in conserving 20 hectares of land each for four years. They were paid a monthly amount of Rs 2,500 earlier which was incremented to Rs 3,500 per month later on. Their efforts led to the successful restoration of highly degraded forest land.

The assessment team enquired with the beneficiaries if post the programme completion, the conservation of forests would continue. The beneficiaries replied that now that there is no monthly income from conservation, they are visiting their respective patches of forest land less frequently. But this has not led to any reduction in the conservation of forests. The main reason was that the larger community, especially people from villages neighbouring the forests, have become habituated to the conservation of these particular forests. This kind of change in behaviour, especially in non-beneficiaries, bodes well for the future of conservation of forests in the area.

Membership in institutions

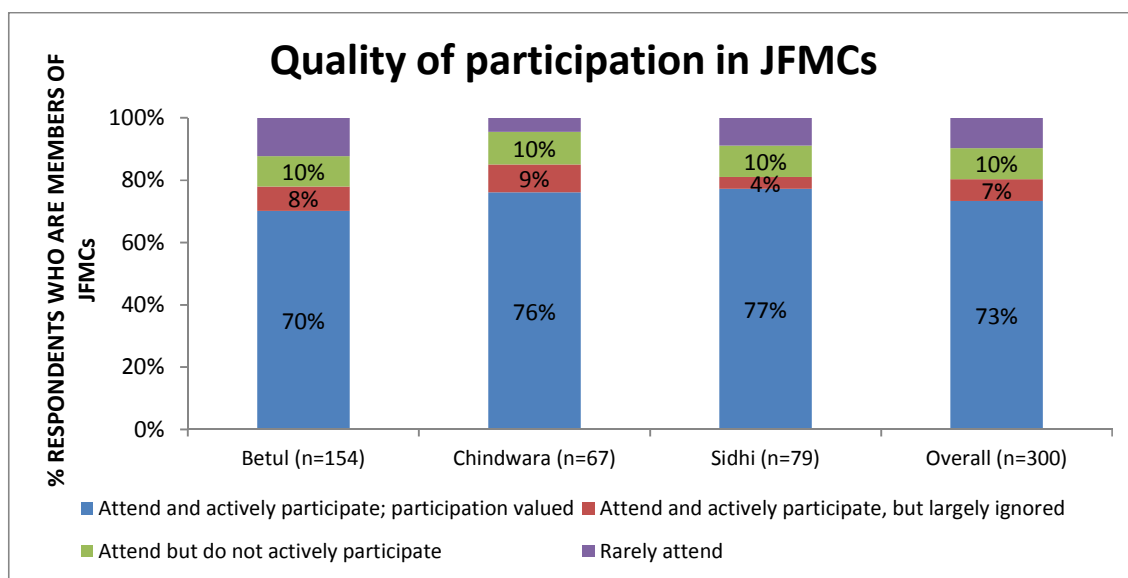
In terms of membership in institutions, it is seen that overall, 70% of the respondents had family members as part of Joint Forest Management Committees (JFMCs). 23% of the respondents overall had family members who were not part of any institution. This was also driven by the fact that a section of respondents interviewed were indirect beneficiaries.

Figure 14 - Membership in institutions



The quality of participation in JFMCs was found to be quite high with 73% of the overall respondents who have membership, attending and actively participating which is valued. This is important from the programme point of view as the JFMC was the key forum for ensuring effective community management of forest resources.

Figure 15 – Quality of participation in JFMCs



13.3 Stories of transformation

Kunwabadla village, Tamiya range, Chhindwara

In the forest area around Kunwabadla village in Tamiya range of Chhindwara, 20 hectares of land was assigned to each beneficiary among 30 beneficiaries in total. The beneficiaries ensured the protection of these patches of forest land by keeping a watch in groups. Plantation of bamboo and fodder was carried out in this area. Also, restoration of existing bamboo clumps was carried out by turning the soil at the roots and cleaning the clumps. The assessment team carried out a visit to the sites of change with the beneficiaries. Picture 11 shows a snapshot of the bamboo and fodder plants in the protected forest area.

Picture 11 - Bamboo and fodder plantation in Kunwabadla village, Tamiya range, Chhindwara



During the site visit, the beneficiaries reported that there have also been no instances of forest fire in the protected area since 2010. This has been an added benefit of the forest protection as part of the programme. The beneficiaries also mentioned that there has also been a very positive attitude change in the members of the JFMC due to the programme.

The beneficiaries also believe that better economic status for the beneficiaries can translate into more time available for ensuring rigorous forest protection. In the last year, the harvesting of bamboo had yielded Rs 28,000 for 30 beneficiaries. The fodder harvested from the plantation has been useful in ensuring fodder security for the livestock. Picture 12 gives a snapshot of harvested fodder from the plantation area.

Picture 12 – Harvested fodder in Kunwabadla village, Tamiya range, Chhindwara



During the site visit, the beneficiaries pointed out growth of new plants which supposedly happened due to the rigorous protection efforts of the beneficiaries. (Picture 13) The prevention of forest fires has also facilitated this process. The beneficiaries also reported greater sightings of animals like herds of deer during the programme attributable to the programme interventions.

Picture 13 – Growth of new plants due to protection in Kunwabadla village, Tamiya range, Chhindwara



Dundishikhar village, Tamiya range, Chhindwara

In the forest area around Dundishikhar village in Tamiya range of Chhindwara, 20 hectares of land was assigned to each beneficiary. The beneficiaries ensured the protection of these patches of forest land by keeping a watch in groups. A PRA exercise was carried out with the beneficiaries (seven female and five male respondents) to ascertain the quantum of change which had occurred during the programme. (Picture 14)

Picture 14 - PRA exercise to determine change in Dundishikhar village, Tamiya range, Chhindwara



The below table shows the results of the PRA exercise conducted with the respondents of Dundishikhar wherein using a set of stones, the female and male respondents were asked to state the change which has occurred over the programme on a scale of 0-10 for key change indicators. It can be seen that both sets of respondents reported substantial amounts of positive change in indicators like water and fodder availability. But there was hardly any change reported in the biodiversity related change indicators like density of forest cover and sightings of animals. The beneficiaries reported that animals and birds like deer and peacocks are sighted now to a greater extent. One contributing factor for the forest cover density not changing could be the fact that forest fires have not been controlled to a great extent, as reported by the beneficiaries.

Area of change (From 2010 to 2015)	Change reported by female respondents (On a scale of 0-10)	Change reported by male respondents (On a scale of 0-10)
Availability of water	2 to 8	2 to 8
Density of forest cover	4 to 6	5 to 5
Greater sightings of animals or sightings of new animals	5 to 5	4.5 to 5.5
Fodder availability	1 to 9	1 to 9

Borpani village, Ambada range, Chhindwara

In the Borpani village of Ambada range in Chhindwara, a PRA based discussion took place wherein a group of beneficiaries were asked to draw a resource map of the village and its surrounding areas. This map was to depict the current status of natural resources like water sources, forests, soil and any other related programmatic interventions. The map was then used to facilitate a discussion on what kind of change has occurred related to biodiversity change during the programme. The PRA resource map is shown in Picture 15.

Picture 15 –Resource map showing status of resources and programme interventions in Borpani village, Ambada range, Chhindwara



Based on PRA map discussion, the following points emerged on biodiversity related change during the programme. Due to the watershed interventions like renovation of stop dam, there has been an increase in moisture content which is evident based on observation of hardness of land. Additionally, staggered trenches were created on degraded land which has checked further soil erosion. Bamboo plantation has taken place in 50 hectares out of the total 220 hectares of conservation. In the remaining protected land, protection of existing forests has taken place. Picture 16 shows a snapshot of the revived bamboo forest area. Picture 17 shows the conserved bamboo clumps with turning over of soil and cleaning of the shoots which has also been harvested.

The beneficiaries grew fodder for some time in the protected area and used it. Now, *Tulsi* grass is growing in its place which is not useful. Hence, the beneficiaries now use fodder grass from their own farm land. In another watershed intervention, 6 loose boulder check dams were constructed on streams of water in the forest area which has checked soil erosion and increased the moisture content of soil. Overall, low rainfall in the recent years has led to lower overall water levels.

Picture 16 – Revived bamboo forest in Borpani village, Ambada range, Chhindwara



In 5 hectares of land, plantation of Amla and Orange had also taken place. Overall, according to the beneficiaries, there has been increased tree density in the protected forest area during the programme. There has also been a visible rise in the forest undergrowth. The banning of hunting in the area and protection of forests has increased the fauna density with more sightings of different kinds of animals now.

Picture 17 - Conserved bamboo clumps with turning over of soil and harvested in Borapani village, Ambada range, Chhindwara



Dukarsela village, Ambada range, Chhindwara

In the forest area around Dukarsela village in Ambada range of Chhindwara, 20 hectares of land was assigned to each beneficiary among 30 beneficiaries in total. The beneficiaries ensured the protection of these patches of forest land by keeping a watch in groups. In the forest area, extensive conservation and restoration of existing bamboo clumps has taken place. The restoration of bamboo clumps was carried out by turning the soil at the roots and cleaning the shoots. Also, stone bunding was done at the base of the bamboo clumps to prevent soil erosion due to water runoff on steep slopes. The assessment team carried out a visit to the sites of change with the beneficiaries. Picture 18 gives a snapshot of the stone bunding carried out at the base of bamboo clumps in the forest area which has resulted in ensuring better health of the bamboo clumps.

Picture 18 – Stone bunding at the base of bamboo clumps in Dukarsela village, Ambada range, Chhindwara



Another intervention carried out in the area was in the field of watershed. A series of loose boulder check dams have been constructed on the water streams in the forest. These have resulted in decreased soil erosion as the soil runoff is accumulated at each loose boulder check dam which are in a series and are at a short distance from each other. Picture 19 shows a snapshot of a loose boulder check dam in the forest area.

Overall, the beneficiaries feel that due to the intense protection efforts of the beneficiaries, there has been a vast improvement in the forest cover density as the levels of uncontrolled grazing and firewood collection has come down heavily. There has also been an improvement with respect to fauna wherein there have been increased sightings of animals in comparison to before.

Picture 19 – Loose boulder check dam in Dukarsela village, Ambada range, Chhindwara



Parasda village, Bhaura range, Betul

In the Parasda village of Bhaura range in Betul, each beneficiary was given 20 hectares of land to look after during the project period with 5 hectare of conservation per year. The total conservation area for 40 beneficiaries for 4 years was 800 hectares. The members of the Van Suraksha Samiti used to meet regularly and planned various activities such as capacity building and exposure to similar kinds of projects and institutions, rehabilitation of degraded bamboo forests, plantation of new bamboo, energy plantation, fodder development, watershed management, agriculture and animal husbandry, introduction of solar cookers and income generating activities such as poultry. The committee members would have regular interaction with the forest department, project staff and other stakeholders. This helped in improving their overall confidence.

Of the 968.45 hectares of total land, 445.88 hectares had dense bamboo forest in the village. The bamboo were of good quality, the trees were straight and they were ready to be harvested. The forest department has plans to harvest the bamboo; 80% of the benefits will go to the beneficiaries and 20% will go to the Van Suraksha Samiti for undertaking development work in the future. All 40 beneficiaries were involved in rehabilitation of degraded bamboo forests with 67,245 bamboo clumps over five years. Energy plantation was done in 15 hectares of land by growing 7,125 plants of bamboo, alona, sissoo, neem, karanj, Khamer, mahua, teak and subabul. The survival rate is about 80% even at present. The cutting of trees for fuel wood slowed down and only the wood pruned from trees and wood fallen on the ground was collected.

The fodder availability increased due to plantation of 6,000 fodder trees including cenchrus grass. From 2011 to 2013, the beneficiaries collected 135 quintals of fodder from 30 hectares of land. This helped in reduction of the practice of free grazing. At the same time, 350 kilos of Cenchrus grass was

sown for extending the grass lands. Massive watershed related work was carried out in the village – 11,206 cubic meters of land was treated with boulder check dams, CPT, contour trench, and stop dam.

Picture 20 gives a snapshot of loose boulder check dams constructed in series in a water stream in the forest area. Somewhere between 2,000 and 3,000 loose boulder check dams have been constructed in the entire protected area. This has resulted in prevention of soil erosion and increase in moisture and water retention downstream. This watershed intervention has also helped increase the levels of water in the village wells.

Picture 20 – Loose boulder check dams in series in Parasda village, Bhaura range, Betul



Picture 21 gives a snapshot of the energy plantation in the forest area. The energy plantation will be used in the future to supply firewood to the beneficiaries.

Picture 21 – Energy plantation in Parasda village, Bhaura range, Betul



The fodder planted in the forest area was of the Deenanath variety. Most people in the village just used the fodder for their livestock but some also sold the surplus fodder in the nearby villages. The fodder plantation has sustained benefits since the seeds from one crop automatically ensure the next crop after the current crop is harvested. The evidence of fodder seeds in abundance was spotted during the site visit. Picture 22 gives a snapshot of the fodder plantation.

Picture 22 - Fodder plantation (Deenanath) in Parasda village, Bhaura range, Betul



Another watershed intervention has been to dig staggered trenches in the highly degraded forest land so that the soil erosion occurring could be prevented and the degraded land could be renovated. Picture 23 shows the snapshot of the staggered trenches dug and the positive impact it has had in the surrounding area in terms of improved grass cover.

Picture 23 - Staggered trenches in Parasda village, Bhaura range, Betul



A very unique watershed intervention from the point of view of increasing fauna has been the construction of a well in the forest area and a water holding structure next to it. The water from the well is pumped regularly to the water holding structure, especially in the non-rainy season, to provide drinking water to wild animals. Picture 24 gives a snapshot of the well and water storage structure built in the forest area.

Picture 24 - Well and water storage structure built for animals in Parasda village, Bhaura range, Betul



During the programme period, the forest protection team was so regular in its work that even after the programme period ended, there has been no instance of tree felling by outsiders. The villagers from surrounding villages still have the impression that the forest is being protected rigorously.

With respect to the future, while the Van Suraksha Samiti still exists, the enthusiasm to protect the forest has reduced drastically. In the absence of regular income, the villagers have to hunt for labour work and by the time they return, they are tired and cannot go in a group to the forest. About 15 to 20 families have already gone for sugarcane cutting and the women too have to go to the nearby villages for weeding and harvesting. The assets created during the project period, especially the bamboo, when harvested, shall go a long way helping the beneficiaries with some income on an ongoing basis; similarly, the fodder and fuel-wood shall reduce the drudgery and work-load on women, but the beneficiaries sounded a bit worried during the discussion. Even though, in the last one year, there has not been any incidence of tree cutting but now that the committee is not very active, it will be difficult for just one guard to keep vigil on the forest.

Baghaun village, Sidhi range, Sidhi

In the Baghaun village of Sidhi range in Sidhi, a forest area patch measuring 11 sq. km. was conserved during the programme. The context of this area of Sidhi is unique in the entire programme in that the area was already heavily deforested. During the site visit, the beneficiaries revealed that 40 to 50 years

back, the forests were much more dense; then a lot of deforestation took place. But now, with protection of forests taking place under the programme, the situation has improved a lot.

Bamboo conservation has taken place with 28 beneficiaries with 20 hectares of forest land assigned to each beneficiary. A total of 560 hectares of forest land has been conserved under three villages namely, Baghaun, Dhumma and Charhai. To improve the health of the existing bamboo clumps, cleaning of the shoots, turning of the soil at the roots and construction of stone bunding at the base of the clumps has taken place. Picture 25 gives a snapshot of the forest patch conserved in the area. Picture 26 gives a snapshot of the stone bunding at the base of the bamboo clumps which helps prevent soil erosion. The effects of conservation can easily be noticed if this patch is compared to the adjoining area which is still heavily deforested.

Picture 25 - Protected bamboo forest patch in degraded land (11 Km X 1 Km) in Baghaun village, Sidhi range, Sidhi



In terms of watershed interventions, 420 loose boulder check dams have been constructed (15 per beneficiaries for 28 beneficiaries) on the water streams in the forest area. Additionally, approximately 300 staggered trenches have been constructed to prevent soil erosion and improve grass cover. Also, stone bunding has been carried out to prevent soil erosion due to rain water runoff. Watershed interventions like loose boulder check dams have led to a check on soil erosion, though not an increase in water levels; that has happened due to the canal system of the Bandhsagar reservoir on the Son river. Picture 27 gives a snapshot of a loose boulder check dam which helps prevent soil erosion.

Picture 26 –Stone bunding to prevent soil erosion at base of bamboo clump in Baghaun village, Sidhi range, Sidhi



Picture 27 – Loose boulder check dam in Baghaun village, Sidhi range, Sidhi



In addition to conservation of the existing forest area, new plantations have also been carried out. There has been plantation of trees of amla, harra, bahela and other medicinal plants. About 100-150 amla trees were planted in each plot but they have not yet fruited. There has also been some bamboo rehabilitation carried out. The first lot of bamboo was sold in June 2015 and an income of approximately Rs 40,000 has been earned. This income is yet to reach the beneficiaries. There has also been fodder plantation carried out in 5 hectares of land of the Deenanath variety of grass.

The criteria for selection of the beneficiaries included the house of the beneficiary being close to the forest to ensure better care. The beneficiaries of all three villages sit together and discuss on how to improve the conservation efforts.

When the beneficiaries were asked regarding the future of conservation of this patch of forest area, they said that they will not stop protecting the forest now as they are attached to it. This is despite the fact that they will not be receiving the monthly income from conservation any more nor have they received any income from the sale of bamboo harvested. They still visit the forest area and take care of it. In their opinion, their entire efforts would go in vain if they stop protecting the forest area.

In terms of improvement in fauna, the beneficiaries reported more sightings of animals like the Nilgai and Peacock. They attribute this change to the forest conservation efforts carried out under the programme. The beneficiaries also believe that more forest area should come under protection in the future. They strongly feel that if the forest cover improves, the amount of rainfall occurring will also improve.

Parkhudi village, Churhat range, Sidhi

In the Parkhudi village, interactions with the beneficiaries were carried out and a site visit was undertaken to the forest area covered under the programme. It was seen that 32 beneficiaries were involved from the three villages of Maldeva, Parkhudi and Ghatokhar. With 20 hectares of protection assigned to each beneficiary, a total of 640 hectares of forest area was conserved. Picture 28 gives a snapshot of the protected forest area.

Picture 28 - Protected bamboo forest patch in Parkhudi village, Churhat range, Sidhi



In addition to protection of the forest area, the health of the bamboo clumps was improved by turning over soil at the roots, constructing stone bunds at the roots to prevent erosion and cleaning the

bamboo shoots. The cutting of bamboo started from last year onwards. Last year, approximately Rs 26,000 income was earned by the Forest Department from selling the bamboo. This amount is yet to reach the beneficiaries. Picture 29 gives a snapshot of a renovated bamboo clump in the protected forest area.

Picture 29 - Renovated bamboo clump in Parkhudi village, Churhat range, Sidhi



In terms of new plantation, amla trees have been planted in 5 hectares of degraded forest land. Picture 30 gives a snapshot of the amla plantation in the forest area.

Picture 30 – Amla plantation in Parkhudi village, Churhat range, Sidhi



Fodder plantation was also carried out in the forest area wherein varieties like *Styromata* were planted in 5 hectares of land in 2012. From this plantation, the 32 beneficiaries take fodder for their livestock. Based on availability, a few other beneficiaries also take the fodder for their livestock. In terms of watershed work, interventions like contour trenches and loose boulder check dams have been carried out which have resulted in reducing soil erosion.

Overall, the beneficiaries feel that the forest cover in the protected area has improved during the programme due to the protection efforts. Regarding fauna, the beneficiaries reported sightings of more animals compared to before. They attributed this to the conservation efforts which have taken place under the programme. With respect to the future, the beneficiaries do not want to take the protection efforts forward to the same extent without the income from conservation they were getting earlier. The beneficiaries not having received any income yet from selling bamboo is also a contributing factor towards this attitude.

Piparaha village, Mohan range, Sidhi

In the Mohan range of Sidhi, conservation of forest area has taken place at two places, near the block headquarters of Kusumi and near the Piparaha village. Due to this, there has been an improvement in the density of forest cover in the region. The beneficiaries reported that the improvement has been to a greater extent in the Piparaha village area compared to the Kusumi area as the community around the area has been more supportive of the protection efforts. Picture 31 gives a snapshot of the conserved forest area near Piparaha village.

Picture 31 - Bamboo conservation patch in Piparaha village, Mohan range, Sidhi



Under the conservation programme, apart from the protection of the forest area from felling of trees, improvement in the health of bamboo clumps has also taken place. This involved cleaning of the

bamboo shoots and turning over of soil at the roots of the bamboo clumps. Picture 32 provides a snapshot of bamboo health improvement in the forest area near Piparaha village.

Picture 32 - Bamboo health improvement in Piparaha village, Mohan range, Sidhi



Due to the conservation efforts, especially in the Piparaha village forest area, there are more new small plants visible in forests. The beneficiaries attributed this to the regular visits of the groups of beneficiaries, even after the monthly income for protecting forests was stopped. Picture 33 gives a snapshot of the new trees coming up due to the conservation efforts in the forest area near Piparaha village.

Picture 33 – New trees coming up due to conservation efforts in Piparaha village, Mohan range, Sidhi



During the site visit, evidence of increased undergrowth was pointed out by the beneficiaries. Picture 34 provides a snapshot of the increased undergrowth spotted in the forest area near the Piparaha village which the beneficiaries attributed to the programme interventions.

Picture 34 – Evidence of increased undergrowth in Piparaha village, Mohan range, Sidhi



The bamboo from the protected area was harvested last year and sold but the profit made has not yet been received by the beneficiaries. This could be a problem since the beneficiaries of Piparaha mentioned that one of the incentives to continue protecting the forests was that the income from selling bamboo would eventually come.

One key social outcome of the bamboo conservation efforts has been the discouraging of the general populace from cutting trees in the protected area. Some amount of stealing of bamboo has happened in the forest area near Kusumi but not in the forest area near Piparaha. Though the fear of getting caught is a deterrent, the social profile of the community in the Kusumi area contributes to the higher levels of stealing in the forest area near Kusumi. Specifically, the beneficiary groups mentioned that the caste composition of Kusumi area is different as it is also a market centre. In their view, there are elements in the population in Kusumi who steal firewood from the protected area despite the informal social norms around protection of the forest area.

Other interventions in the area included energy plantation, the benefits of which are yet to be realized in terms of increased firewood availability. Under the fodder plantation intervention, new fodder varieties (*Stylomata*) were planted. Due to this and also due to the conservation of forests, the availability of fodder has increased.

The watershed interventions carried out include loose boulder check dams which have helped reduce soil erosion. In 2013, when the rainfall was good, the water level in the well near the forest increased which was attributed to the programme interventions. A greater amount of water is getting retained in the streams due to the loose boulder check dams. The beneficiaries also reported greater sightings of animals like Peacocks and Tigers which they attributed to the forest conservation efforts carried

out under the programme. Overall, they said that more than the income received due to the programme, they had learnt something new and useful.

13.4 Analysis of change in bamboo clump density

Tables 2 and 3 give details on the analysis performed on the change in the density of bamboo clumps in the areas of bamboo plantation and renovation, for the districts of Chhindwara and Sidhi. The density of bamboo has been checked at the stages of Karlla (new bamboo clump), Mahila (2nd year bamboo clump) and Pakiya (4th year from Mahila).

In Chhindwara, as per the field calculations in Table 2, the number of Karla (1st stage) and Mahila (2nd stage) have increased and these (Karla) are the new born bamboo clumps which suggests that the bamboo clumps are protected and are not been eaten or damaged by animals and human beings. The increase in number of pakiya (3rd stage) is majorly associated with the fact that there has been sustainable cutting for commercial purpose in the area and illegal cutting of the forests has been curbed. This was verified with the programme team and the community.

Table 2 -Change in bamboo clump density (Chhindwara)

Selected Comp No	No of bhirras	Karlla count			Mahila count			Pakiya count		
		Baseline	Endline	Change	Baseline	Endline	Change	Baseline	Endline	Change
1865	6,006	9,998	10,677	7%	5,880	30,030	411%	2,991	25,025	737%
1872	3,605	3,608	5,505	53%	2,326	17,845	667%	3,689	14,617	296%
1889	2,892	3,278	1,628	-50%	1,756	8,501	384%	3,322	26,587	700%

In Sidhi, as per the field calculations in Table 3, the number of Karla (1st stage) have decreased and these (Karla) are the new born bamboo clumps which suggests that the bamboo clumps are been eaten or damaged by animals and human beings. On the other hand, the number of Mahila (2nd stage) has increased which suggests that the protection was good for the last year. The increase in number of pakiya (3rd stage) is majorly associated with the fact that there has been sustainable cutting for commercial purposes in the area and the illegal cutting of bamboo clumps has been curbed. This was verified with the programme team and the community.

Table 3 – Change in bamboo clump density (Sidhi)

Selected Comp No	No of bhirras	Karlla count			Mahila count			Pakiya count		
		Baseline	Endline	Change	Baseline	Endline	Change	Baseline	Endline	Change
982	3,131	11,332	11,331	0%	15,314	42,641	178%	15,655	73,355	369%
983	6,745	26,042	11,884	-54%	32,244	38,222	19%	34,725	1,46,142	321%
984	4,999	17,222	9,284	-46%	22,562	54,989	144%	23,496	94,029	300%

The comparative analysis has not been performed for Betul district as the corresponding baseline data could not be obtained.

13.5 NDVI imagery analysis

Figures 16 to 21 present the NDVI analysis for six sites of intervention of the programme. The change has been mapped from 2011 to 2013. The areas marked in green show no change in vegetative cover. The areas marked in blue show an increase in vegetative cover whereas the areas marked in red show a decrease in vegetative cover.

From the figures, it can be inferred that in almost all the cases, there is a greater area where vegetative cover has reduced as against area where vegetative cover has increased. Also, in some cases, the areas marked blue include farmland where crops were sown. Hence, there is a marked trend towards reduced vegetative cover over the two year period in most of the sampled sites. This is in direct contrast to the perception of the local community near the intervention sites. As mentioned earlier, some limitations of this analysis include slight difference in the times at which the corresponding images were taken in 2011 and 2013 and the fact that the exact boundary of the intervention area was not available.

Figure 16 – NDVI analysis for Site 1

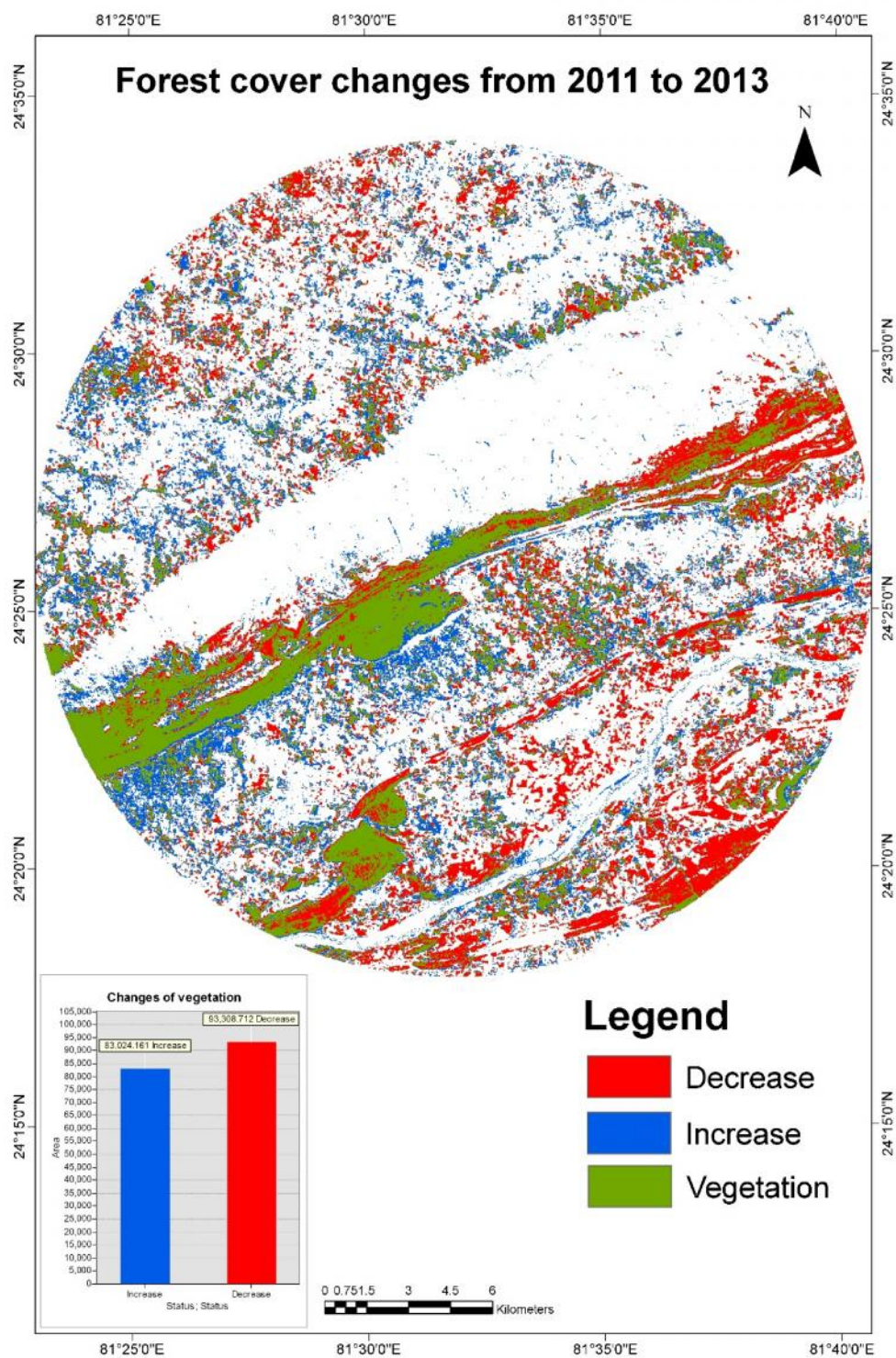


Figure 17 -NDVI analysis for Site 2

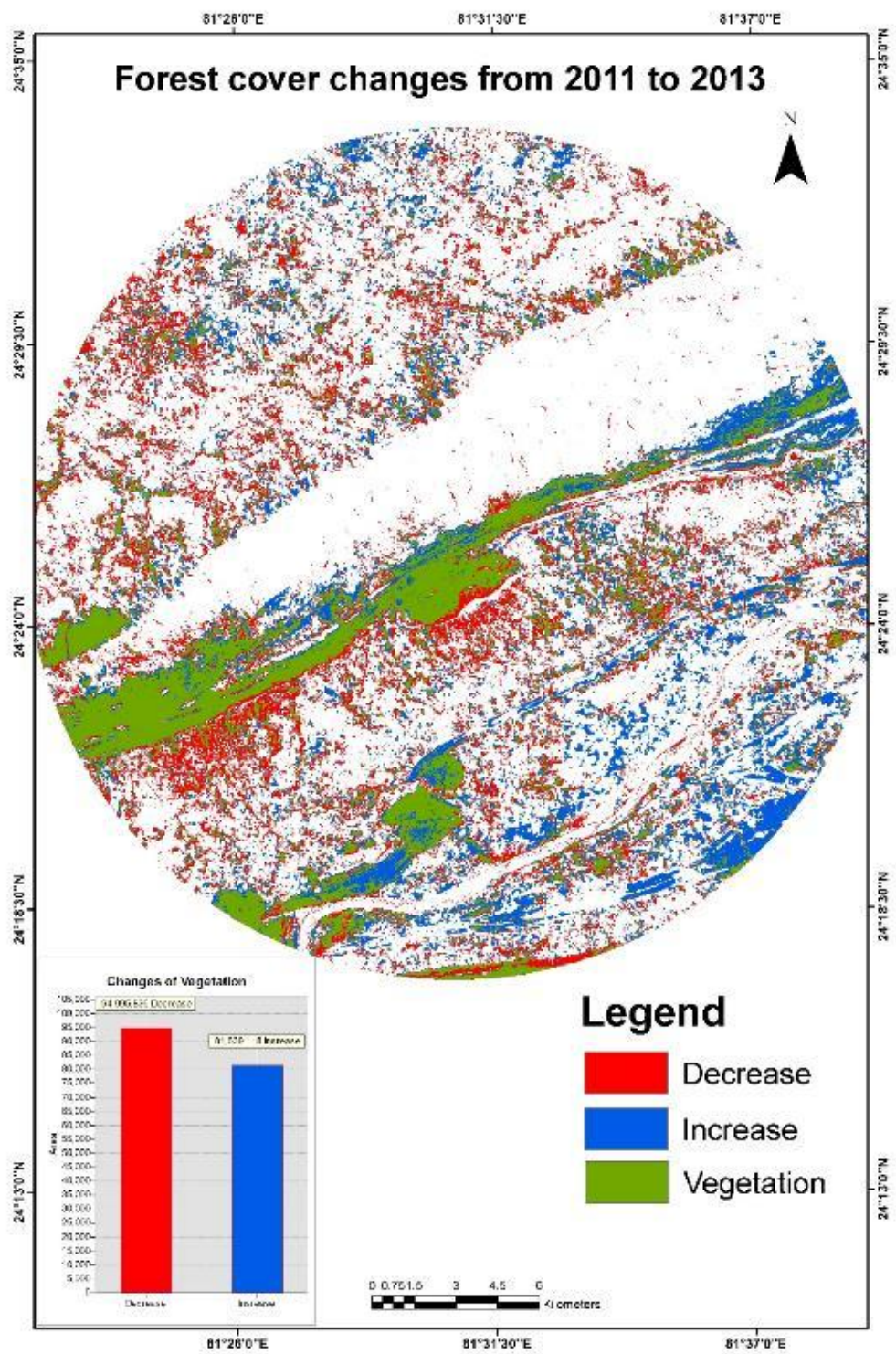


Figure 18 -NDVI analysis for Site 3

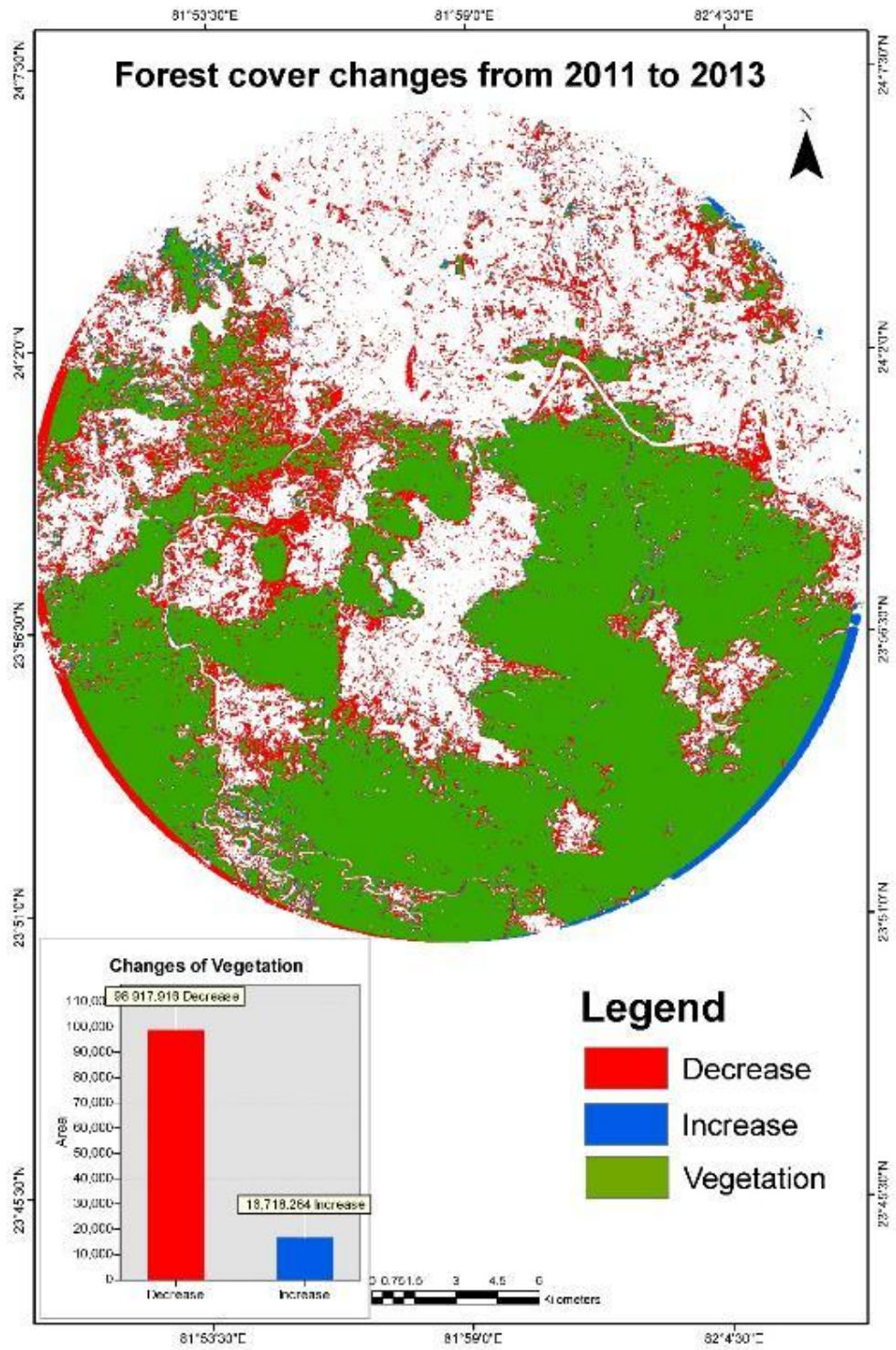


Figure 19 – NDVI analysis for Site 4

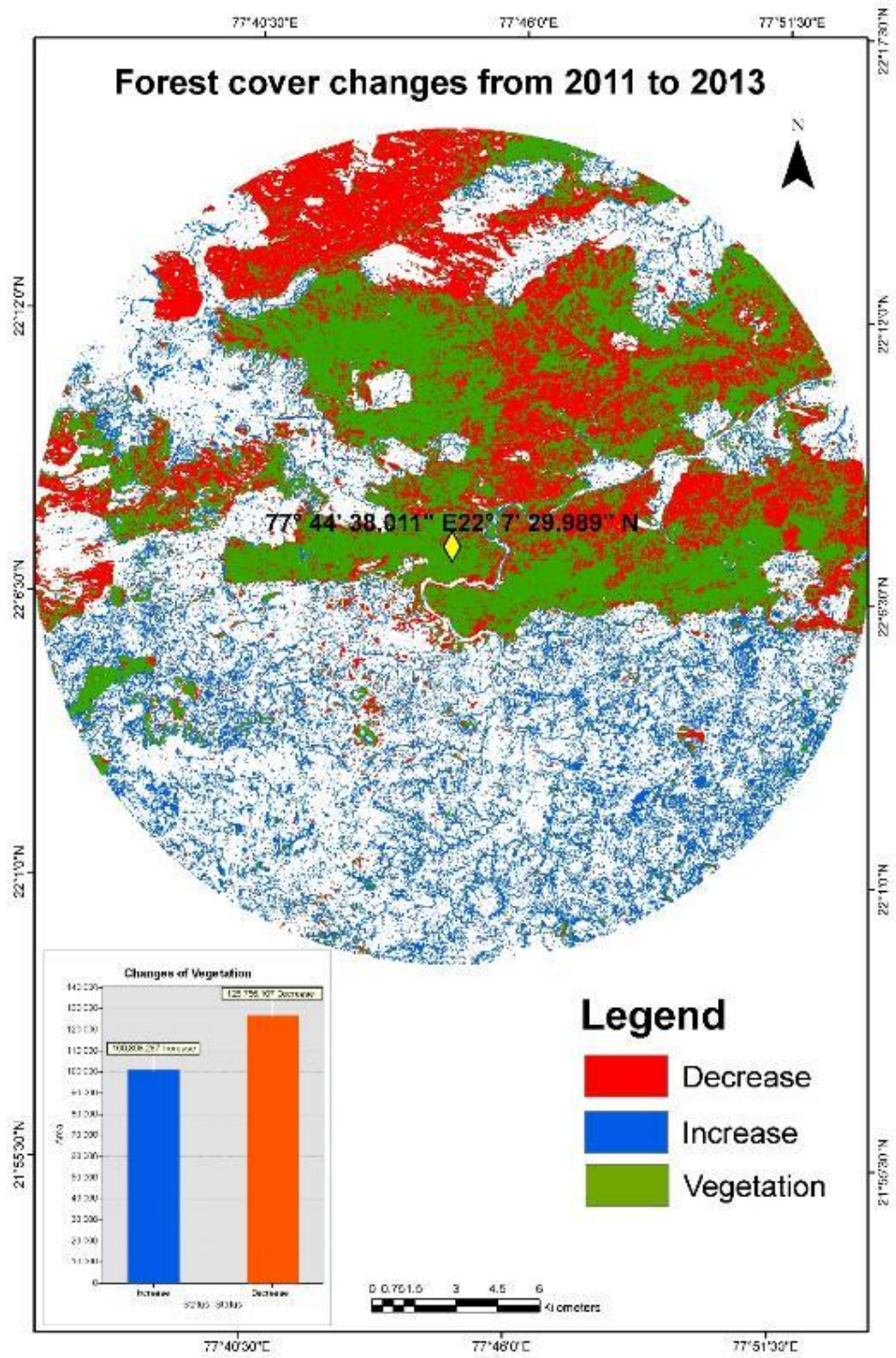


Figure 20 – NDVI analysis for Site 5

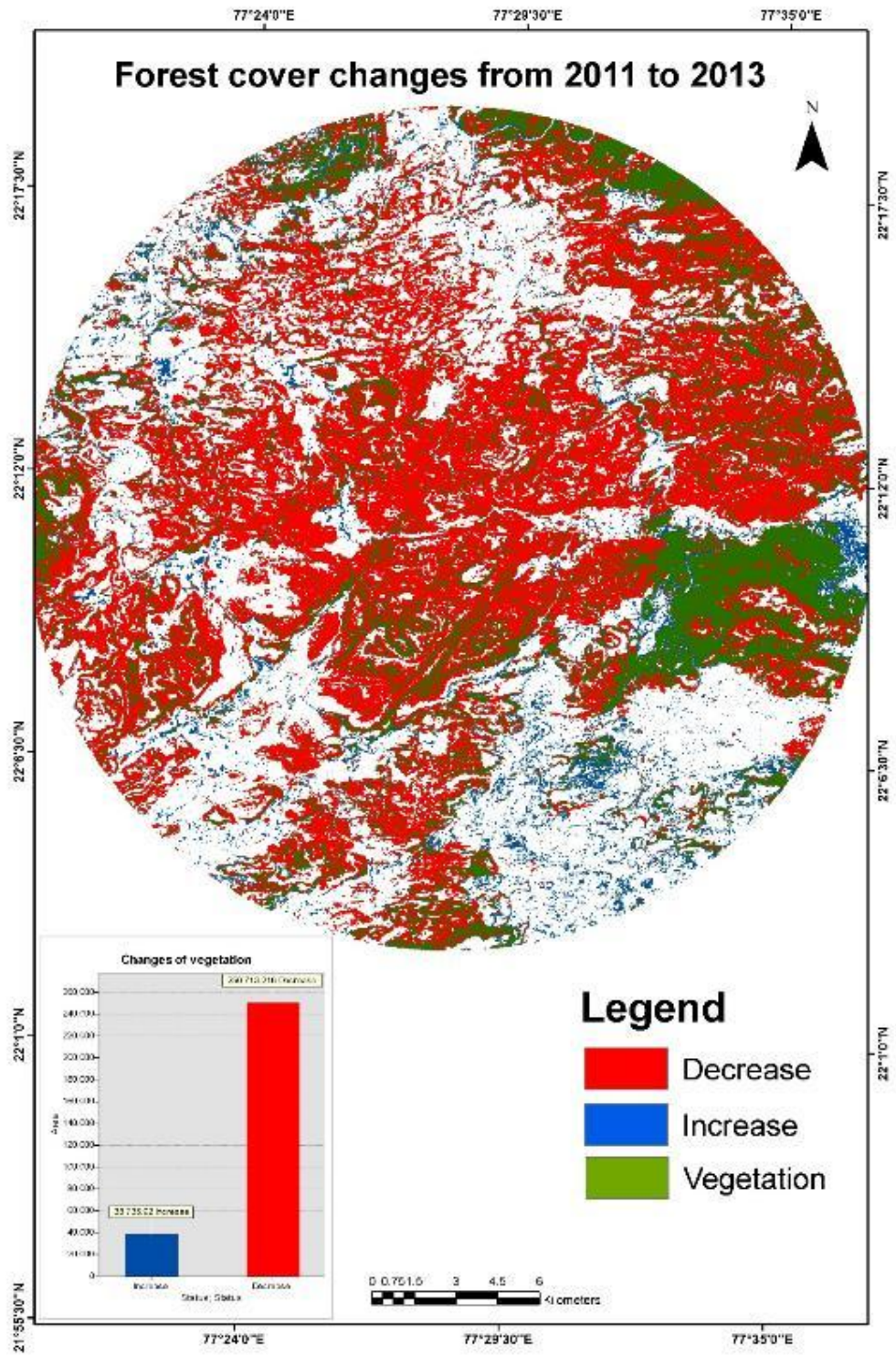
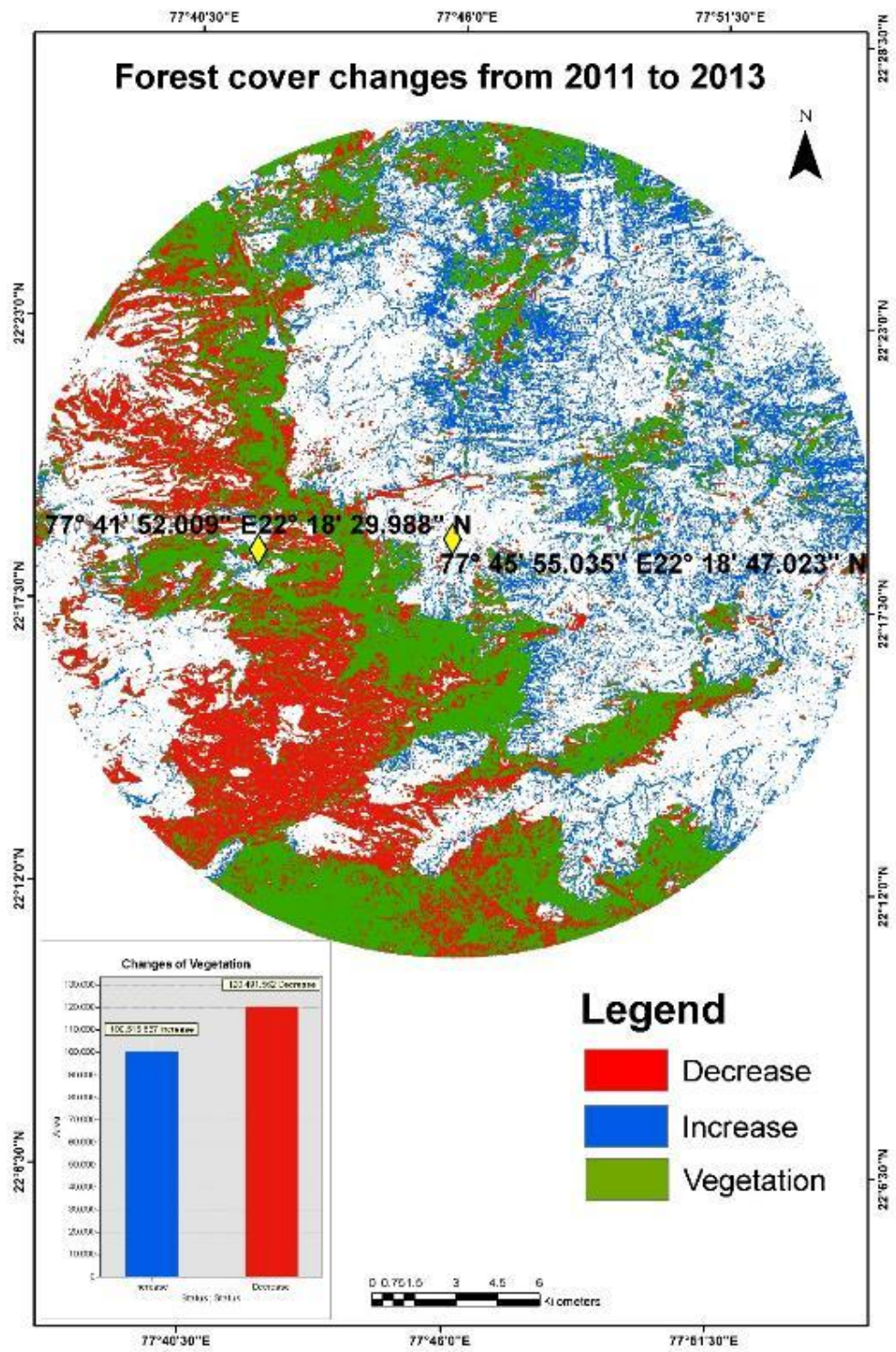


Figure 21 – NDVI analysis for Site 6



14 Conclusion and Recommendations

Change in protection of forests

The primary intervention of the programme was to engage the community in protection of forests which would allow it to regenerate effectively. This also included improving the health of existing bamboo clumps and planting new ones which came under the bamboo rehabilitation intervention. The key components of the intervention were:

1. This intervention was carried out intensively for four years with each beneficiary being assigned 5 hectares of land to protect each year for four years, thus ensuring 20 hectares of conservation per beneficiary.
2. As an incentive, the beneficiary was paid Rs 2,500 per month initially which was later increased to Rs 3,500 per month. If added up, the total income from conservation a beneficiary received over 4 years was Rs 1,44,000.
3. The stated goal with respect to bamboo rehabilitation was also the regular sale of bamboo through the Forest Department, the income from which would go to the beneficiary (80%) and the JFMC (20%).

In the qualitative study, the assessment team found that the monthly income from forest conservation has been very beneficial to the beneficiary. This is especially true in areas like Sidhi where a large section of the beneficiaries was landless. Having a regular monthly income for four years helped the families of beneficiaries overcome their vulnerabilities with respect to irregular income flow. This acted as a very strong financial incentive for the beneficiaries to invest time wholeheartedly in forest conservation.

With respect to the income from sale of bamboo, the assessment team found that the scenario was very different across the three districts. The different cases are elaborated below:

1. The best case was Chhindwara where one round of selling of bamboo had happened and the beneficiaries had been paid the money from the sale, some as high as Rs 17,200.
2. In Sidhi, one round of sale of bamboo had happened last year but the proceeds from sale had yet to be given to the beneficiaries. There was a lot of resentment regarding this in beneficiaries of Sidhi and there was also a risk of their discontinuing protection of forests in some cases due to this.
3. In the case of Betul, the sale of bamboo was yet to happen and there was a high level of anticipation in the beneficiaries regarding this.

Thus, it can be concluded that there has been a much higher impact of income from forest protection than from income from the sale of bamboo, in terms of acting as an incentive to protect forests as the income from conservation was much more regular and also assured.

In the quantitative study, it was found that 61% of the respondents had directly engaged in bamboo rehabilitation as part of the programme. This figure is slightly on the lower side owing to the fact that the study also covered indirect beneficiaries.

Change in availability of fodder and dependence on forests for grazing

Overall, 18% of the respondents had been engaged in fodder plantation as an activity. But the impact of this intervention was found to be widespread with 79% of the respondents reporting an increase in availability of sufficient fodder for livestock during the programme period and 87% of the respondents reported a reduction in dependency on forests for uncontrolled grazing for their livestock. These findings were also corroborated through the interactions with the beneficiary groups wherein engagement with a small number of beneficiaries in fodder cultivation on common land was leading to increase in availability of sufficient fodder for the livestock of the entire village.

Change in fuelwood extraction

Overall, 11% of the respondents had been engaged in energy plantation as an activity. It was also seen that 79% of the respondents reported a decrease in fuelwood extraction from surrounding forests during the programme period which was attributed to the programme interventions. Based on the qualitative study, it was inferred that the energy plantation in many cases was still in its growth stage and hence, the decrease in fuelwood extraction has been more on account of the protection of the forests.

Change in watershed interventions

Of the overall respondents, 22% reported being associated with renovation of existing watershed structures. An example of this was the deepening of a community pond in Borpani village of Chhindwara which has led to increased water levels in wells and improved moisture retention in soil.

With respect to any new watershed interventions, it is seen that overall, 25% of the respondents reported having been associated with any new watershed interventions. The new interventions included mostly loose boulder check structures constructed in streams running through the forest area. These loose boulder check structures serve the purpose of preventing soil erosion within the stream as well as increasing the level of water and moisture retention downstream. The new interventions also included novel initiatives like construction of a well and a water storage structure in the forest area to act as a drinking water source for wild animals.

As a result of the programmatic interventions, 45% of the overall respondents perceived an improvement in soil fertility during the programme due to the interventions carried out.

Improvement in Flora

Overall, 94% of the respondents reported during the in-depth interviews that in their perception, the forest cover density had improved during the programme period. This was asked specifically for the protected area of 20 hectares per beneficiary under the programme. This perception was shared by the highest section of beneficiaries in Sidhi where 99% of the respondents perceived an improvement in forest cover. During the qualitative study, it was observed that the level of deforestation in Sidhi had been much higher than that of Betul and Chhindwara and hence, any positive change in the forest cover was more easily perceptible.

Improvement in Fauna

Overall, 88% of the respondents reported during the in-depth interviews that in their perception, there have been sightings of more animals or new kinds of animals during the programme period. This was reported for the protected area of 20 hectares per beneficiary under the programme wherein improved forest cover density and reduced human activity had supposedly led to a greater presence of animals. The section of respondents in Sidhi (96%) which reported increased sightings of animals or sightings of new animals was the highest, flowing from the improvement in forest cover being perceived by a greater section of respondents over there.

Change in behavior in beneficiaries and the community

A key mandate of the programme was management of forest resources by the community. This was to bring in greater ownership in protection of natural resources as well as avoid conflict and bring in sustained use of natural resources. In terms of behaviour change in the beneficiaries with respect to forest conservation, it was inferred that the change in behaviour was clearly linked to the financial incentive. For four years, a regular monthly income from conservation for the beneficiaries was a very strong incentive for them to make frequent trips to the forest and protect them. It substituted for any loss being incurred by them in not possibly giving sufficient time to their other livelihood sources.

Over a period of time, the beneficiaries also began seeing the results of their conservation activities and this led to a strong belief in the benefits of forest conservation, at the behavioural level. Once the monthly income was stopped in the beginning of 2015, in many cases, the protection activities continued but the rigour of protection decreased over time. This was due to the fact that the financial incentive left was only the income from sale of bamboo but that has not happened uniformly across all the districts. In light of this, even though the belief of the beneficiaries in the protection of forests was strong, the capacity to rigorously protect the forests from unsustainable use was reduced. Thus, it can be inferred that there was a strongly positive behavioural change in the beneficiaries with respect to forest conservation which was facilitated by the financial incentive linked to it.

When the larger community is taken into account, it was inferred through interactions that they largely followed the norms of forest conservation for the forest land protected under the programme by the beneficiaries. After the protection period of four years ended (with a linked financial incentive of monthly income from conservation for beneficiaries), the behaviour of the community towards these protected areas has most probably not changed as they still believe the protection is taking place with the same rigour.

Of the overall respondents, 70% had family members who were part of the Joint Forest management Committees (JFMCs). The quality of participation in JFMCs was found to be quite high with 73% of the overall respondents who have membership, attending and putting forward their point which is valued. Quality participation in JFMCs was critical to ensure effective community management of forest resources.

Table 2 gives a consolidated list of key indicators disaggregated based on whether the beneficiary is direct or indirect.

Table 4 - Listing of key indicators for direct and indirect beneficiaries

Area	Indicator	Direct beneficiaries (n=435)	Indirect beneficiaries (n=117)	Overall beneficiaries (n=552)
Bamboo rehabilitation	Respondents engaged in bamboo rehabilitation	75%	8%	61%
Fodder plantation	Respondents engaged in fodder plantation	21%	9%	18%
	Respondents reporting improvement in availability of sufficient fodder for livestock	81%	71%	79%
	Respondents reporting reduction in dependency on forests for uncontrolled grazing	89%	79%	87%
Energy plantation	Respondents engaged in energy plantation	13%	3%	11%
	Respondents reporting reduction in fuelwood extraction from surrounding forests	80%	74%	79%
Renovation of existing watershed structures	Respondents reporting existing watershed structures have been renovated	25%	11%	22%
New watershed interventions	Respondents reporting any new watershed interventions	28%	14%	25%
Soil fertility	Respondents who perceived improvement in soil fertility	47%	36%	45%
Forest cover density	Respondents who perceived improvement in the density of forest cover	96%	87%	94%
Fauna density	Respondents who perceived increased sighting of animals or sighting of new animals	90%	81%	88%

Change in density of bamboo clumps

The density of bamboo clumps was checked at the stages of Karlla (new bamboo clump), Mahila (2nd year bamboo clump) and Pakiya (4th year from Mahila). Based on the analysis performed on the change in the density of bamboo clumps in the areas of bamboo plantation and renovation, it was seen that for the districts of Chhindwara and Sidhi, the number of Mahila (2nd stage) had increased which suggests that the protection was good for the last year.

There was an increase in the number of pakiya (3rd stage) in both Chhindwara and Sidhi which was majorly associated with the fact that there has been sustainable cutting for commercial purpose in the area and illegal cutting of the forests has been curbed. This was verified with the programme team and the community. There was a decrease in the number of karlla (new bamboo clump) in Sidhi which suggests that the bamboo clumps were eaten or damaged by animals and human beings. The reverse was true in the case of Chhindwara which suggests that the bamboo clumps were protected and were not eaten or damaged by animals and human beings.

Change in vegetative cover based on NDVI imagery analysis

Based on the analysis of 6 sites of interventions, in almost all the cases, there is a greater area where vegetative cover has reduced as against area where vegetative cover has increased. Hence, there is a marked trend towards reduced vegetative cover over the two year period in most of the sampled sites. This is in direct contrast to the perception of the local community near the intervention sites. Some limitations of this analysis include slight difference in the times at which the corresponding images were taken in 2011 and 2013 and the fact that the exact boundary of the intervention area was not available.

Sustainability of impact:

Behavioral sustainability

The assessment team found that by being part of a four years long conservation effort in the programme, the beneficiaries have begun to appreciate the increase in density of forest cover. What made it work effectively was the financial incentive linked to inculcating this behavior. Now that the programme period is complete, there is a high probability of this behavior continuing in terms of the beneficiaries understanding the value of forest conservation. But this may not necessarily translate into effective forest conservation in the future as the financial incentive, in terms of a regular monthly income, is no longer present. If a beneficiary has to secure the livelihood for his family, he may not have the leeway in terms of time and energy to make frequent visits to the forest area and protect it with the same rigor as earlier. Hence, in the case of the beneficiary, behavioral sustainability may not necessarily translate into environmental sustainability.

This is where the sustainability of behavioral change in the larger community would come into the picture. The assessment team could deduce that the larger community had a positive behavior towards the protected areas, mainly because of the highly effective protection by the beneficiaries. Once the rigor of protection comes down with time, there is a high likelihood of the larger community members using the resources of the protected forests in an unsustainable manner again. Hence, the change in behavior in the larger community will most probably not sustain.

Institutional sustainability

The assessment team found that the key interaction which facilitated the implementation of the programme on the ground was the interaction between the beneficiaries and the staff of the Forest Department. The selection of beneficiaries was also largely driven by the Forest Department staff with certain criteria being followed like the inclination of the beneficiary to participate, level of land holding and ease of access to forest area. The institution which should have had a central role in the implementation of the entire programme was the JFMC. The JFMC was the representative group from the community whose role also involved getting the larger community on board the programme objectives.

But the assessment team found the role of the JFMC to be limited in areas like beneficiary selection. The entire programme still seemed more like an employment opportunity for the beneficiaries with the Forest Department rather than a community institution led initiative with wholehearted

participation of the entire community. In terms of institutional sustainability, this could be an issue as the role of the Forest Department remains central to achievement of the programme goals. If the protection of forests needs to be continued beyond the programme period, it would have to be through a consensus achieved in the entire community which needs to be led by a strong community institution. This would require a lot of investment in the capacity building of the JFMC members on the processes to be followed in strengthening the institution and building consensus in the larger community.

Technical sustainability

The assessment team looked at technical sustainability in terms of the sustainability of adoption of practices like improving the health of bamboo clumps and the functioning of assets like loose boulder check dams since these were two of the most widespread interventions across all the ranges. It was found that activities like raising soil at the roots of the bamboo clumps and making stone bunds at the bamboo roots had been carried out by paying the beneficiaries daily wages. Even the construction of the loose boulder check dams had been carried out by paying daily wages to the beneficiaries and also some other members of the community.

Since the programme period is over, the question to be answered is whether these practices will continue in the absence of wages. The assessment team felt that the probability of beneficiaries carrying out these activities in the absence of a financial incentive is low. This would also be because of the fact that the outcomes of these practices would benefit not just that individual but the entire community and the environment. That may not be a strong enough incentive for a beneficiary to carry out these practices on a voluntary basis.

Financial sustainability

The assessment team found that the protection of forests as a goal has been achieved almost uniformly across all the ranges. The key contributing factor has been the rigorous involvement of the beneficiaries who were employed for four years continuously on a regular monthly income. The beneficiaries achieved this goal by making frequent visits to the protected forest area and guarding the forests. Over a period of four years, this has led to a clear increase in plant and tree density and rise in the undergrowth.

If this outcome has to be sustained, the financial sustainability of the entire intervention comes into question. Based on interactions with beneficiary groups, it was inferred that the incentive to continue protecting forests in the absence of the monthly income was not uniform across the ranges. It was not even uniform in the beneficiaries within a range. Even though protection of forests has become habituated to a certain extent in the beneficiaries and the larger community as well, it is not widespread. Additionally, the income from selling bamboo has not been realized by all the beneficiaries. Even in cases where the income has been realized, the income received per beneficiary is not uniform and varies widely. Hence, there is a high risk of the outcome of forest protection being reversed in the absence of a continuous and substantial financial incentive.

Environmental sustainability

The assessment team looked at environmental sustainability as the continuation of key impact areas like increased forest cover density, greater sightings of animals and overall, greater biodiversity.

According to the team, this goal has been achieved during the programme across the areas of study and has been widely recognized by the beneficiaries and the larger community. What was understood was that the protection of forests under the programme was done very effectively which allowed the forests to regenerate. But this outcome is not irreversible owing to the continuous pressures from the human population on exploiting the natural resources.

In light of this, the environmental impact can be sustainable if the protection of forests is continued and even scaled up significantly. As discussed earlier, this cannot be delinked from the financial incentive to a set of beneficiaries to continue protecting the forests. Currently, the income to protect forests has been stopped. If the income from selling bamboo is not realized soon and in sufficient quantity, the beneficiaries will stop protecting the forests area with sufficient rigor and the environmental impact achieved would be reversed.

Key recommendations

1. The primary reason for effective forest conservation taking place was the strong financial incentive given to the beneficiaries in terms of a regular monthly income from conservation. Since this mechanism has worked so well, it could be explored if sufficient resources could be mobilized to make the wage payment mechanism a permanent one to ensure conservation in the future too and on a much larger scale.
2. The primary role of the Forest Department staff is the conservation of forests which requires a particular kind of approach towards the community. But a programme which seeks to make the community a key stakeholder in forest conservation requires the staff to be more sensitive towards the needs of the community. Hence, it is recommended to have capacity building of the Forest Department staff to sensitize them on community mobilization, specifically oriented towards making the community take more ownership of the conservation of forests.
3. Two key areas of improvement to achieve the programme's objectives would be improving the capacities of the community and institution building in the community. It would be advisable to involve reputed NGOs on a long term basis who would be ready to invest time and resources with members of the community and work on these areas. This is very important from the point of view of bringing in sustainable behavioural change in the larger community towards forest conservation. It would also be imperative to build the strength of the JFMC as an institution and strengthen its internal processes.
4. The programme has succeeded in the conservation of forests to a much larger extent than in creating sustainable income generating activities. Thus, income generation should also be given high priority in the future as it is the key incentive to a beneficiary for sustained protection of forests.
5. Currently, the sale of bamboo is the key option being looked at to provide income to the beneficiaries as an incentive to continue protecting the forests. If this can be expanded to include a wide gamut of other NTFP products, then the scope to earn income increases. In the case of many NTFP products, people living in forests areas already engage in collection and selling but are not able to get the just rates. It is recommended that working towards more effective and equitable market linkage for these NTFP products would incentivise the beneficiaries to continue protecting the forests effectively.

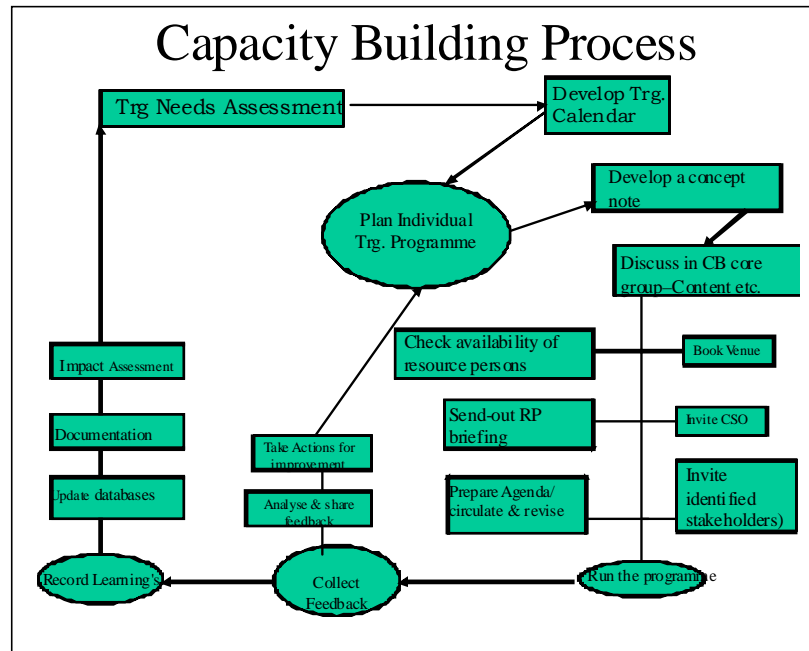
15 Manual of Practice for Capacity Building of Stakeholders

Capacity building shall be treated as process – a means to an end – by which an individual, group of individuals or communities/organizations can find their own solutions, usually by building competence in terms of knowledge, skills, and experience; strengthening commitment, developing team work and team culture, and ensuring consistency. This includes repeating good work every day, to undertake actions leading to sustainable NRM and livelihood. Capacity building should not be considered in

isolation of on-ground actions. Rather, it should specifically support effective on-ground implementation and uptake of NRM and livelihood practices.

Given that strategic NRM & livelihood related outcomes of the project are achieved in the longer term after withdrawal, capacity building provides important intermediate results related to attitude, behaviour and practice change, and increased engagement in sustainable NRM. In the proposed project, monitoring, evaluation and learning framework could be developed so that these intermediate results are measured as management action targets. Capacity building of core group will be planned to take up all the capacity building issues to plan, design, implement and follow up. Below are some standard questions for designing capacity building interventions –

- **What** – specific behaviour and practice changes (intermediate results) are required to achieve in the proposed project? What are the specific, critical capacity building activities that will most effectively support the achievement of these changes, and what is the justification for their choice? What pre-requisite and co-requisite activities are required in order to successfully undertake these capacity building activities? What has already been done and is the proposed activity building on this?



- **Where** – geographically within the project should capacity building activities be targeted, in order to best achieve key expected result areas of project? This necessitates an understanding of socio-economic demographics, in addition to the sustainable livelihood and NRM issues of the districts separately.
- **Who** – within these areas should be specifically targeted for involvement in capacity building?
- **When** – should specific capacity building activities be undertaken and in what order?

- Which are time critical and which cannot be undertaken until others have been completed?

- **Which** – are the most appropriate delivery mechanisms in terms of level (local, district, State), delivery party (forest department, line department, PRI, community institutions, core groups, community support networks, industry etc.) and approach?

- **How much** - information is it necessary to include in the capacity building plan in order to substantiate the capacity building decisions, assumptions and proposed actions? Evidence is required that a strategic and systematic process has been followed in determining capacity building needs.

Topic of the training based on the Subject	:	Name for the programme
Proposed Date	:	Tentative dates (Duration)
Venue	:	If known
Target Group Coordinators/ ORW etc.	:	For whom? Eg: Project
Background	:	Underlying reasons/ Need for the programme
Purpose	:	What does the programme aim at
Programme Structure	:	How will the subject be delivered? Methods to be applied for achieving the purpose.

Depending on context and situation, Stakeholders can adopt below suggested capacity building models, at single or multiple levels:

- The **Programmed Learning model**, where courses/workshops will be developed (in-house) and are being run to improve specific skills and understanding. This could be further done through cost-sharing model (more than two interested project/agencies/departments will work out strategies to share their capacity building resources with each other) or cost-effective model – in-house resource person shall be identified and asked to impart trainings to identified person for building existing/new capacities.
- **Village study/learning group model**, where representatives from community institutions will identify key issues of learning; debate thoroughly/in-depth. Field coordinator will be responsible to handhold community to strengthen the community level learning/study forum.
- **E-learning model**, where Capacity building core will initiate to identify CB issues, seeking for interested parties to build their capacities through the principles of distance education programme. Handholding will also be provided.
- The **Group Empowerment/Facilitation Model**, where groups will be provided with assistance to prioritize and seek their own learning and information needs. ‘Training of trainers’ (TOT) concept could be promoted where potential trainers are groomed.

- **Outreach services model** encompasses all the efforts of proposed project, other than direct implementation that helps in replication and influence other stakeholder(s) to enhance rural livelihoods in a sustainable manner. Building capacity of a larger number of NGO and Govt. staff and work towards changing policies through applied research, networking and policy dialogue and documentation and dissemination of best practices.

- The **Technological Development Model**, where a combination of methods is used (including exposures) to help stakeholder(s) to improve specific management practices and technologies (for example organic farming, NTFP processing, value addition, sustainable bamboo harvesting, irrigation efficiency etc.).

Looking at diversity of interventions and stakeholder(s), regular and periodic capacity building approaches shall be applied –

1. Class room based training – in-house /overseas
2. Field level training
3. Job swap
4. Peer learning reviews: Internal (staff) and external (organizational)
5. Cross learning visits: project staff will visit external organizations of same nature of interventions.
6. Peer learning workshops
7. Exposure visits (within and outside state)
8. On job training
9. Mentoring support
10. Sponsor - link for outside trainings & Workshops, exposures

Table 5 mentions the key areas of capacity building relevant to this programme -

Table 5 - Key Areas of Capacity Building covered under the manual

S. No.	Key capacity building areas	Description on sub-areas of capacity building	Stakeholder(s)
1	Technical competencies	Rules and regulations, structure of the Forest Department	Field staff of forest department, partner
1.1	Forestry sector	Communication protocols in Forest department Innovative approaches of forest protection and wild animals Bio-diversity conservation laws and regulations NTFP, Bamboo – regeneration and best practices of harvesting etc. Approach and areas where convergence is possible with other line department	NGOs team, Line department, PRI members

S. No.	Key capacity building areas	Description on sub-areas of capacity building	Stakeholder(s)
1.2	Monitoring and evaluation	<p>Concepts of monitoring and evaluation</p> <p>Principles, and approaches of monitoring and evaluation</p> <p>How to carry out monitoring and evaluation in field?</p> <p>Periodic data collection and report writing</p> <p>Uses of IT based solutions and monitoring systems</p>	Middle and field staff of forest department, line dept., partner NGOs team, PRI members
1.3	Community mobilization and formation of institutions	<p>PRA methods, micro plan development methods</p> <p>Gender equity – concepts, principles, best practices etc.</p> <p>Basic models and principles of community mobilization, best practices of community mobilization</p> <p>Principles, methods, models, basic rules and regulations of mobilization, formation of committees – JFM, SHGs</p> <p>JFM – policies, models, best practices, profit sharing mechanisms etc.</p> <p>Roles and responsibilities of stakeholders in JFM</p> <p>Principles of institutions management – linkages, organization and functioning of institutions, management of institutions etc.</p>	Middle and field staff of forest department, line dept., NGOs, PRI members, JFM and SHG members
1.4	NTFP management and micro enterprise development and management	<p>Identification, processing technologies, value addition techniques, market linkages etc.</p> <p>Setting up micro enterprise related to NTFP or other income generation activities; Functioning and working systems of Community institutions – SHG, JFM etc., traders, retailers</p>	Middle and field staff of forest department, line dept., partner NGOs team, PRI members
1.5	Bio-diversity conservation and Livelihood development activities	<p>Bio-diversity conservation – concepts, types, implementation</p> <p>Organic farming - concepts, types, implementation of NADAP, Vermi compost, biogas etc.)</p> <p>Alternative energy - concepts, types, implementation –biogas, smokeless Chulha, solar appliances</p> <p>Fodder and livestock management – area, best practices, models, approaches best suited in their area</p> <p>Agriculture input supply and marketing – concepts, best practices, models etc.</p> <p>Agriculture productivity enhancing methods, best practices</p> <p>Promotion of water use efficient devices – strategies, methods, principles, best practices etc.</p> <p>Horticulture/floriculture- strategies, methods, principles, best practices etc.</p> <p>Common land development and management - strategies, methods, principles, best practices etc.</p>	<p>Middle and field staff of forest department, line dept., partner NGOs team, PRI members</p> <p>All target villages</p> <p>Households/families</p>

S. No.	Key capacity building areas	Description on sub-areas of capacity building	Stakeholder(s)
2.0 2.1	Behavioural/Social/Management: Skills required to improve working with stakeholder(s)	How to communicate clearly in writing; Use effective verbal communication skills? Best practices on work with others in teams; build and maintain networks and work relationships? How to develop appropriate level of rapport with stakeholder(s); negotiate with others to achieve tasks and goals? What are the effective ways of dealing with conflict situations? How do we perform, entertain, occupy or inspire others?	Forest dept., Line dept., NGOs project staff, PRI members
2.2	Skills required to improve Stakeholder(s) management	Ways to adapt to changing circumstances; identify and articulate long term vision for future How to conduct stakeholder wise power analysis; business/enterprise development and management; deep understanding of markets, stakeholders and competitors? How to do correct assessment of risk and return of decisions? Global perspectives, and political processes on sustainable livelihood and Natural resource management	Selected staff from field, middle and top management separately Forest dept. and partner NGOs team, PRI and line-dept. - Low
2.3	Improving Personal characteristics	How to improve and demonstrate a passion to succeed? Best way to accept responsibility for success and failures; openness to adopt new ideas; challenge the status quo; display confidence How to balance and maintain commitment to continual personal development Best practices to think analytically and be sensitive to the needs of others	FD, NGOs, Line depts., PRI members
2.4	Skills required to improve Strategic management	Adapt to changing circumstances Identify and articulate long term vision for future Deep understanding of markets, customers and competitors Correctly assess the risk and return of decisions; global perspective.	Selected staff from field, middle and top management from Forest dept. and NGOs partner
2.5	Skills required to improve management of results	How to organize own work to achieve goals; use latest technologies of information management? Stress management to manage work priorities; produce quality results; produce complex documents? How to plan and implement planned interventions at activities? What would be the standards of delivering quality community based services? How to manage resources smartly; manage operations to achieve planned consequences? Ways to implement new strategies in response to changing needs?	Selected staff from field, middle and top management separately Forest dept. and NGOs – High PRI and line-dept. – Low

S. No.	Key capacity building areas	Description on sub-areas of capacity building	Stakeholder(s)
		Skills to Implement and monitor continuous improvements to systems and processes How to facilitate and capitalize on change; encourage and manage innovation; translate long term vision into a step by step plan Practical ways to work appropriately on handle crises; manage budgets and timelines	

16 Tools/techniques to Track and Measure Project Impacts on Biodiversity / Ecological Assessment

16.1 Tracking and Measuring of Impact on biodiversity

Why is tracking and measuring impact so important? ²

Cost-effective monitoring is essential to justify investment from biodiversity beneficiaries, be they public or private. Government, Investors and beneficiaries need to know their funds are effectively assisting forest developers and farmers to shift to biodiversity conservation, ecological agriculture and generate the ecosystem service expected.

What do you monitor?

The performance of the biodiversity interventions process and assessment of outputs to understand the change of social and economic behaviours can be measured by its environmental and social impacts. Environmental impacts can affect species diversity, habitat connectivity and ecosystem processes. Social impacts can be diverse, affecting livelihoods, income, food security, gender and well-being. Tracking these impacts is key as its socio-economic outcomes determine the long-term environmental performance of the initiative.

How do you measure impact?

Not all ecosystem services have equal monitoring requirements. For example, while rates of carbon sequestration in young fast-growing trees can be easily estimated with allometric equations, changes in water quality and quantity can take several decades to be realized. Relationships between land management and hydrology in particular are complex, site-specific and prone to misunderstandings; more detailed and site specific measurements may need to be kept for long periods of time to yield reliable data.

A monitoring framework needs to be set in place from the very beginning, to allow for comparison with the results achieved along the way. Indicators can then be used to measure both environmental and socio-economic impacts. These can be identified through participatory research methods, such as household surveys, focus groups, mapping, and ranking methods etc. for socio-economic impacts, and remote sensing and ground-based surveys, etc. for environmental impacts.

² <http://www.fao.org/ecosystem-services-biodiversity/incentives/ies-step-by-step/tracking-impact/en/>

16.2 Types of monitoring

Different biodiversity conservation and livelihood development work requires different types of monitoring. This is dependent on the context, the ecosystem service, agricultural production and impacts considered, and the rigor required by the investors. Developing a very detailed and cost intensive methodology that cannot be sustained by the initiative in the long run, either due to lack of funds or insufficient equipment and skills, will not adequately track impact. Levels of precision can range from broad estimations based on global coefficients to site-specific sampling.

Measuring Tools and Indicators

Below are some examples of these methodologies. Some are specialized in gathering environmental data, others focus on social impacts. Some are simpler than others, but if used more often, they can increase the level of rigor of the methodology. By combining several of these methods, the level of rigor can also increase.

Environmental Impact



Social and biodiversity Impact assessment (SBIA) Manual for REDD+ Projects provides tools to guide practitioners to monitor environmental and social impacts relating to specific CCB Standard Certification criteria.



[IIED - Poverty and Conservation Learning Group](#)

Guides for practitioners on Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) methods for biodiversity in relation to CBD requirements.

Social Impact



[IIED - Poverty and Conservation Learning Group](#)

Multiple tools and methodologies to assess the impact of initiatives on socio-economics and biodiversity. These also include valuation methodologies and frameworks to guide decision-making.



Information to design livelihood surveys that document the impact of co-benefit conservation interventions on local welfare.



[ProFor's Poverty-Forest Linkages Toolkit](#)



Wide set of rapid participatory assessment methods on economic and non-economic contributions from forests to households. A guide to support capacity building and training of these tools is also included.

Assessing the Impact of Development Programmes on Food Security

E-learning course from FAO providing guidelines on:
 (1) Methods to assess the impact of programmes on food security
 (2) How to plan for monitoring and evaluation (M&E) activities
 (3) Commonly used indicators for impact assessment and M&E

Additional resources

The following online links give more information on conducting social and biodiversity impact assessment:

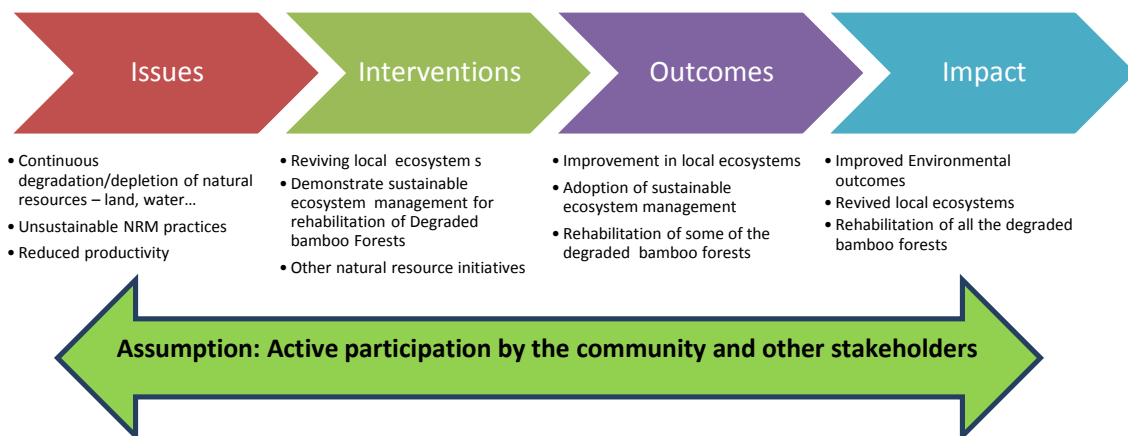
https://s3.amazonaws.com/CCBA/SBIA_Manual/SBIA_Part_3.pdf

<http://unpan1.un.org/intradoc/groups/public/documents/cgg/unpan026197.pdf>

Theory of Change

The development of Theory of change for any project is most important to monitor the program interventions on periodic basis. This will bring together the context, programme level interventions, the intended changes and impact. The effort shall include listing of all assumptions being made in the process. The diagram below captures a suggested Theory of Change for the programme developed for assessment of UNDP-GEF Integrated Land and Ecosystem Management to Combat Land Degradation and Deforestation in Madhya Pradesh.

Figure 22 - Suggested Theory of Change (ToC)



The main impact indicators include:

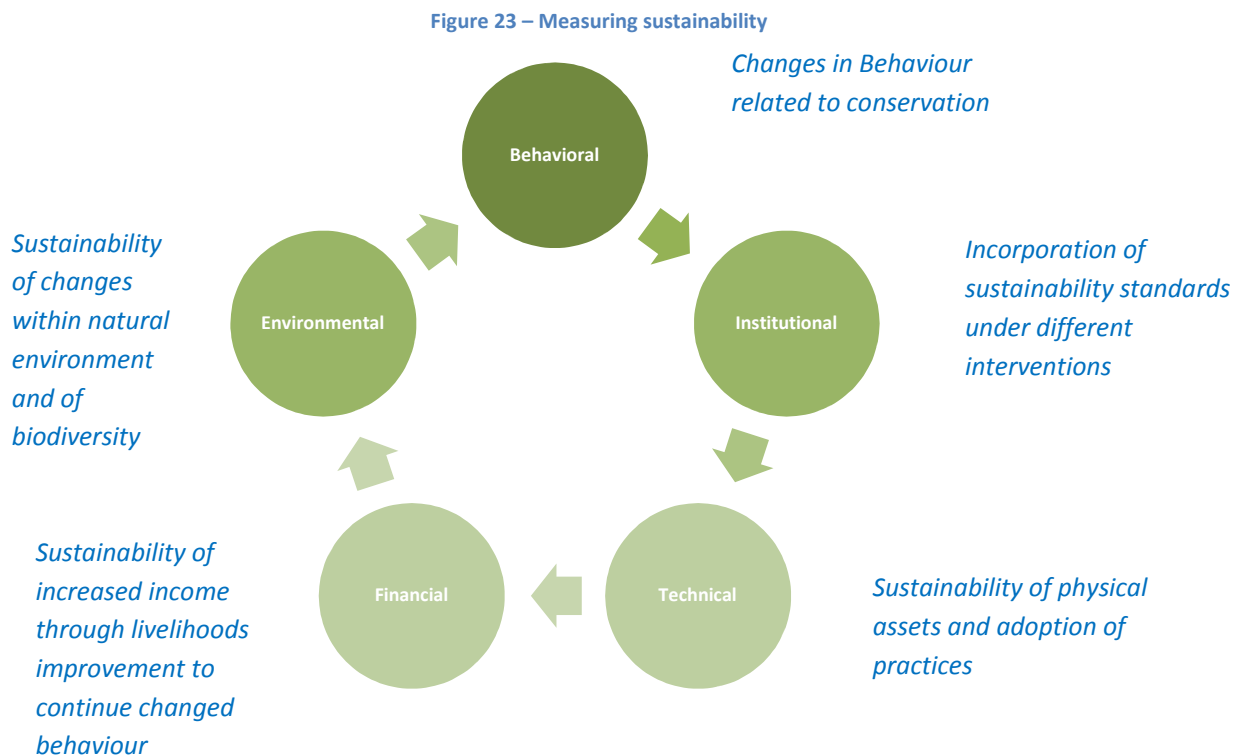
1. Improved Environmental Outcomes: This would be measured through improvement in water quality, salinity, biodiversity, soils and invasive native scrub
2. Revived local ecosystems: Change in behaviour of the local community towards better livelihood and natural resource management practices
3. Rehabilitated degraded bamboo forests: Increased bamboo production

Measuring Sustainability

One of the key indicators for measuring impact is sustainability. The diagram below depicts the manner in which we propose to measure sustainability. This model is based on the sustainable livelihoods framework. Sustainability in this framework is measured as per 5 parameters:

1. Behavioural sustainability
2. Institutional sustainability
3. Technical sustainability
4. Financial sustainability
5. Environmental sustainability

The achievements and changes in all 5 of these parameters is consolidated together to measure the programme sustainability.



17 Key inputs on the way forward emerging from stakeholders' workshop

A one day workshop was held on 26th April 2016 in Chhindwara with important stakeholders of the programme. The main purpose of this workshop was to disseminate the findings from the study to the participants, gain their insights on these findings and seek their inputs on what is the way forward for key components of the programme.

The workshop was organized with the support of Mr K C Tyagi, CCF, Chhindwara. The workshop had close to 70 participants and had a mix of Forest Department staff and beneficiaries of the programme. The divisions represented in the workshop included East Chhindwara, West Chhindwara, South Chhindwara, North Betul, West Betul and South Betul. The workshop was divided into three sessions as explained below:

1. In the first session, CMS shared the findings and recommendations from the socio-economic and the biodiversity assessment study with the workshop participants.
2. In the second session, an open discussion was held on the findings from the study which was facilitated by Mr K C Tyagi. The discussion helped in refining the interpretation of the findings from the study and added to the recommendations proposed.
3. In the third and final session, the participants were divided into sub-groups and were asked to give inputs on the following questions:
 - a. What were the main learnings from the UNDP-GEF programme?
 - b. What were the activities which were successful and should be taken forward in the future?
 - c. How can these activities be taken forward in the future?
 - d. What are the possible challenges in this process?

After the relevant points were shared by the sub-groups in the plenary, the workshop was concluded.

Key insights on the study findings shared in the open discussion session

1. The impact of the programme has a link to the ratio of beneficiaries to total population of the village. In villages with a high ratio of beneficiaries to total population, the programme has been more effective in achieving its goals.
2. The formation of the first stage of growth of a bamboo shoot happens during the 2-3 months of the monsoon rainfall season. Hence, the protection of bamboo forests from grazing in the future has to be carried out intensively only in the peak rainfall months of the monsoon season. The protection for remainder of the year can be less intensive. This kind of planning can help in better utilization of the time of a person involved in forest protection.
3. Making of agarbattis and kaadis should be two separate enterprises as the market for the two varies. The making of kaadis can be a more successful enterprise as there is a lot of unutilized waste left over after cutting bamboo which can be used in making kaadis cost effectively.
4. Rather than focus on SMEs, the focus in the future should be on micro-enterprises, either individual based or Self Help Group based.

5. Systematic felling in a forest in a sustainable manner should be promoted for multiple species of flora. This would ensure the twin benefits of profit as well as conservation. Hence, in the future, beneficiaries could be given rights to conserve and sell not just bamboo but other species of flora too.
6. The approach should not be to lock people out of the forest area in order to conserve it but rather to manage the demand of the population from the forest area in a way that ensures sustained growth within the forest area.
7. A highly decentralized approach to forest conservation is needed to effectively achieve the goals outlined in the programme. This would also require changes in the policy environment.

Key points shared in session on the way forward

Learning from UNDP-GEF Project

- Co-management practices had regenerated the local bamboo forest as a resource, creating opportunities for the families to access the resource for commercial benefits, leading to improvement in their socio-economic condition.
- The income from the above improved the agriculture and education status of the beneficiaries.
- The water table increased through water and soil conservation works.
- The establishment of fodder plantation has led to the availability of fodder for domestic animals.
- Beneficiaries learned the importance of community participation and management.
- Funds should be utilized for community (not for individuals) and in right direction.
- Linkages with other line departments had proven to be very useful.
- Skill development in fishery as an activity was very useful.
- Fire, illegal felling and open grazing has been controlled to a large extent.
- The forest density has improved as a result of the programme.

Activities which were successful and should be considered in future

- Protection of forests.
- Soil and water conservation works.
- Plantation of fodder, fast growing and fruit bearing trees.
- Training on various activities such as poultry, vermi compost, bio fertilizer, fishery etc, with exposure visits.
- Improved agriculture practices.

How to take forward these activities in future

- The UNDP-GEF project should be continued in the future in a scaled up form.

- Joint Forest Management Committees and Forest Department should work together effectively.
- Local people living in the vicinity of the forest area should be motivated strongly to conserve forests.
- Plantation of new trees should happen.
- Financial help should be provided to ensure regular protection of forests.
- A change in attitude has to be brought about in people regarding forests protection and use.
- There should be continuous focus on trainings and education.
- Convergence with other line departments should be pursued.

Picture 35 - Workshop participants presenting key points from sub-group discussion on way forward



Possible challenges in fulfilling these activities

- Lack of availability of markets for products would reduce the profits made.
- Exploitation by middle men and agents may be a big disincentive.
- The required financial resources may not be available.
- There may be resistance from the community in carrying out some of these activities.
- People living in villages may not have sufficient time and resources to take these activities forward.
- Lack of awareness and direction may hinder progress.

18 Drivers in making forests more vulnerable to biodiversity change

Interactions with different stakeholders helped the assessment team to identify the key activities which affect the biodiversity in the region. For each activity, the corresponding driver of increased vulnerability to biodiversity change was identified. The details have been given in Table 6 below.

Table 6 – Drivers of increased vulnerability to biodiversity change

S No	Activity	Outcome	Driver of increased vulnerability to biodiversity change
1	People in village collect firewood for own use, including cooking and providing warmth. They collect wood fallen on the ground or prune trees. In some cases, they also cut down entire trees.	Reduced forest cover density, increased human activity in the forest area	Need for an energy source for rural households
2	People in village collect firewood for constructing their house. They cut down entire trees for this purpose.	Reduced forest cover density, increased human activity in the forest area	Need for building material for homes
3	People in village collect firewood for selling in the market. They collect wood fallen on the ground or prune trees. In some cases, they also cut down entire trees.	Reduced forest cover density, increased human activity in the forest area	Need for an energy source for rural households
4	People in village collect NTFP products like <i>mahua</i> and <i>tendu patta</i> from the forest. This provides them supplementary income in addition to agriculture in many cases.	Increased human activity in the forest area	Need for supplementary sources of income
5	People in village cut agroforestry species like bamboo from the forest. This is done in an unsustainable manner in many cases. This provides them building material for homes as well as income from selling.	Reduced forest cover density, increased human activity in the forest area	Need for building material for homes, need for supplementary sources of income
6	People in village need to increase the area under farming. Hence, they take over forest land and clear it of trees to practice farming on it. This has happened to a much greater extent in the past. Acts like the FRA have also regularized past cases of encroachment in many cases.	Reduced forest cover density, increased human activity in the forest area	Need for agricultural land, especially with increasing population

7	<p>People in village almost universally own livestock, either for tilling land or for dairy purposes and consuming and selling meat. For the livestock, the owners need to arrange fodder round the year. This demand is usually not met from the fields of the owners. There is also not a prevalence of dedicated fodder growing sites known as <i>charagaahs</i>. Hence, there is the prevalence of uncontrolled grazing on forest land.</p>	<p>Loss of forest undergrowth, reduced density of new plants, increased human activity in the forest area</p>	<p>Need for fodder for livestock</p>
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19 Conceptual framework for monitoring biodiversity

A conceptual framework for monitoring biodiversity loss is to be prepared in consultation with the key programme stakeholders. However, a few guiding principles for developing the same are given here.

The first question which needs to be addressed is how the loss in biodiversity is happening. This could be measured through indicators like reduction in forest cover density, reduced sightings of wild animals, reduced undergrowth and reduced diversity in plant species per unit area. The process of selection of these indicators should be carried out keeping the following in mind: ³

1. Choose indicators that have clear links to the biodiversity objectives of the programme.
2. Choose indicators that have clear links to the programme interventions.
3. Choose multiple indicators; it is necessary to strike a balance between choosing too few indicators (and thereby running the risk of failing to document actual biodiversity improvements) and choosing too many indicators (and thereby necessitating an expensive and complicated monitoring program)
4. Choose Pressure, State, and Response (PSR) indicators; monitoring programs should never monitor conservation targets in isolation, but rather together with the positive and negative influences on those targets. Thus, while a reforestation project might be wise to track over time the abundance of forest specialist bird species (a state indicator), it would also do well to simultaneously monitor the frequency of forest fires (a pressure indicator) and the number of trees planted over time (a response indicator).
5. Use indicators that can be monitored with relative ease.
6. Use indicators that reflect local conditions.

The next question which needs to be addressed is why is the biodiversity loss happening. The drivers for biodiversity loss, as mentioned earlier, would include the need for an energy source for rural households, need for building material for homes, need for supplementary sources of income from NTFP, need for agricultural land and need for fodder for livestock. These drivers and the consequent outcomes need to be tracked by the monitoring system.

The biodiversity monitoring framework would need to spell out the key stakeholders involved in tracking the biodiversity related indicators. This would include forest department staff, JFMC members, other members of the community and external experts. Additionally, the mechanisms to track biodiversity loss would need to be finalized which could include visual monitoring by JFMC members from villages, photographic evidence, satellite imagery analysis and time series monitoring of test sites to check for density and variety of species. This framework would be detailed out post the workshop to be held with key stakeholders from UNDP and the Madhya Pradesh Forest Department.

³ https://s3.amazonaws.com/CCBA/SBIA_Manual/SBIA_Part_3.pdf