

# Clean Energy Interventions for Livelihood Enhancement in Rural Odisha: Baseline and Way Forward

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## Project Overview

The Framework Agreement (2008-2013) between the Norwegian Ministry of Foreign Affairs (MFA) and The Energy and Resources Institute (TERI) aims towards strengthening of linkages between Norway and India, through a focused set of activities and initiatives that address larger global concerns of climate change and energy security. The framework also involves other third party institutions on climate change, Clean Development Mechanism, renewable energy and energy policy at various levels. The framework activities are oriented towards addressing knowledge gaps in three strategic themes; (i) Clean energy options, (ii) climate change, and (iii) Energy security and climate change interfaces.

TERI is implementing five projects matching the three strategic themes along with establishment of one of its kind specialized library on climate change. The projects “**Clean Energy Interventions for Livelihood Enhancement in Rural India**” under the head project “**Innovating to bring clean energy for livelihood generation in India**” intervenes in rural areas of four states; Uttar Pradesh, Odisha, Assam and Madhya Pradesh.

General objective of the project “**Clean Energy Interventions for Livelihood Enhancement in Rural India**” is to promote clean energy based technologies to facilitate existing livelihoods of rural communities spread across four states. The specific objectives are:

1. Mapping of livelihoods, their market linkages and energy needs
2. Identifying livelihood options for intervention
3. Identifying clean energy options in consultation with technology team
4. Developing business models for implementation and sustainability
5. Reporting of baseline and impact assessment of the interventions

The broad approach adopted in the project process is:

1. Identification of sites based on state specific identification criteria
2. Energy needs assessment and baseline survey
3. Identification of technologies and implementation model
4. Measuring change after a year of installation



## EXECUTIVE SUMMARY

The present report provides baseline scenario of three identified sites for project implementation; Village Baunsadiha, Village Laxmiposi and Village Kochila Nuagoan. The baseline is reported at three levels; at village level, at operating group level, and at household level. The report follows the scoping study report submitted to Norwegian Ministry for Foreign Affairs early in the year 2012. The objective of the report is three fold;

1. To develop a database and analysis framework as well as methodology to measure output/ change after a year of installation and initiation of usage of technology by the end users.
2. To provide a reference base for developing action plan in the near future for smooth integration of technology and society.
3. To monitor and document the project progress to assess whether the project is moving towards the overall goal of facilitating technologies for productive usage by rural community.

The baseline indicates agriculture for self-consumption as the primary source of livelihood in all the three villages. Dependency on rain and small landholdings are the limiting factors towards transiting agriculture as a source of cash income. Non timber forest produces (NTFPs) makes for the secondary source of livelihood or the major source of cash income. About 58 % of the households thrive on annual cash income of less than INR 22000. NTFPs also possess seasonality constraint. The energy scenario at village and household level provides a picture of limited or no access, and thus reporting of energy usage for productive usage is almost negligible. Other basic facilities of health, drinking water and education are at bare minimum. The broad energy needs and technology feasibilities are discussed in the report, leading to finalization of technologies and livelihood activities.

At the end, the report proposes way forward at two levels; detailed model for output/change assessment including finalization of sub-indicators, methodology and household level schedules to capture change. The sustainability and improvement aspects are taken care in the proposed interventions to strengthen the existing interventions.





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# 1. INTRODUCTION AND METHODOLOGY

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In the state of Odisha, TERI partnered with a state level Non-Governmental Organization SAMBANDH, in implementing the project. The state of Odisha is one of the energy poor states in terms of household energy where 84 per cent of the rural households depend on traditional use of biomass for cooking and 49 per cent rural households reporting usage of kerosene as the primary source of lighting (NSSO 66<sup>th</sup> Round).

Considering the poor access to clean energy at rural level, the project explores the next level of clean energy access- for productive usage. Initially, scoping study in five villages in two districts of Odisha were conducted and based on the willingness to implement the project by the Panchayat, three sites were finalized. Figure 1 presents the overall process adopted for overall implementation of the project in the state.

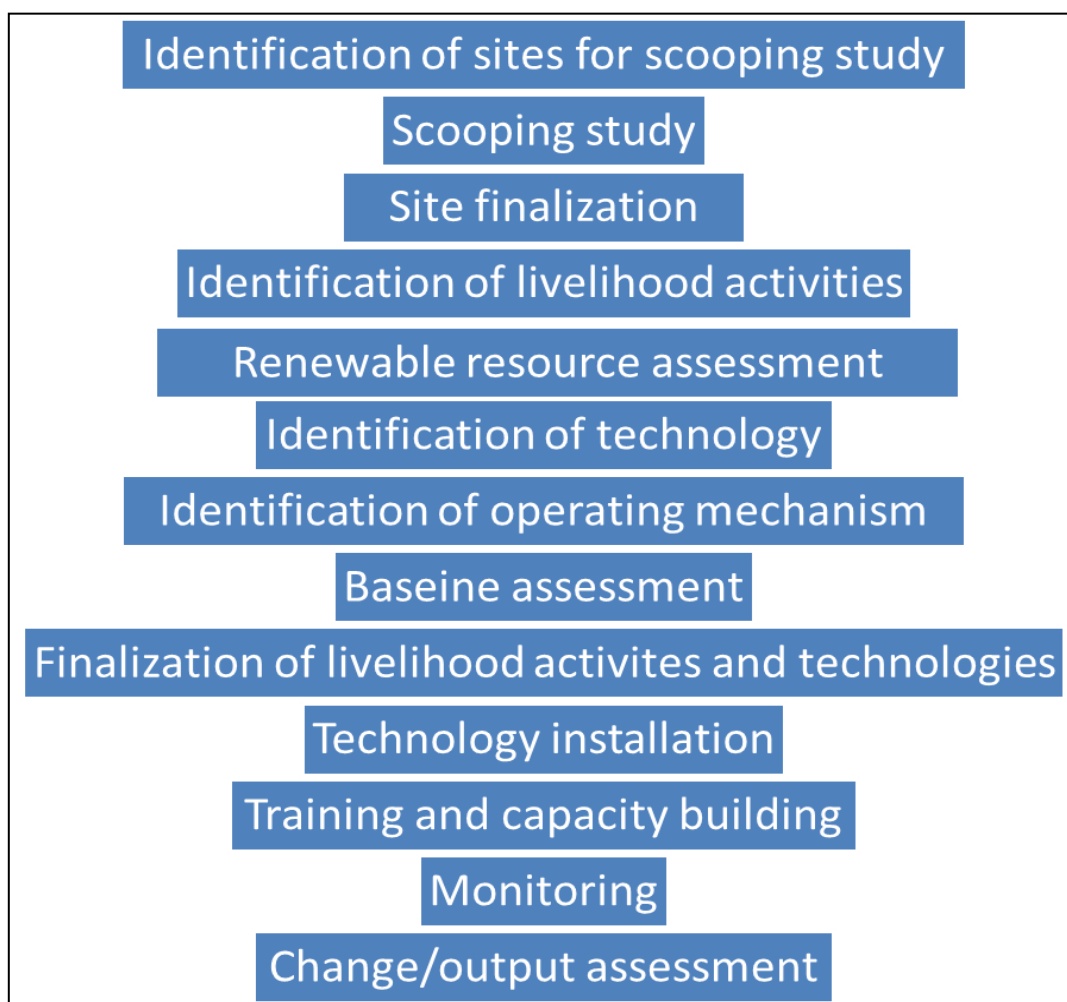


Figure 1 Approach towards project implementation

The analyses of scoping studies were presented in the separated report submitted to MFA during early 2012. Three sites were identified for implementation;

1. Village Baunsadiha, Block Thakurunda, District Mayurbhanj
2. Village Laxmiposi, Block Thakurmunda, District Mayurbhanj
3. Hamlet Potapolasahi, Village Kochila Nuagaon, Block Tangi-Choudwar, District Cuttack



Figure 2 Location of blocks

### 1.1 SCOPE OF THE REPORT

The report presents the baseline scenario at three levels. The report furthers on developing of methodology and final indicators for change/output assessment. Baseline scenario is reported at three levels;

1. Scenario at village level
2. Scenario of operating groups
3. Scenario at household level

The village level scenario is presented based on the key person's interviews (KPI) and focused group discussion. The village level scenario tries to capture the overall energy access issues in terms of electrification and for productive purpose, livelihood profile, basic amenities for health and drinking water, present market linkages existing in the village and village level institutions.

The scenario of operating groups provides for the present organization of the group, activity details, backward and forward marketing linkages, educational and skill status, and energy needs.

The unit level scenario provides for the detailed livelihood activities; major produces or products; employment status; marketing scenario; energy assess for basic lighting, cooking and productive usage; income security; migration; children's involvement in income generation activities; women's participation in household income and decision making; employability; health; education; and ownership of basic assets.

Based on the baseline reporting, the chapter draws energy needs, classified according to ownership at village, operating group and household level. The resource assessment and technology feasibility analysis finally identifies the technologies for installation.

The report furthers with the way forward chapters. Detailed approach, indicators and assessment tools to be followed during the change/output assessment process is discussed which draws inference from the baseline scenario. Another chapter proposes strengthening measures to implement the project at grassroots.

### 1.2 A BRIEF NOTE ON INSTITUTIONAL FRAMEWORK

The brief background would help in understanding the categorization adopted in the baseline analysis. TERI in partnership with SAMBANDH shall install the equipment and technology for power generation. Already existing village level institutions are identified to maintain and operate the systems. In total four institutions are identified;

1. Rajkusum Vaidya Sangha; an association of Traditional Herbal Practitioners in Kochila Nuagoan
2. Maa Malati Gramashree; a Self Help Group (SHG) in Baunsadiha
3. Ashwini Kumar VaidyaSangh; a cooperative of traditional healers in Baunsadhia
4. Netaji Farmers' Club; a cooperative in Laxmiposi

The operating groups are entrusted with the responsibility of maintaining and operating the multi utility centres. The operating groups shall process their produces in the multi-utility centres. The groups shall keep aside a decided share of profit for maintenance of the utility centre. Any end user can also avail the facilities in the multi utility centre by paying for the service decided by the operating group in cognizance with SAMBANDH.

TERI and SAMBANDH shall handhold the operating groups for a period of three years. A detailed retrospection of the institutional setup shall be conducted during output/change assessment survey.

## 1.3 SURVEY DESIGN

### 1.3.1 DEVELOPING OF INDICATORS

A set of indicators and sub indicators were developed based on secondary literature review and proposed project outcomes. A matrix was developed to list assessment pattern for each indicator. Tools were identified, developed and pretested during the reconnaissance visit to all the three sites in Odisha.

### 1.3.2 BASELINE LEVELS AND TOOLS

The baseline survey was conducted at three levels;

- a. **Baseline at Village level:** Village level information was collated using the tool Key Person's Interview. The format for the Key Person's Interview was based on the scoping study. The respondents were; Village Pradhan/ Panchayat Member/ School teacher (if residing in the village) and SHG leaders.
- b. **Baseline of Operating groups:** The baseline of the operating groups was captured through detailed focused group discussion. Format for the focused group discussion was pretested with one of the Self Help Groups at Mayurbhanj district.
- c. **Baseline at household level:** Baseline at household level comprised of two aspects;
  - i. **Livelihood details at household level:** Livelihood details were captured using a schedule with both open as well as close ended questions. The schedule primarily captured the livelihood activities, income from livelihood activities, available energy for productive purposes, felt and actual energy needs, alternate energy sources, technologies used and market linkages.
  - ii. **Household level quality of life:** The household level schedule to assess quality of life comprised of close ended questions with pretested options. The quality of life was assessed primarily with the objective to assess changes in the various spheres of life if energy for the productive usage is provided at village level.

### 1.3.3 SAMPLING

Random sampling technique was followed to assure unbiased representation from each site during the household survey. The sample size for each site was calculated considering confidence level of 95% and confidence interval of 5%.

Table 1 Sample size

Village	Total households	Total Sample size
BAUNSADIA	206	133
KOCHILA NUAGAON	36	33
LAXMIPOSI	56	48
TOTAL	298	214



Figure 3 Surveyors collating household level information

## 1.4 ANALYSIS FRAMEWORK FOR THE BASELINE REPORTING

The household level responses were categorised as;

1. Operating groups
2. End users

The basis of the categorization is the proposed institutional mechanism for operating the project. The household level schedule captured the information on affiliation of the household with the operating group. The sample households were then categorized into operating groups and end users.

The categorization would provide a basis to assess the level of change after a year separately among the operating and end users households.

Table 2 Categorization of sample households

Village	Total sample size (hhs)	Operating group (hhs)	End user (hhs)
BAUNSADIA	133	23	110
KOCHILA NUAGAON	33	5	28
LAXMIPOSI	48	34	14
TOTAL	214	62	186

The village level information is provided in qualitative terms while the scenario of the operating groups is presented as case study. The household level information is presented in quantitative terms assessed as proportion/ percentage of responses against the identified indicators and sub-indicators.

## 1.5 UTILITY OF THE REPORT

1. A database and analysis framework to measure change/output of the energy and technology interventions in different spheres of rural life such as
  - a. Income security
  - b. Livelihood activities
  - c. Drudgery
  - d. Employment pattern
  - e. Employability level
  - f. Migration
  - g. Energy usage for productive purpose
  - h. Energy usage at household level
  - i. Children's involvement in income generation
  - j. Role of women in income generation and decision making
  - k. General health
  - l. Education
  - m. Ownership of assets
2. Base data for finalization of methodology, sub indicators and tools for change assessment/output assessment to be conducted after a year of installation of technologies.
3. Information on renewable resource assessments and technology specification.
4. Reference for developing incremental plans in future.

## 2. SITUATIONAL ANALYSIS: REPORTING OF VILLAGE AND LIVELIHOOD PROFILE

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The chapter provides an overall profile of the intervention villages' profile.

### 2.1 LAXMIPOSI

Laxmiposi is a village in Thakurmunda Block of Mayurbhanj district in Odisha. The village houses 55 households and a population of nearly 500. Out of 55 households; 52 households belong to Schedule Tribe category and the rest 3 households belong to Other Backward Class (OBC) category. Habitation in the village is dispersed. A large stretch of agricultural land in the middle segregates the village into hamlets.

#### 2.1.1 VILLAGE PROFILE

The village is yet to be electrified however the village is covered under "Lighting a Billion Lives" (LaBL) Campaign, a lighting initiative of TERI. A village level entrepreneur operates the charging station, and lanterns are rented for INR 2.00 per day.

Although the land is fertile, lack of irrigation facility has been a constraint for agricultural development, as reported by the villagers. Of late (in 2008), the farmers of the village have organized themselves into Netaji Farmers' Club.

The villagers depend on the Public Health Centre (PHC) at Thakurmunda (18 Kms from Laxmiposi) that has the facilities of vaccination, check-ups, free distribution of basic medicines, blood tests and child delivery. The government health facility is affordable, however; problems occur with regards to non-availability of free medicine and lack of sanitation facility. Furthermore, bed is not available and in the absence of the facility of ambulance people face difficulty in taking the patients to hospital at Karanjia and SCB Medical College at Cuttack; on which they depend for treatment of critically ill patients. All-weather road is available in the village. Hand pumps and open wells are the source of drinking water in the village. There is no mobile charging centre in the village.

MGNREGS<sup>1</sup>, PDS<sup>2</sup> and Social Assistance Schemes like; Indira Gandhi National Old Age Pension (IGNOAP), Madhubabu Pension Yojana, Widow Pension are the government schemes operational in the village. SAMBANDH has been working in the village for the last 3 years on Agriculture Development and Horticulture Development (WADI) Project. SAMBANDH has also taken up the issues of streamlining service delivery under different schemes such as; MGNREGS & PDS promoting and encouraging a culture of demand based accountability among the community.

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<sup>1</sup> Mahatma Gandhi National Rural Employment Guarantee Scheme

<sup>2</sup> Public Distribution System

## 2.1.2 LIVELIHOOD PROFILE

Households are dependent on agriculture, agricultural wage labour, non-agricultural wage labour and forest produces. In general, adult members of the households are engaged in the livelihood activities. However, engagement indicates typical gender stereotyped division of labour. Women are mostly engaged in collection and sale of Non-Timber Forest Produces (NTFPs) and have access and control over the income. Almost all the households own land; but none of the households is able to meet its food requirements solely from home-grown production. Small size of the landholding and dependence on monsoon are cited as the reasons for inadequacy of the home-grown production. Therefore, all the households in the village are dependent on agricultural wage labour.

Majority of the households in Laxmiposi depend on Agriculture as their primary occupation, while; Collection and sale of NTFP such as; *Mahua* Flower, *Mahua* Fruit (Tola), Chara, *Saal* Leaves and *Kusuma* seed is the Secondary and Tertiary occupations of majority of the households. Cultivation of maize and vegetables in addition to Paddy explains for one-third of the households pointing out agriculture as their primary occupation and an equal proportion as their secondary occupation. Nearly 10 households sell their agricultural produce (Maize and Vegetables) in the market.

Agriculture is rain-fed. The agricultural calendar begins in June-July and continues till November-December. Paddy, maize and vegetables like tomato, eggplant and cauliflowers are grown. Paddy is cultivated in approximately 300 acres, maize in 15-20 acres and vegetables are grown in nearly 5 acres of land. Agricultural products are mostly sold directly in the market of Thakurmunda, a place at a distance of 8-9 kms from the village.

Households collect forest produces like; *Mahua* Flower, *Mahua* Fruit (*Tola*), *Chara*, *Saal* & *Siali* Leaves, *Jhuna*, *Kusuma* seed and Tamarind. More than three-fourth of the households in the village are engaged in collection and sale of *Mahua*; while 50 per cent of the households sell *Mahua* seed. Households consume *Mahua* oil for cooking which is manually extracted following the processes of drying, deseeding and crushing. 10 to 20 per cent of the households are engaged in collection and sale of *Saal* seed and *Kusuma*. **It is important to note that income from the NTFPs comes to the household when it is mostly starved of income from other sources.** At the same time, income from NTFPs is susceptible to the fluctuation of crop. In the absence of value addition to NTFPs and vulnerability of the primary collectors leaving them with no option but to sale at the price dictated by the buyers, the income is sub-optimal.

Quite a substantial proportion of each household's income comes from *Saal* Leaves. *Saal* leaves are collected and stitched into leaf plate and leaf cups which are sold to the wholesaler visiting the village. Almost all the households collect *Mahua* flower and after drying, it is either sold to the wholesaler or in the market of Thakurmunda which is at a distance of 8-9 kms. Some of the households (3 to 4) are also engaged in brewing and sale of country liquor which is prepared from *Mahua*. Similarly, some of the households (nearly 10) collect *Chara* (A fruit) and following drying; sell it either to the trader that comes to the village or sell it in the market at Thakurmunda. Income from collection and sale of *Chara*



doesn't contribute substantially to the household income and the produce is vulnerable to weather condition. 10-15 households are engaged in collection of *Jhuna* (A substance used as mosquito repellent). *Jhuna* is sold in the market at Thakurmunda. *Kusuma* seed is dried; deseeded and crushed for oil extraction which is (commonly called *Kusuma* Oil) sold either to the wholesaler or in the market at Thakurmunda. The entire chain of processing is done manually. Nearly 10 households who own Tamarind tree sell it either to the wholesaler or in the market at Thakurmunda. Villagers mostly sell the NTFPs directly in the market and at times, to the middlemen that come to the village.

Income from NTFP being an important source of income, value addition holds the promise of enhancing economic well-being and making the income sustainable.

Table 3 Distribution of households by primary, secondary and tertiary occupation in village Laxmiposi

Occupations	Primary	Secondary	Tertiary
Agriculture	32%	32%	10%
Salaried job in government and private sector	4%	-	-
Agricultural labour	12%	8%	2%
Non-Agricultural labour	12%	8%	8%
NTFP related	28%	50%	28%
Unskilled labour in Public Works	12%	-	12%
Pension/Remittance	-	-	2%
Livestock	-	2%	16%
<b>Source: Field Survey, 2012</b>			

Table 4 Distribution of households by livelihood activities in village Laxmiposi

Livelihood activities	Number of households	% of total households
Leaf Plate Making	43	90%
Mahua Seed	18	38%
Mahua	27	56%
Saal Seed	3	6%
Kusuma	3	6%
Poultry	5	10%
Dairy	3	6%
Goat rearing	7	15%
Total households surveyed	48	
<b>Source: Field Survey, 2012</b>		

Out of the 48 households surveyed in the village, 43 are found to be engaged in Leaf plate making, 18 households in collection & sale of Mahua seed, 27 households in collection and sale of Mahua and 3 households in collection and sale of Kusuma seed. Among the surveyed households, 5 households have sold poultry bird, 3 households reported sale of milk and 7 goats in the market.

Majority of the households with agriculture as their primary occupation earn in the range of INR 6000-18000 per annum. Rain fed subsistence agriculture doesn't provide scope for

marketization of agricultural produces beyond household consumption. Collection and sale of NTFP, engagement in salary based job and non-agricultural wage labour provide the households cash income.

There are two Retail Shops, three households are engaged in Carpentry, one household is engaged in Blacksmithy and 11 households depend on dairy in addition to agriculture. On an average, retail shop owners earn INR 1000-1500 per month, households engaged in carpentry earn INR 2000 per month, the household engaged in blacksmithy earns INR 1500 per month and households engaged in Dairy earn a net income of INR 2000-3000.

### 2.1.3 INFERENCE

It is important to note that all the sources of cash income except salary based job are vulnerable to fluctuations. Collection of NTFP depends on the weather conditions and furthermore, since they are sold without value addition, households don't have the scope to enhance their income. NTFPs sold without value addition are susceptible to price determination by the middlemen to the disadvantage of the primary collectors. Unorganized primary collectors, incapable of collective bargain are mostly at the receiving end. Non-agricultural wage labour another source of cash income has limited elasticity both in terms of capacity to provide employment and raise household income. Therefore, diversification of agriculture, increasing productivity, promotion of good agricultural practices and value addition to NTFPs taking into account use of appropriate technology and energy needs seem to be the way forward for dealing with the present situation of economic insecurity.

## 2.2 BAUNSAADIHA

Baunsadiha village is located in Thakurmunda block of Mayurbhanj district in Odisha. There are nearly 180 households in the village and the population is approximately 1000. The village comprises of 7 hamlets. Nearly 140 households belong to Schedule Tribe, 35-40 households belong to Other Backward Category and 2 households belong to Schedule Caste category. Habitation clustered in different hamlets is dispersed. Although clusters are not patterned on caste considerations, relative affluence of the households in Main *Sahi* (hamlet) is quite evident. Women of the households contribute to the income generation activities; mostly collection, manual processing and sale of NTFPs. Such active participation of the women of the households could be attributed to presence of women SHGs in the village.

### 2.2.1 VILLAGE PROFILE

The village is electrified; however, only 10 per cent of the households have availed the facility. Source of electricity is through Grid Connection. Consumers experience difficulties on account of scheduled power cuts as well as non-scheduled disruption in power supply. Scheduled power cut is for 2 hours during the day time and 2 hours in the evening; however, non-scheduled disruption creates much more difficulty. More than 90 per cent of the households engaged in leaf plate stitching don't have the facility of electricity. Women engaged in leaf plate making use kerosene lamp in the evening. Inconvenience arising out of

lack of lighting facility mostly restricts the working hours to day time. On the other hand, affording lighting facility is difficult on the part of the households. Members of Self Help Group (SHG) engaged in supply of *Sattu* to the *Aanganwadis* (Maa Malati SHG) face the problem on account of scheduled and non-scheduled disruption in power supply since they have to do the packaging (sealing the packets) manually instead of using electricity operated machine. The *Vaidyas* (Traditional healers) have no option but to travel to Jashipur, a place at a distance of 80 kilometres for grinding of raw materials and restrict their activity to day time.

There are 4 SHGs in the village; MaaMalatiGramashree, MaaTarini, Mahalaxmi (A) and Mahalaxmi (B). MaaMalatiGramashree has 18 members, MaaTarini has 15 members, Mahalaxmi (A) has 17 members and Mahalaxmi (B) SHG has 12 members. MaaMalatiGramashree SHG prepares Nutrition meal (*Sattu*<sup>3</sup>) and supplies it to Anganwadi Centres (AWCs) in 4 Panchayats. MaaTarini SHG has taken up the responsibility of Mid-Day Meal management. Mahalaxmi (A) has taken up Goat Rearing as income generation activity.

The village doesn't have PHC. The PHC is located at Thakurmunda which has the facilities of vaccination, check-ups, free distribution of medicines, blood tests and child delivery. Non-availability of bed, inability to access the health service providers in case of emergency and difficulty in accessing the facility of ambulance are some of the problems associated with the PHC.

The village has all-weather road. There is no provision of street light. The AWC of the village hasn't been electrified.

Open well (individual owned), pond (community owned) and bore well (Panchayat owned) are the water resources in the village. Hand pumps and stand posts are the sources of drinking water. The village doesn't have mobile charging centre. Biju Kutir Jyoti Yojana, MGNREGS, NSAP (Widow and Old Age Pension), Indira Awas Yojna and PDS are the government schemes operational in the village.

SAMBANDH and Centre for Youth and Sustainable Development (CYSD) are the Non-Governmental Organization (NGOs) working in the village. Activities on agriculture and horticulture development, dairy development, health and energy (LABL) have been taken up by the NGOs.

### 2.2.2 LIVELIHOOD PROFILE

Majority of the households in Baunsadiha depend on non-agricultural wage labour as their primary occupation, while collection and sale of NTFP such as *Saal*/Leaf (for leaf plate

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<sup>3</sup> Sattu are ground powders of pulses and cereals like horse gram (chana dal), green gram, jowar, wheat, oat, barley, etc. Sattu is consumed along with fruit slices, sugar or milk. Green chilli, lemon juice and salt are sometimes added as flavouring.

making), *Mahua* Flower and *Mahua* Fruit (Tola) is the Secondary occupation of majority of the households. Among all the Tertiary occupations, agriculture has been taken up by a majority of the households.

**Table 5 Distribution of households by primary, secondary and tertiary occupation in village Baunsadiha**

Occupations	Primary	Secondary	Tertiary
Agriculture	15%	19%	19%
Traditional Healing	1%	-	3%
Salaried job in government and private sector	7%	1%	1%
Agricultural labour	2%	1%	5%
Non-Agricultural labour	36%	7%	7%
NTFP	23%	54%	5%
Business	7%	1%	1%
Unskilled labour in Public Works	5%	7%	2%
Pension/Remittance	3%	1%	1%
Livestock	-	1%	1%

**Source: Field Survey, 2012**

Households are dependent on rain-fed agriculture. Nearly 50 per cent of the households own cultivable land. However, among the landowning households a few (less than 10 per cent) are able to meet their household food requirements from home grown production. While almost all the households depend on forest produce like *Saal* Leaf, *Mahua* Flower, *Mahua* Fruit, *Saal* Seed and *Chara*, not less than 50 per cent of the households depend on wage labour both agricultural and non-agricultural (stone crushing) as their primary occupation. Nearly 40 households have taken up stone crushing as their primary occupation. 7-8 households own retail shops, 3-4 households are engaged in Carpentry and only 2 households have taken up Dairy. On an average households engaged in stone-crushing earn Rs. 1000-1500 per month, retail shop owners earn Rs. 1500-2000 per month, carpenters earn Rs. 1000-1500 per month and those engaged in dairy earn Rs. 1500-2000 per month.

Households depend on the forest produces and majority of the households point out collection, manual processing and sale of NTFPs as their secondary occupation. In some cases, delineation of NTFP collection and sale as the secondary occupation by the households looks like an underestimation of the resource, since it engages the members, especially the women members, and contributes significantly to the household income. *Saal* leaves stitched into leaf plate, *Mahua* flower dried following collection, *Mahua* fruit dried and deseeded, *chara* dried after collection are sold to the middleman who sells them to the wholesaler and often to the visiting middlemen that come to the village. It is no wonder that landowning households with agricultural production inadequate to meet the household food requirement point out agriculture either as secondary or tertiary occupation.

Table 6 Distribution of households by livelihood activities in Village Baunsadiha

Livelihood activities	Number of households	% of total households surveyed
Leaf Plate Making	112	84%
Mahua Seed	3	2%
Mahua	5	4%
Bamboo utility items	3	2%
Kusuma	3	2%
Traditional herbal practitioner	4	3%
Total households surveyed	134	

Source: Field Survey, 2012

Agriculture is rain-fed and small landholdings barely generate surplus cereal to be sold in the market. Paddy is the primary crop that is cultivated by most of the cultivating households. Paddy is cultivated in 500 acres of land. Paddy cultivation begins in the month of June-July and the crop is harvested in the month of November-December. In the absence of irrigation facility, productivity is limited within the average of 8 quintals per acre. Cultivation of wheat has been taken up by some farmers on experimental basis since the land is suitable for cultivation of the crop. Wheat is cultivated in 2-3 acres of land which has the agricultural calendar of December-January to March-April. Vegetables like tomato, eggplant, cauliflower, potato and peas are cultivated in 20-25 acres of land which is done during September-December, mostly for household consumption except for 10-15 households who sell their produce in the market of Thakurmunda. In other words, the village is not a major vegetable producing village of the area. The village is not a major vegetable producing village of the area.

Paddy is sold in regulated market. Vegetables are sold to the middlemen who sell them in the open market at Thakurmunda which is at a distance of 3 kms. Central Cooperative at Thakurmunda is a government run Cooperative which supports agricultural development and paddy procurement.

Women involvement in economic activity with regards to collection, manual processing and sale of NTFPs seems to be a reason for the ease with which women have taken up group based activities. Another fact that stands out the most is the level of literacy among the members of the groups and educational attainment among some of the members. Proximity to the block headquarters, availability of handholding support and access to administration could be attributed to effective functioning of the SHGs.

Out of the 134 households surveyed in the village, 112 are found to be engaged in leaf plate making, 3 households in collection & sale of *Mahua* Seed, 3 households in collection and sale of *Mahua* and 4 households with herbal practitioners. Collection and manual processing of NTFP is primarily the economic activity of the women of the households. *Mahua* another NTFP that provides income to the households is susceptible to the weather condition and income of the households varies accordingly. 3 such households are engaged in production of bamboo utility items which is sold in the market at Thakurmunda. Among the herbal practitioners there are a few trainees who work in close association with an experienced practitioner. The trainees help in collection of raw materials, preparation of medicine and spreading the message; while they gain knowledge on treatment and preparation of

medicine. Needless to mention, the experienced herbal practitioner earns much more than a trainee practitioner.

### 2.2.3 INFERENCE

Among all the occupations, collection and sale of NTFP has primacy with more than three-fourth of the households selecting it either as their primary or secondary occupation. However, among the households with NTFP collection and sale as their primary occupation; a majority earn Rs. 6000-12000. Creation of scope for value addition in leaf plate making and scoping options and opportunities for alternative livelihoods that could engage women, who are at present engaged in leaf plate making; need to be taken up for enhancing household income. To elaborate, manual stitching of leaf plate restricts volume of production, consumes time and fetches far less price compared to leaf plates stitched with machine. Plates of *Saal* leaf pressed on hard paper has market demand, requires lesser Sal leaf and fetches higher price in the market which could be taken up selecting appropriate technology option fulfilling the energy needs.

## 2.3 POTAPOLASAH

Potapolasahi is a hamlet of Kochila Nuagaon village that comes under Mangarajpur Panchayat of Tangi-Choudwar block in Cuttack District. The Block headquarters is at a distance of 25-30 kms from the village and the district headquarters i.e.; Cuttack is at a distance of 32 kms. There are 35 households in Patapolasahi with a population of 180. All the households except 1 household belong to Schedule Tribe i.e.; Munda.

### 2.3.1 VILLAGE PROFILE

Patapolasahi was connected with grid only last three months back under Biju Kutir Jyoti Yojana. People suffer on account of disruption in power supply; both scheduled and un-scheduled. Two hours of power cut in the evening is scheduled, but power cut during the day time in non-scheduled. Disruption in power supply causes inconvenience, affects the study of the school going children and restricts mobility after sun set, but; doesn't have direct impact on the livelihoods of the people. On the other hand, interruption in power supply makes the expansion plan of production centre of Healing Heritage (A producers company processing herbal medicines and products) on hold restricting the scope for employment of the people in the village.

Berena (adjoining hamlet) has a school for students' up to Class III. High School in Mangarajpur is at a distance of 5-6 kms. At least 2 Traditional Herbal Practitioners (THPs) are available in each of the hamlets of the village. All these THPs have been trained by SAMBANDH. Traditional Herbal Practitioners treat Jaundice, Fever, Migraine and other minor health problems. The nearest PHC located at Mangarajpur has the facility of vaccination, check-ups, free distribution of medicines, blood tests and child delivery. Since SCB Medical College, Cuttack is at a distance of 32 kilometres, people avail the facility on the occasions of emergency and criticality.

People of Patapolasahi depend on *Chuan* (shallow aquifers) for drinking water; while people of Berena depend on *Chuan* and hand pump. Biju Kutir Jyoti Yojana,

MGNREGS, NSAP (Widow and Old Age Pension), Indira Awas Yojna (IAY) and PDS are the government schemes operational in the village.

Only one SHG of the village is engaged in savings and credit activities. Most of the households in the village are engaged in agriculture. Youths of the hamlet are members of Hatiasuni Youth Club. The Youth Club organizes sports events. People of the hamlet are also members of Maa Damdamani Jungle Suraskhya Samiti (VanaSangrakhyanSamiti) that protects 260 hectares of village forest. Activities on promotion of Organic Farming and Health have been taken up by SAMBANDH.

### 2.3.2 LIVELIHOOD PROFILE

Majority of the households in Potapolasahi depend on agriculture as their primary and secondary occupations while; animal husbandry has been taken up as the tertiary occupation by majority of the households. Non-agricultural wage labour (in stone quarry, production centre of Healing Heritage and Poultry Farm) is the primary occupation of one-fifth of the households. Agriculture being rain-fed engages most of the households during rainy season when work in stone quarry grinds to a halt. Households work in stone quarry when there is hardly any work available in agriculture. Poultry farm located in the vicinity also provides employment in the lean season. To sum up, workforce of the village shift their economic activity between engagement in agriculture and non-agriculture depending on the season with opportunities available for employment in a major part of the year.

**Table 7 Distribution of households by primary, secondary and tertiary occupation in village Potapolasahi**

Occupations	Primary	Secondary	Tertiary
Agriculture	39%	39%	6%
Traditional Healing	-	3%	3%
Job	18%	6%	3%
Agricultural Labour	6%	12%	-
Non-Agricultural Labour	21%	3%	-
Business	-	6%	3%
Unskilled Labour in Public Works	12%	12%	9%
Pension/Remittance	-	6%	-
Animal Husbandry	-	6%	15%

*Source: Field Survey, 2012*

Paddy, black gram and horse gram are the primary crops grown by the cultivators. Nearly one-third of the households own land and the rest are share-croppers. Cultivation of paddy follows the agricultural calendar of June/July-November/December. Most of the land owned by the cultivators of Potapolasahi are rain-fed and are therefore; cultivated once in a year. However, as share croppers the cultivators of Potapolasahi grow paddy twice in a year i.e.; June-July-November/December and January/February-April on the lands owned by the

people of Kochilapada. A share cropper is entitled to get half of the yield with all the expenses on input borne by the share cropper. A few households grow vegetables for household consumption and it is grown mostly during July-December. Vegetables meant for household consumption are grown in the backyard with almost no scope available for commercial cultivation.

Almost all the households depend on wage labour. Stone quarry provides casual wage labour to the people throughout the year except in the rainy season. The wage labourers are paid INR 100-150 per day. Production Centre of "Healing Heritage" located in the vicinity also provides employment on daily wage basis to 5-6 persons. Income from livestock (Poultry & Goat Rearing) addresses the need of unforeseen emergency expenses.

Out of the 33 households surveyed in the village, four are found to be engaged in goat rearing, six households in poultry and two households in collection of medicinal herbs. Income from animal husbandry (Goat rearing and poultry) addresses the emergency financial needs of the households.

Non-agricultural wage labour provides the households in Potapolasahi the scope for cash income. Of all the households engaged in non-agricultural wage labour as their primary occupation, more than half earn INR 18000-22000 and nearly one-third earn more than INR 22000. The limitation of rain fed subsistence agriculture is evident in nearly one-third of the households engaged in agriculture and all the households engaged in agricultural labour earning less than INR 6000. Non-agricultural wage labour in stone quarry and poultry farm provide employment for a good part of the year to the workforce which is borne out by the fact that 54 per cent of the households reporting non-agricultural wage labour as their primary occupation earning INR 18000-22000 and another 28 per cent earning more than Rs. 22000.

### 2.3.3 INFERENCE

Agriculture and labour work are the primary occupation in the village. Irrigation and incorporation of a livelihood activity are the possible means for enhancing existing livelihoods in the villages.

## 2.4 KEY POINTS

1. Poor electrification status is indicated in all the three villages leading to limiting of livelihood activities to daytime.
2. Usage of energy for livelihood activities is negligible.
3. NTFPs provide livelihood to majority of the households indicating immediate impact if value addition processes and technologies for NTFPs are introduced.
4. Rain-fed agriculture is practiced in all the three villages limiting the production to one season and self-consumption.



5. Market linkages exist in case of NTFPs and agricultural produces.
6. Infrastructure and service delivery related to health, education and streetlight are a matter of concern.
7. State and NGO presence is indicated in the village as far as development activities are concern.
8. Active presence of village level institutions is reported in all the three villages.



### 3. SITUATIONAL ANALYSIS: REPORTING OF BASELINE

Starting with demographic details, the chapter reports baseline scenario of all three villages against the indicators;

1. Livelihood<sup>4</sup> status
2. Employment<sup>5</sup> status
3. Functional literacy and training
4. Involvement of women in economic activities
5. Cooking Energy
6. Household lighting
7. Fuel usage in livelihood activities
8. Education level
9. Health
10. Ownership of assets

#### 3.1 DEMOGRAPHY

As per the survey design (chapter 1), 133 households were surveyed in and adjoining areas of village Baunsadiha. The corresponding figures for Village Laxmiposi and Kochila Nuagoan are 48 and 33 respectively. The demographic details of the sample households provide an insight on distribution of age groups and genders across the benefiting households.

Table 8 provides gender distribution across the end users and operating group households. The skewed distribution is observed in case of Kochila Nuagoan. However, the overall gender distribution standing at 99 females benefiting per 100 males indicates that a balanced impact on quality of life can be expected if compared through gender lens.

**Table 8 Gender distribution across benefiting households**

Category	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI	
	Male	Female	Male	Female	Male	Female
End user	270	301	101	75	103	93
Operating group	72	68	20	20	41	46
<b>Grand Total</b>	<b>342</b>	<b>369</b>	<b>121</b>	<b>95</b>	<b>144</b>	<b>139</b>

<sup>4</sup> The working definition of livelihoods adopted for the study is “A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a living” (Robert Chambers and Gordon Conway, 1992)

<sup>5</sup> The “employed” comprise all persons above a specified age who during a specified period were in the following categories; (a) paid employment and (b) self-employment

The percentage of the working age group population (15 to 60 years) stands at 62 among the end users as well as operating groups respectively (Refer table 9). The rest of the population is expected to derive benefit in terms of better health care and nutrition, if the working age group population is able to enhance income levels through the SMUs. Table xx represents age distribution across the two categories of households. A detailed demographic scenario is presented at table 10.

**Table 9 Distribution of dependent and working age population among the benefiting households**

Category	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		TOTAL
	End user	Operating group	End user	Operating group	End user	Operating group	
Male dependent (0-14 and above 60 years)	91 (34%)	25 (35%)	51 (50%)	8 (40%)	40 (39%)	15 (37%)	230 (38%)
Female dependent (0-14 and above 60 years)	109 (36%)	21 (31%)	32 (43%)	10 (50%)	35 (38%)	21 (46%)	228 (38%)
Male working (15 – 60 years)	179 (66%)	47 (65%)	50 (50%)	12 (60%)	63 (61%)	26 (63%)	377 (62%)
Female working (15 – 60 years)	192 (64%)	47 (69%)	43 (57%)	10 (50%)	58 (62%)	25 (54%)	375 (62%)
<b>TOTAL Male</b>	<b>270</b>	<b>72</b>	<b>101</b>	<b>20</b>	<b>103</b>	<b>41</b>	<b>607</b>
<b>TOTAL Female</b>	<b>301</b>	<b>68</b>	<b>75</b>	<b>20</b>	<b>93</b>	<b>46</b>	<b>603</b>

**Table 10 Distribution by age in absolute terms across the villages and respondent categories**

Age group	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Male (0-6)	29	13	16	4	8	6	76
Female (0-6)	41	10	13	2	12	7	85
Male (7-14)	40	6	25	4	28	4	107
Female (7-14)	44	9	14	7	16	9	99
Male (15-17)	25	3	8	1	14	3	54
Female (15-17)	21	4	2	2	9	2	40
Male (18-35)	92	27	30	6	27	15	197
Female (18-35)	111	24	25	5	30	18	213
Male (36-60)	62	17	12	5	22	8	126
Female (36-60)	60	19	16	3	19	5	122
Male (< 60)	22	6	10	0	4	5	47
Female (< 60)	24	2	5	1	7	5	44

An assessment of below poverty line (BPL) households was made on the basis of the fact whether the household possess BPL ration card or not. Table 11 indicates that a considerable representation of BPL card holders among the operating groups as well as end users in the

villages Baunsadiha and Kochila Nuagoan. As the application to issuance for BPL ration card may take a considerable time, this particular indicator may not show any variation within the timeframe of 1-2 years thus negating the scope for incorporation of the indicator during output assessment.

**Table 11 BPL Card holders in absolute and percentage (with base as total households surveyed in the category and village)**

Village	End user	Operating group
BAUNSIADIA	83 (72%)	19 (73%)
KOCHILA NUAGAON	19 (16%)	4 (15%)
LAXMIPOSI	14 (12%)	3 (12%)
<b>Grand Total</b>	<b>116</b>	<b>26</b>

## 3.2 LIVELIHOOD STATUS

The existing livelihood scenario is assessed by capturing the primary and secondary income source for the past 365 days. In total the Primary and secondary income sources are categorized into 15 sections and their distribution is presented at table 12 and table 13.

### 3.2.1 PRIMARY INCOME SOURCE

Majority of the benefiting households (35%) indicated that the major share of the household income comes from casual labour work at construction sites. The casual labour work is available only if any construction work is going on in any nearby area. A major proportion of benefiting households depending on an irregular income source demands for development of a comprehensive livelihood development plan.

Almost 24% of the benefiting households reported farming either in own or leased in land as primary income source. However, the households are not able to produce marketable surplus. The total paddy produced was converted into market price of paddy in the last year at the rate of INR 1000 per quintal. The conversions are not carried for any other crop or horticultural produce.

Collection and sale of Non-Timber Forest Produce (NTFP) is reported by 18% of the households as primary income source. None of the respondents from Kochila Nuagoan reported NTFP as primary income source of the household. Only one respondent indicated traditional healing as primary income source.

Small business in the case refers to owning businesses such as grocery shop, tea shop, cycle repair shop etc. About 5 households prepare handicraft products made of bamboo such as basket, mats to sell in local market or haat.

**Table 12 Distribution of households based on primary income source**

	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Labour work in industry/ public works	45 (41%)	5 (22%)	8 (29%)	2 (40%)	14 (41%)		74 (35%)
Farming on own agricultural land/leased in land	16 (15%)	4 (17%)	10 (36%)	3 (60%)	9 (26%)	10 (71%)	52 (24%)
Collection and sale of NTFP - Non-timber forest produce	25 (23%)	6 (26%)			6 (18%)	2 (14%)	39 (18%)
Labour work in agriculture	3 (3%)		3 (11%)		4 (12%)	1 (7%)	11 (5%)
Government service	4 (4%)		4 (14%)			1 (7%)	9 (4%)
Owns small business	5 (5%)	2 (9%)	1 (4%)				8 (4%)
Pension / remittance/ investment in banks	1 (1%)	3 (13%)	1 (4%)				5 (2%)
Production and sale of handloom/handicraft products	5 (5%)						5 (2%)
Regular service in private sector/industry	3 (3%)		1 (4%)				4 (2%)
Leases out agricultural land	1 (1%)				1 (3%)		2 (1%)
No income source		1 (4%)					1 (0%)
Others		1 (4%)					1 (0%)
Provides health services/ traditional healing/local doctor		1 (4%)					1(0%)
Rentals	1 (1%)						1 (0%)
Works in shop/restaurant/tea shops/sweet shops	1 (1%)						1 (0%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total in the category for village

### 3.2.2 SECONDARY INCOME SOURCE

Second largest share of income comes from collection and sale of NTFP produces, reported 44 % of the households. None of the respondents from Kochila Nuagoan reported NTFP as primary income source of the household. Farming in own/leased in land is secondary income source for 20% of the households. 17% of the households partially depend on labour work in construction sites and agricultural fields. Only one household reported traditional healing as secondary income source.

**Table 13 Distribution of households based on secondary income source**

	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Collection and sale of NTFP - Non-timber forest produce	61 (55%)	7 (30%)			17 (50%)	9 (64%)	94 (44%)
Farming in own agricultural land/ leased in land	12 (11%)	5 (22%)	9 (32%)	2 (40%)	11 (32%)	4 (29%)	43 (20%)
Labour work in industry/public works	15 (14%)	3 (13%)	3 (11%)			1 (7%)	22 (10%)
Labour work in agriculture	5 (5%)		3 (11%)	1 (20%)	5 (15%)		14 (7%)
Others	3 (3%)		7 (25%)				10 (5%)
None	4 (4%)	2 (9%)	2 (7%)				8 (4%)
Owns small business	2 (2%)	3 (13%)	1 (4%)		1 (3%)		7 (3%)
Pension / remittance/ investment in banks	2 (2%)		3 (11%)				5 (2%)
Production and sale of handloom/handicraft products	3 (3%)						3 (1%)
Leases out agricultural land	1 (1%)	1 (4%)					2 (1%)
Regular service in private sector/industry		1 (4%)		1 (20%)			2 (1%)
Works in shop/restaurant/tea shops/sweet shops	1 (1%)			1 (20%)			2 (1%)
Government service	1 (1%)						1 (0%)
Provides health services/ traditional healing/local doctor		1 (4%)					1 (0%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total in the category for village

### 3.2.3 LIVELIHOOD CATEGORIES FOR INTERVENTIONS

A close look at the table 12 and table 13 indicates that a major proportion of household (above 80%) depends on farming, NTFP and labour work for income generation. Considering the core objective of the project of enhancing existing livelihoods, the project interventions shall directly or indirectly support;

- Farming in own agricultural land/ leased in land
- Collection and sale of NTFP - Non-timber forest produce
- Labour work in industry/ public works
- Labour work in agriculture

### 3.2.4 AGRICULTURE AS LIVELIHOOD SOURCE

Rainfed agriculture is practised in the area. An assessment was made only for the produces were marketable surplus was reported.

In general paddy is used for home consumption while vegetables are marketed. Only six households reported to sell paddy either to wholesalers where the marketable quantity ranged between 8-10 quintals for a year. One household producing 150 quintals of marketable surplus sold paddy to a cooperative. Wholesalers buy paddy at the cost of INR 1000-1020 per quintal while the procurement price of cooperative is reported as INR 1080. The team didn't captured information on quality or variety of paddy.



**Figure 5** Agriculture for self-consumption is the major source of livelihood



**Figure 4:** An old lady making brooms to sell in market

Cashew nut is cultivated by two households and each household cultivated about 1-2 quintals of cashew nut in the last year. The raw nuts were sold to a wholesaler visiting the village at the cost of INR 60/kg.

Mango is cultivated by only one household in Baunsadiha village which managed to produce one quintal of mangos. The produce was sold to a wholesaler visiting the village at the cost of INR 10/ Kg.

Only four households reported to market eggplants at local haats at the cost of INR 20 per kg. One household managed to cultivate and sell 100 Kgs of eggplants. Other vegetables/fruits sold are jackfruit (INR 2/ Kg), lemon (INR 10/Kg), and green leafy vegetables (INR 10/Kg).

At present scenario, the only post-harvest technology used and need felt by the households is a paddy dehusker.

### 3.2.5 NTFP AS LIVELIHOOD SOURCE

Collection and sale of NTFP is reported as one of the major primary as well as secondary income source. Table 14 consolidates the processing and marketing of NTFP products. All the households who reported NTFP as primary or secondary income source collects *Saal* leaves. The leaves are sun dried, pressed using large stones as weights and then stitched manually to make leaf plates. Wholesalers visit the village and buy at a cost of INR 100 for 1000 leaf plates. Minimum and maximum quantity sold in the past 365 days reported by the households' ranges between 12000 and 40000.



Bamboo baskets, brooms, honey, *Satabari* (medicinal leaves) and *Bahada* (medicinal leaves) are sold in village *haats*. Dried *Mahua* seeds, dried *Saal* seeds and dried *Kusum* seeds are procured by wholesalers visiting the villages. Only one household reported to extract oil from *Kusum* seeds which is procured at the cost of INR 120 per litre whereas *Kusum* seeds are procured at the rate of INR 5 per Kg.

Looking at the existing processing practices of the NTFPs, the technologies providing the following facilities would be preferred:

1. Drying and pressing of *Saal* leaves
2. Stitching of *Saal* leaves for making leafplates
3. Oil extraction of *Kusum* seeds
4. Drying of seeds

**Table 14 Processing and marketing of NTFP products**

NTFP	Processing	End products	Market	Distance of market	Quantity in past year*	Selling price (INR)
<i>Saal</i> Leaf	Stitching (Manual)	Leaf plate	Wholesaler visiting the village		12000-40000 plates	INR 100 / 1000 plates
Bamboo	Basket making	Basket	Local <i>haat</i>	5-10 Kms	200 baskets	Rs. 5-8/ basket
Broom Grass	Binding (Manual)	Broom	Local <i>haat</i>	5-10 Kms	200 brooms	
Honey			Local <i>haat</i>	5-10 Kms		
<i>Satabari</i> and <i>Bahada</i>	Sun drying	Dry leaves	Local <i>haat</i>	5-10 Kms		
<i>Mahua</i> flower	Brewing	Liquor	Local <i>haat</i>	5-10 Kms		120/ lit
<i>Mahua</i> seed	Drying, deseeding	Dry <i>mahua</i> seed	Wholesaler visiting the village		50 kg - 2 quintal	8-10/ kg
<i>Kusum</i> seed	Deseeding	Dry <i>Kusum</i> Seed	Wholesaler visiting the village		10 kg	5/ kg
<i>Kusum</i> seed	Oil extraction	<i>Kusum</i> Oil	Wholesaler visiting the village		3 lit	120/ lit
<i>Saal</i> seed	Deseeding	Dry <i>Saal</i> Seed	Wholesaler visiting the village		2 kg-2 quintal	5-10/ kg

\*The quantity reported is the range households reported to sell in the past 365 days

Market for *Saal* leaf plates already exists in the area. However, if the equipment for above mentioned functions is installed, marketing channel needs to be strengthening for *Kusum* oil and dried seeds.



Figure 6 *Saal* leaf plates are one of the major sources of cash income

Only two households where traditional healing is reported as primary and secondary income source mentioned of collection of medicinal plants from forests. The traditional healers (locally called *Baidya*) prepare medicine for treatment of Arthritis, Paralysis and Blood Pressure. For preparation of the medicines the *Baidya* either collects the raw materials or engages wage labourers or purchases the raw materials from the market. The raw materials are; *Rakta Chandan, Sweta Chandan, Jai Phala, Jaitri, Jai Patri, Kankada Shrunghi, Jeera, Pippali, Maricha, Shunthi, Rasana, Guluchi, Bena Chera, Garagada, Kuiliakha Manji, Koikanda, Padma Alu, Padma Keshar, Padma Kastha, Agar, Bhuian Anla, Gokhura, Nila Pushpa, Dasakerenta, Pasharuni, Phenaphena Chhali, Gambhari Chhali, Sunari Chhali, Patali Chhali, Ashwagandha, Sugar, Honey*. Raw materials like; *Salapani, Krushnapani, Bena Chera, Phenaphena Chhali, Gambhari Chhali, Sunari Chhali, Patali Chhali* and *Ananta Mula* are collected from the forest. All other raw materials mentioned above are purchased from the market. *Rasnadi Guggula Goti* is prescribed for Arthritis. *Rasna, Guggula* and *Ghee* are used as ingredients for preparation of the medicine. *Bataraj Goti* is prescribed for Paralysis. *Kochilakhai Manji* powder, *Pepper* powder and *Betel Juice* are used as ingredients for preparation of the medicine. For treatment of Blood Pressure the medicine is prepared using *Patala Garuda Powder, Bacha Powder, Pepper, Rasa Sindur* and *Brahmi Juice*. Patients both of the district and outside the district come for treatment. The *Baidya* sells approximately 15 kgs of medicine in a year. The medicine is sold at a price of Rs 500 per kg.

### 3.2.6 TRADITIONAL HEALING

About six households reported to practice traditional healing though the practice is not providing in remuneration to be counted among primary or secondary income source. One household reported to treat 150-200 patients in a month while the corresponding figures reported by other five households are less than 10.

### 3.3 EMPLOYMENT STATUS

The two major livelihoods, collection and sale of NTFP produce and agriculture for self-consumption involves almost all the adult members of the households to participate in income generation activities. The cause is expected for the response towards the indicator on males/females searching for income generation activities or not involved in any income generation activities. In total only 8% of males and 7% of females reported to search or not involved in any sort of income generation activities (Refer table 15).

**Table 15 Employment status**

	BAUNSDIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Male ( above 18) in income generation activities	164(92%)	42 (89%)	42 (100%)	9 (82%)	57 (90%)	25 (96%)	347 (92%)
Male (18-60) searching for Income generation activities/ not involved in income generation activities	15 (8%)	5 (11%)	0	2 (18%)	6 (10%)	1 (4%)	30 (8%)
Male (18-60 years)	179	47	42	11	63	26	377
Female (above 18) in income generation activities	175 (91%)	46 (98%)	38 (93%)	8 (100%)	53 (91%)	25 (100%)	349 (93%)
Female (18-60) searching for Income generation activities/ not involved in income generation activities	17 (9%)	1 (1%)	3 (7%)	0	5 (9%)	0	26 (7%)
Female (18-60 years)	192	47	41	8	58	25	375

Note: the figure in parentheses indicates % with base as total in the category for village

Table 16 provides members migrated to other villages or towns for employment. The reasons of migration were not probed. However, a general observation and informal discussion with the community highlighted quality and regular paying jobs for the skilled and educated in towns, jobs in armed forces, more labour work opportunities in cities as the reasons for migration. **Looking at the wide range of reasons instilling from higher education to dearth of quality job at local level, the indicator may be excluded from the list of output assessment.**

**Table 16 Members migrated to other villages/ towns for employment**

BAUNSDIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
End user	Operating group	End user	Operating group	End user	Operating group	
21	7	8	2	19	2	59

Rainfed agriculture, reported as one of the primary and secondary income source by majority of the households indicates dependency on seasonal employment. Again, though inappropriate to mention NTFP based livelihood as seasonal, the rains affect collection and drying of Saal leaves and other seeds.

An examination on the members aged between 7 and 14 years involved in income generation activities reveal that in 14% of the households children participate full time in income generation activities leading to absence from school (Refer table 17). The reason may also lead to school dropout. 23% households reported that children help in income generation either during a part of the day or occasionally. The Solar multi utility centre if is able to reduce drudgery or time involvement in present activities may result in fewer households stating participation of children in full time basis.

**Table 17 Level of involvement of members (aged 7-14 years) in income generation activities**

Level of involvement	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group		Operating group	
Full time	16 (15%)	3 (13%)	2 (7%)	1 (20%)	7 (21%)	1 (7%)	30 (14%)
Occasional	8 (7%)		4 (14%)		8 (24%)		20 (9%)
Part time	14 (13%)	2 (9%)	2 (7%)	2 (40%)	7 (21%)	3 (21%)	30 (14%)
<b>Grand Total</b>	<b>38 (35%)</b>	<b>5 (22%)</b>	<b>8 (29%)</b>	<b>3 (60%)</b>	<b>22 (65%)</b>	<b>4 (29%)</b>	<b>80 (37%)</b>
<b>Total households surveyed</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total in the category for village

### 3.4 FUNCTIONAL LITERACY AND TRAINING

The baseline study tried to capture the employability status in terms of basic literacy and any vocational/formal training. Table 18 indicates a fair level of functional literacy among adult men and women belonging to operation groups indicating ease for using user friendly literatures during training. Only 2 % of adult males and 1 % of adult females received any formal or vocational training. **As the project barely has any component on adult literacy the indicator shall be excluded from the indicators list for output assessment.** However, the number of adults receiving any training related to operations and maintenance of SMU shall provide as assessment of change in skill level.

**Table 18 Status of functional literacy and formal training among the adult members**

Literacy and training status	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Functionally literate adult males (18-60 years)	105 (59%)	34 (72%)	25 (60%)	7 (64%)	29 (46%)	23 (88%)	223 (59%)
Adult males (18-60 years) who received any vocational training	2 (1%)	1 (2%)	3 (7%)	0	0	1 (4%)	7 (2%)
Total male (18-60 years)	179	47	42	11	63	26	377
Functionally literate adult females (18-60 years)	62 (32%)	25 (53%)	15 (37%)	2 (25%)	17 (29%)	20 (80%)	141 (38%)
Adult females (18-60 years) who received any vocational training	0	2 (4%)	0	1 (13%)	0	1 (4%)	4 (1%)
Total female (18-60 years)	192	47	41	8	58	25	375

Note: the figure in parentheses indicates % with base as total in the category for village

### 3.5 INVOLVEMENT OF WOMEN IN ECONOMIC ACTIVITIES

Women’s involvement in economic activities were assessed based on their involvement in buying of raw materials and equipment, selling of produce, expenditure on food and cloths; and expenditure on children’s education. Only seven households reported no involvement of adult females in any of the above mentioned activities. Table 19 provides the information in absolute terms. The information shall be used as base by the gender expert while assessing the level of female participation in the SMU related activities and change in the level of their involvement in economic activities.

**Table 19 Distribution of households by women's involvement in income generation activities**

Women's involvement in income generation activities	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Buying necessary raw material	1 (2%)	1 (4%)			1 (3%)		3 (1%)
Buying necessary raw material, Expenditure on food and clothes	2 (2%)		2 (7%)		2 (6%)	1 (7%)	7 (3%)
Buying necessary raw material, Expenditure on food and clothes, Expenditure on education	6 (5%)		1 (4%)		2 (6%)		9 (4%)
Buying necessary raw material, Selling of produce	11 (10%)	1 (4%)		1 (20%)	7 (21%)	2 (14%)	22 (10%)
Expenditure on education	1 (1%)	1 (4%)					2 (1%)
Expenditure on food and clothes	5 (5%)	9 (39%)	7 (25%)		3 (9%)	2 (14%)	26 (12%)
Expenditure on food and clothes, Expenditure on education	27 (25%)	5 (22%)	17 (61%)	4 (80%)	11 (32%)	7 (50%)	71 (33%)
None	3 (25%)		1 (4%)		1 (3%)	2 (14%)	7 (3%)
Selling of produce	44 (40%)	3 (13%)			7 (21%)		54 (25%)
Selling of produce, Expenditure on food and clothes, Expenditure on education	10 (9%)	3 (13%)					13 (25%)
<b>Total households surveyed</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>



**Figure 7 Females working in agricultural fields**

### 3.6 INCOME SECURITY

Income levels are defined based on the cash income of the households. 8% of the surveyed households reported to be in abject poverty where total household income for the past year was less than INR 6000. A considerable proportion of households reported of annual cash income of more than INR 22000. The indicator would be one of the major tools in assessing change in income level due to project intervention.

**Table 20 Distribution of households by total cash income of a household in the past one**

Total cash income of a household in the past one	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Less than INR 6000	9 (8%)	2 (9%)	3 (11%)	1 (20%)	2 (6%)	1 (7%)	18 (8%)
INR 6000 to INR 12000	17 (15%)	8 (35%)	2 (7%)		5 (15%)	4 (29%)	36 (17%)
INR 12000 to INR 18000	21 (19%)	1 (4%)	6 (21%)	1 (20%)	7 (21%)	2 (14%)	38 (18%)
INR 18000 to INR 22000	19 (17%)	3 (13%)			9 (26%)	1 (7%)	32 (15%)
More than INR 22000	44 (40%)	9 (39%)	17 (61%)	3 (60%)	11 (32%)	6 (43%)	90 (42%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total in the category for village

42% of the households reported no savings as on February 2012. Proportion of households reporting no savings is higher in case of end users category than the operating groups. Only 14% of the households reported to possess savings more than INR 12000. Detailed distribution by total cash/money savings is presented at table 21. The indicator shall also be considered to assess income security in the output assessment study.

**Table 21 Distribution of households by total cash/money savings as on February 2012**

Total cash/money savings as on February 2012	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Nil	50 (45%)	7 (30%)	10 (36%)	1 (20%)	17 (50%)	4 (29%)	89 (42%)
Rs 10 and Rs 400	25 (23%)	4 (17%)	1 (4%)		4 (12%)	3 (21%)	37 (17%)
Rs 400 and Rs 1000	10 (9%)	2 (9%)	1 (4%)			1 (7%)	14 (7%)
Rs 1000 and Rs 1500	4 (4%)		2 (7%)		4 (12%)		10 (5%)
Rs 1500 and Rs 3000	3 (3%)	2 (9%)	1 (4%)	1 (20%)	2 (6%)	1 (7%)	10 (5%)
Rs 3000 and Rs 6000	9 (8%)	3 (13%)	1 (4%)	1 (20%)			14 (7%)
Rs 6000 and Rs 12000	3 (3%)	1 (4%)	2 (7%)		4 (12%)	1 (7%)	11 (5%)
More than Rs 12000	6 (5%)	4 (17%)	10 (36%)	2 (40%)	3 (9%)	4 (29%)	29 (14%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total in the category for village

In total, 46 households (21% of the total households surveyed) reported to be under debt as on February 2012 (Refer Table 22).

**Table 22 Representation of households under any form of debt as on February 2012**

Any member of the household under any form of debt	BAUNSDIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
	22 (20%)	6 (26%)	4 (14%)	1 (20%)	5 (15%)	8 (57%)	46 (21%)
<b>Total households surveyed</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

### 3.7 COOKING ENERGY

Common practice in the intervention villages is usage of traditional biomass mud stoves. Collated information at table 23 indicates firewood as the primary cooking fuel for 99 % of the households. Only two households belonging to village Baunsadiha and Kochila Nuagoan reported usage of LPG as primary cooking fuel. Affordability and accessibility both are constraining factors towards usage of cleaner cooking fuels.

**Table 23 Distribution of households by primary cooking fuel**

Primary cooking fuel	BAUNSDIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Firewood	108 (98%)	23 (23%)	27 (96%)	5 (100%)	34 (100%)	14 (100%)	211 (99%)
LPG	1 (1%)		1 (4%)				2 (1%)
None	1 (1%)						1 (0%)
<b>Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

Dependency on firewood for cooking is very high as 205 among 214 the households using firewood as primary cooking fuel have no other cooking fuel alternative. Only five households reported usage of LPG or Kerosene as secondary cooking fuel (Refer table 24). Looking at the high dependency on traditional biomass stoves, there is scope introducing improved cook stoves through business models involving local level entrepreneurs.

Table 24 Count of households by secondary cooking fuel

Primary cooking fuel	Secondary cooking fuel	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
		End user	Operating group	End user	Operating group	End user	Operating group	
Firewood		108	23	27	5	34	14	211
	Kerosene	1		1				2
	LPG		2	1				3
	None	106	21	25	5	34	14	205
	Solar cooker	1						1
LPG		1		1				2
	None			1				1
	Electricity	1						1
None		1						1
	None	1						1
	<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

A close look at the primary source of firewood collection (Table 25) clearly indicates that 98% of the households collect firewood from forest areas. The change in forest cover in the region over a period of time is beyond the scope of the baseline study, however, considering long term climate change challenges, reduced usage of biomass may be considered as an option, which may be attained through introduction of efficient cook stoves.

Table 25 Distribution of households by primary source of firewood collections

Row Labels	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Forest	107 (99%)	22 (96%)	25 (93%)	5 (100%)	34 (100%)	14 (100%)	207 (98%)
Market		1 (4%)	2 (7%)				3 (1%)
Roadside	1 (1%)						1 (0%)
<b>Grand Total</b>	<b>108</b>	<b>23</b>	<b>27</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>211</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

The responsibility of firewood collection is shared by both adult males and females in majority of the households. However in 23 per cent of the households, the drudgery is solely borne by the adult females. The general practice is collect fuel for 2-3 days per collection. The approximate time spent for each collection was captured.



Table 26 Distribution of households by members responsible for fuel collection

Row Labels	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Adult men	15 (14%)		4 (14%)		5 (15%)	5 (36%)	29 (14%)
Adult men and adult women	62 (56%)	14 (61%)	13 (46%)	4 (80%)	18 (53%)	8 (57%)	119 (56%)
Adult men and children					1 (3%)	1 (7%)	2 (1%)
Adult women	28 (25%)	4 (17%)	9 (32%)	1 (20%)	8 (24%)		50 (23%)
Adult women and children	2 (2%)				2 (6%)		4 (2%)
Children	2 (2%)						2 (1%)
Not applicable	1 (1%)	5 (22%)	2 (7%)				8 (4%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

45% of the households in Baunsadiha reported collection time between 4-6 hours, whereas majority (48%) of the households reported 2-4 hours as average collection time. In Laxmiposi, 23% of the households indicated collection time as 4-6 hours and 21% as more than 6 hours. The figures indicate that a considerable time is spent on fuel collection. The indicator might not capture change in case if the interventions limit to multi utility centre, however, if improved cook stoves are introduced in the area, the indicator may stand as an important indicator to measure change. Table 27 presents the average time for fuel collections.

Table 27 Distribution of households by hours spent in fuel collection

Row Labels	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Nil	3 (3%)	4 (17%)	2 (7%)				9 (4%)
Up to 2 hours	20 (18%)	1 (4%)	1 (4%)	1 (20%)	16 (47%)	6 (43%)	45 (21%)
Between 2 and 4 hours	6 (5%)	7 (30%)	13 (46%)	3 (60%)	2 (6%)	3 (21%)	34 (16%)
Between 4 and 6 hours	49 (45%)	11 (48%)	3 (11%)	1 (20%)	8 (24%)	3 (21%)	75 (35%)
More than 6 hours	32 (29%)		9 (32%)		8 (24%)	2 (14%)	51 (24%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

### 3.8 HOUSEHOLD LIGHTING

Only 28 per cent of the households in total are electrified (Refer table 28). Those electrified in Laxmiposi and Kochila Nuagoan is electrified under Biju Gram Jyoti, a flagship programme of Government of Odisha to electrify all the habitations having population of less than 100. The scheme was launched in the year 2007. There are three components of the scheme- Village/ habitation electrification, Kutir Jyoti (BPL) connections and energisation of L.I. Points. In village Laxmiposi, a Solar Charging Station is installed by TERI on an entrepreneurship based model. The charged solar lanterns are rented by the village level

entrepreneur at the cost of INR 2.00 per day. In a village with scattered population and surrounded by forest area, the solar lanterns are perceived as extremely beneficial by the villagers.

The electrification status indicates scope for decentralized generation for lighting purpose in the villages. Solar operated grids and household systems may lead to provision of basic clean and reliable energy for lighting to the households.

**Table 28 Distribution of households by electrification status**

	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
Row Labels	End user	Operating group	End user	Operating group	End user	Operating group	
Un-electrified	93 (85%)	13 (57%)	2 (7%)		32 (94%)	14 (100%)	154 (72%)
Electrified	17 (15%)	10 (43%)	26 (93%)	5 (100%)	2 (6%)		60 (28%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

The un-electrified households reported Kerosene lamps (65%) and solar lanterns (7%) as primary device used for lighting purpose (Refer table 29). CFL are preferred over incandescent bulbs by 23% of the households. Energy efficiency at household level may initiate from awareness on usage of CFLs. Though the model in Odisha barely impacts the lighting scenario, yet the indicator can for assessment to measure change in quality of light available during evening hours.

**Table 29 Distribution of households by primary devise used for lighting during evening hours**

	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
Row Labels	End user	Operating group	End user	Operating group	End user	Operating group	
CFL	5 (5%)	7 (30%)	8 (29%)		2 (6%)		22 (10%)
Incandescent bulb	12 (11%)	2 (9%)	18 (64%)	5 (100%)			37 (17%)
Kerosene lamp	92 (84%)	13 (57%)	2 (7%)		24 (71%)	9 (64%)	140 (65%)
Solar lantern	1 (1%)				8 (24%)	5 (36%)	14 (7%)
Tube light and CFL		1 (4%)					1 (0%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category



Figure 8 Baseline survey during evening hours were conducted using torch light

Information on the duration of usage of electricity operated devices for lighting (such as CFL, incandescent bulb, tube-light) in a day was assessed. A mixed response was observed. However, reasons for variation in the duration were not assessed. The reasons are assumed as irregular power supply and lifestyle.

Table 30 Distribution of households by duration of usage of electricity operated lighting devices in a day

Row Labels	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Less than 2 hours	9 (8%)	1(4%)			4 (12%)	4 (29%)	18 (8%)
2-4 hours	4 (4%)	4 (17%)	3 (11%)	1 (20%)	1 (3%)	1 (7%)	14 (7%)
4-6 hours	8 (7%)	1 (4%)	7 (25%)	3 (60%)			19 (9%)
Above 6 hours	8 (7%)	5 (22%)	16 (57%)	1 (20%)	1 (3%)		31 (14%)
Not Applicable	81 (74%)	12 (52%)	2 (7%)		28 (82%)	9 (64%)	132 (62%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

All the surveyed households use kerosene for lighting purpose. On an average, monthly consumption of kerosene for lighting purpose for 64% of the households falls in the range of 2-4 Litres. The price of kerosene in PDS is Rs. 14 and in open market is Rs. 30.

Table 31 Distribution of households by usage quantity of kerosene for lighting purpose

Row Labels	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Less than 2 liters	10 (9%)	5 (22%)	10 (36%)		8 (24%)	4 (29%)	37 (17%)
2-4 liters	74 (67%)	10 (43%)	18 (64%)	5 (100%)	21 (62%)	9 (64%)	137 (64%)
4-6 liters	22 (20%)	7 (30%)			5 (15%)		34 (16%)
6-8 liters	3 (3%)	1 (4%)				1 (7%)	5 (2%)
More than 8 liters	1 (1%)						1 (0%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

### 3.9 FUEL USAGE FOR LIVELIHOOD ACTIVITIES

Majority of the households use kerosene lamps for lighting purpose. During evening hours light is used for stitching *Saal* leaf plates. In Laxmiposi, three households reported of stitching *Saal* leaf plates in the light from solar lanterns rented from LaBL (Light a Billion Lives) Charging Station (Refer Table 32). The quality of light from solar lanterns is better than the kerosene lamps. During the baseline survey, TERI team also rented Solar lanterns to conduct survey during evening hours.

Table 32 Fuel usage for livelihood purpose

Fuel used for livelihood purpose	Purpose	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
		End user	Operating group	End user	Operating group	End user	Operating group	
None	None	68 (62%)	21 (91%)	24 (86%)	3 (60%)	24 (71%)	8 (57%)	148 (69%)
Diesel	For operating Huller machine	1 (1%)						1 (0%)
Electricity	Irrigation	1 (1%)		1 (4%)	1 (20%)			3 (1%)
	Light for Leaf plate making		2 (9%)					2 (1%)
	Preparation of Medicine	1 (1%)						1 (0%)
Firewood	Preparation of country liquor			2 (7%)				2 (1%)
Kerosene	Light for Leaf Plate making	38 (35%)				8 (24%)	3 (21%)	49 (23%)
	Shop	1 (1%)						1 (0%)
Kerosene, Firewood	Light for Leaf Plate making, Preparation of country liquor			1 (4%)	1 (20%)			2 (1%)
Kerosene, Solar Lamp	Light for Leaf Plate making					1 (3%)	1 (7%)	2 (1%)
Solar Lamp	Light for Leaf Plate making					1 (3%)	2 (14%)	3 (1%)
<b>Grand Total</b>		<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

The fuel usage pattern indicates the possibility of introducing Solar Homelight systems for lighting purpose to enhance duration of livelihood activities in Laxmiposi. Mini or micro grids might be a suitable option in Baunsadiha and Kochila Nuagoan.

### 3.10 EDUCATION LEVEL

An attempt is made to capture education status of aged between 7 and 14 years. Integrating of technology is expected to facilitate livelihood activities including reduction in drudgeries. In a way, reduced drudgeries may encourage young population to divert their time to educational activities. However, it is to note that education status is more linked to accessibility of school in the vicinity, service delivery in these schools, presence of teachers, motivation in interest level of the students, understanding of parents on importance of education.

Table 33 provides count of students attending primary and secondary schools. Ratio of females to males attending primary schools is concerning among the end users category in Kochila Nuagoan and Laxmiposi. The table indicates that only 30% of the boys and 34% of the girls who attend primary school take admission in secondary school.

**Table 33 Count of students attending primary and secondary schools**

Counts	BAUNSADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Number of boys attending primary school	38	8	25	6	24	6	107
Number of girls attending primary school	41	11	15	6	15	10	98
Number of boys attending secondary school	12	1	4	2	8	5	32
Number of girls attending secondary school	23	1	0	1	6	2	33
Proportion (girls/boys) attending primary school	1.08	1.38	0.60	1.00	0.63	1.67	0.92
Proportion (girls/boys) attending secondary school	1.92	1.00	0.00	0.50	0.75	0.40	1.03
Percentage of boys attending secondary school with base count of boys attending primary schools	32%	13%	16%	33%	33%	83%	30%
Percentage of girls attending secondary school with base as count of girls attending primary schools	56%	9%	0%	17%	40%	20%	34%

Reasons for dropping out of schools were mapped separately for boys and girls (Refer table 34). Contributing to household income and disinterest in studies were the key attributes towards dropping out of schools for boys, whereas household work was the primary reason of dropping out for girls.

Table 34 Reasons for dropping out from schools

Row Labels		BAUNSIADIA		KOCCHILA NUAGAON		LAXMIPOSI		Grand Total
		End user	Operating group	End user	Operating group	End user	Operating group	
Reasons for dropping out of school for boys	Contributing to daily household work	1 (6%)				1 (14%)		2 (6%)
	Contributing to household income	7 (41%)		2 (33%)	1 (100%)	2 (29%)	1 (50%)	13 (39%)
	Lack of fund to support education	2 (12%)		1 (17%)		1 (14%)	1 (50%)	5 (15%)
	Not interested in studies	7 (41%)		3 (50%)		3 (43%)		13 (39%)
	<b>Grand Total</b>	<b>17</b>		<b>6</b>	<b>1</b>	<b>7</b>	<b>2</b>	<b>33</b>
Reasons for dropping out of school for girls	Contributing to daily household work	4 (29%)		2 (67%)	2 (100%)	2 (50%)	1 (33%)	11 (37%)
	Contributing to household income	4 (29%)	1 (25%)			2 (50%)		7 (23%)
	Lack of funds to support education	3 (21%)	2 (50%)				1 (33%)	6 (20%)
	Not interested in studies	2 (14%)	1 (25%)	1 (33%)				4 (13%)
	Others	1 (7%)					1 (33%)	2 (7%)
<b>Grand Total</b>	<b>14</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>30</b>	

Note: the figure in parentheses indicates % with base as total of the responses

The indicators “number of hours for which children study at home” and “time of the day when children study at home” are more suitable for the sites where lighting facility is provided at household level (Refer table 35 and 36). However, the data captured may be referred to measure change across sites spread over four states. It is noteworthy that in spite of the fact that village Laxmiposi and Kochila Nuagoan are un-electrified, there are households reporting that children study for more than 2 hours in a day.

Table 35 Distribution of households by average number of hours for which children (7 to 14 years) study at home

Row Labels	BAUNSIADIA		KOCCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Not applicable	52 (47%)	10 (43%)	8 (29%)	1 (20%)	10 (29%)	7 (50%)	88 (41%)
None	15 (14%)	1 (4%)	4 (14%)		7 (21%)	1 (50%)	28 (13%)
More than 2 hours	12 (11%)	3 (13%)	6 (21%)	1 (20%)	6 (18%)	1 (7%)	29 (14%)
Up to 2 hours	31 (28%)	9 (39%)	10 (36%)	3 (60%)	11 (32%)	5 (36%)	69 (32%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

Table 36 Distribution of households by the time of the day children usually study at home

Row Labels	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
NA	52 (47%)	10 (43%)	8 (29%)	1 (20%)	10 (29%)	7 (50%)	88 (41%)
Afternoon	5 (5%)	1 (4%)	2 (7%)		2 (6%)		10 (5%)
In early morning and evening	28 (25%)	9 (39%)	9 (32%)	3 (60%)	16 (47%)	1 (7%)	66 (31%)
In the evening	25 (23%)	3 (13%)	9 (32%)	1 (20%)	6 (18%)	6 (43%)	50 (23%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

An indicator on accessibility level to computers was included in the baseline for children aged between 6 and 17 as in one of the sites there is provision of computer literacy centre. At present, 99 % in the age group does not have access to computers. (Refer table 37)

Table 37 Distribution of households by accessibility level to computers in the group 6-17

Row Labels	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
At internet café			1 (4%)				1 (0%)
At school/home	2 (2%)						2 (1%)
None	108 (98%)	23 (100%)	27 (96%)	5 (100%)	34 (100%)	14 (100%)	211 (99%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

### 3.11 HEALTH

In two sites, the interventions are linked to traditional healers. (Refer table 38). Majority of the population across the categories visit Public Health Centres. Only 2% of the households reported to visit traditional healers in case of health problems. The traditional healers use herbs or forest products to prepare medicines.

Table 38 Distribution of households by the health institutions accessed by them

Row Labels	BAUNSIADIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
None	1 (1%)	1 (4%)			1 (3%)		3 (1%)
Both private dispensaries and PHC/sub centers	3 (3%)	3 (13%)	5 (18%)	2 (40%)			13 (6%)
PHC/ sub-center	99 (90%)	18 (78%)	11 (39%)	2 (40%)	31 (91%)	14 (100%)	175 (82%)
Private dispensaries	4 (4%)		12 (43%)	1 (20%)	1 (3%)		18 (8%)
Traditional healers/ Baidya	3 (3%)	1 (4%)			1 (3%)		5 (2%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

Malaria and dengue are the major health problems in the area (refer table 39). The category “other” in the table represents fever, body ache etc. One of the project interventions relates to provision of refrigerators for storage of medicines for malaria and dengue.

**Table 39 Distribution of households by common health problems reported by the members in the last one year**

Row Labels	BAUNSIADIA		Kochila Nuagaon		LaxmiPosi		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Diarrhea	4 (4%)	1 (4%)			1 (3%)	1 (7%)	7 (3%)
Jaundice			1 (4%)				1 (0%)
Malaria/dengue	70 (64%)	17 (74%)	12 (43%)	3 (60%)	15 (44%)	7 (50%)	124 (58%)
Malaria/dengue and Diarrhea	5 (5%)	1 (4%)	4 (14%)	1 (20%)	12 (35%)	4 (29%)	27 (13%)
Other	29 (26%)	3 (13%)	10 (36%)	1 (20%)	4 (12%)	2 (14%)	49 (23%)
Tuberculosis	1 (1%)	1 (4%)	1 (4%)		1 (3%)		4 (2%)
Typhoid					1 (3%)		1 (0%)
Typhoid, Malaria/dengue	1 (1%)						1 (0%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

Hand pumps are the drinking water source for 57 per cent of the households. For 10 households residing in Baunsadiha, the distance of the hand pump ranges between 500 metres and 1 Km. (Refer table 40). 17 households in Kochila Nuagaon depend on stream for drinking water indicating the potential to install renewable based drinking water facility in the village. Tap water is accessible only in village Baunsadiha, or 8 per cent of the total sample surveyed.

**Table 40 Distribution of households by primary source of drinking water and distance from water source**

Row Labels	BAUNSIADIA		Kochila Nuagaon		LaxmiPosi		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
<b>Hand pump</b>	<b>78 (71%)</b>	<b>17 (74%)</b>	<b>2 (7%)</b>	<b>2 (40%)</b>	<b>18 (53%)</b>	<b>4 (29%)</b>	<b>121 (57%)</b>
Up to 500M	66	17	2	2	16	4	107
Between 500M to 1 KM	10				1		11
Between 1 to 2 KM	1						1
More than 2 KM	1				1		2
<b>Open well</b>	<b>21 (19%)</b>	<b>1 (4%)</b>	<b>12 (43%)</b>	<b>1 (20%)</b>	<b>15 (44%)</b>	<b>10 (71%)</b>	<b>60 (28%)</b>
Up to 500M	21	1	12	1	15	9	59
Between 500M to 1 KM						1	1
<b>Stream</b>			<b>14 (50%)</b>	<b>2 (40%)</b>	<b>1 (3%)</b>		<b>17 (8%)</b>
Up to 500M			13	2	1		16
Between 500M to 1 KM			1				1



	BAUNSDIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
Row Labels	End user	Operating group	End user	Operating group	End user	Operating group	
<b>Tap water</b>	<b>11 (10%)</b>	<b>1 (4%)</b>					<b>12 (6%)</b>
Up to 500M	11	1					12
<b>Tap water and Hand pump</b>		<b>4 (17%)</b>					<b>4 (2%)</b>
Up to 500M		4					4
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Note: the figure in parentheses indicates % with base as total households surveyed under the category

Percentage of households reporting the quality of drinking water as brackish stands only at 7 % however these households does not follow any purification process for drinking water. (Refer table 41) Among those who reported water quality as clear, 79 % does not follow any water purification process while 13% boils water before drinking. 3 % of the households use chlorine tablets for water purification.

Table 41 Distribution of households by quality of drinking water and water purification method

	BAUNSDIA		KOCHILA NUAGAON		LAXMIPOSI		Grand Total
Row Labels	End user	Operating group	End user	Operating group	End user	Operating group	
<b>Brackish</b>	<b>5 (5%)</b>		<b>2 (7%)</b>				<b>7 (3%)</b>
None	5 (100%)		2 (100%)				7 (100%)
<b>Clear</b>	<b>105 (95%)</b>	<b>23 (100%)</b>	<b>26 (93%)</b>	<b>5 (100%)</b>	<b>34 (100%)</b>	<b>14 (100%)</b>	<b>207 (97%)</b>
Any other	6 (6%)	2 (9%)	3 (12%)		6 (18%)		17 (8%)
Boiling	2 (2%)	3 (13%)	5 (19%)	1 (20%)	1 (3%)		12 (6%)
Boiling, Using chlorine tablets						1 (7%)	1 (0%)
Filtering	7 (7%)	1 (4%)	2 (8%)				10 (5%)
None	90 (86%)	16 (70%)	16 (62%)	4 (80%)	26 (76%)	12 (86%)	164 (79%)
RO system		1 (4%)					1 (0%)
Using chlorine tablets					1 (3%)	1 (7%)	2 (1%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

### 3.12 OWNERSHIP OF ASSETS

It is presumed that with income enhancement the ownership in case of assets involving small investments may increase. However, the choice entirely depends on households. In the baseline, assets such as land holdings, agricultural equipment are negated as the interventions are not directly linked to agriculture and neither a substantial increase in income level is envisaged in a year.

146 households among 214 reside in Kutcha (thatched) houses (Refer 42) while 25 % of the houses are semi pucca (floor is cemented while walls are made of mud. Cemented houses

may or may not indicate affluence, as kutcha dwellings are preferred over pucca dwellings during summers in particular when there is no electricity.

**Table 42 Distribution of households by type of dwelling**

	BAUNSADIA		Kochila Nuagaon		Laxmiposi		Grand Total
Row Labels	End user	Operating group	End user	Operating group	End user	Operating group	
Kutcha house	75 (68%)	19 (83%)	16 (57%)	2 (40%)	25 (74%)	9 (64%)	146 (68%)
Pucca	3 (3%)	2 (9%)	8 (29%)	1 (20%)	1 (3%)		15 (7%)
Semi pucca	32 (29%)	2 (9%)	4 (14%)	2 (40%)	8 (24%)	5 (36%)	53 (25%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

In spite of the fact that Kochila Nuagaon and Laxmiposi being un-electrified, 43 % of the households reported to own mobile phones (Refer table 43). The villagers go to the nearby town to charge their mobile. INR 2 to 4 is charged for mobile charging. The solar multi-utility centre would also have the facility for mobile charging.

**Table 43 Distribution of households by kind of telephone facility available**

	BAUNSADIA		Kochila Nuagaon		Laxmiposi		Grand Total
Row Labels	End user	Operating group	End user	Operating group	End user	Operating group	
Accessing phone through neighbor's house	31 (28%)	1 (4%)	8 (29%)	1 (20%)	2 (6%)		43 (20%)
Fixed line telephone	2 (2%)						2 (1%)
Mobile phone	33 (30%)	16 (70%)	15 (54%)	3 (60%)	15 (44%)	11 (79%)	93 (43%)
None	40 (36%)	6 (26%)	3 (11%)	1 (20%)	14 (41%)	2 (14%)	66 (31%)
Using public telephone booth	4 (4%)		2 (7%)		3 (9%)	1 (7%)	10 (5%)
<b>Grand Total</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

Percentage of households owning radio stands at 80. Only 1 % of the households owns refrigerator. The utility centre at Laxmiposi will also provide refrigerator, which would benefit the villagers in storing perishable items such as milk and sweets.

**Table 44 Distribution of households by selected assets**

	BAUNSADIA		Kochila Nuagaon		Laxmiposi		Grand Total
	End user	Operating group	End user	Operating group	End user	Operating group	
Owns radio	92 (84%)	18 (78%)	23 (82%)	4 (80%)	28 (82%)	6 (43%)	171 (80%)
Owns television	4 (4%)	3 (13%)	8 (29%)	1 (20%)		1 (7%)	17 (8%)
Owns refrigerator	1 (1%)	2 (9%)					3 (1%)
<b>Total households surveyed</b>	<b>110</b>	<b>23</b>	<b>28</b>	<b>5</b>	<b>34</b>	<b>14</b>	<b>214</b>

### 3.13 INFERENCE

The chapter provided a baseline scenario at household level in the intervention sites. The output/ change assessment shall be measured based on the baseline scenario. At present, the household scenario presents poor access to clean energy for lighting and cooking, and almost no access of energy for productive purpose. Low income levels, negligible savings and accompanied with subsistence agriculture are the driving factors indicates the importance of planned livelihood interventions. NTFPs in majority of the cases are secondary livelihood but primary source for cash income. Energy interventions to provide value addition in the NTFPs would immediately add to sash incomes of the households, though in long term energy interventions for agricultural activities linked with robust marketing linkages would be able to make visible changes in terms of livelihood enhancement as well as income security.



## 4. SITUATIONAL ANALYSIS: THE CASE OF OPERATING GROUPS

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Focused group discussions were conducted with operating groups. The chapter reports the baseline scenario of the operating groups.

### 4.1 LAXMIPOSI

**Netaji Farmers' Club** located in Laxmiposi village of Thakurmunda Block in Mayurbhanj district has 25 members. The group formation dates back to three years i.e.; 2008. The Farmers' Club has been promoted by SAMBANDH which has been working in the area since the last three years.

Households are dependent on subsistence rain-fed agriculture. The farmers' club was formed for easy access and dissemination of information on government schemes and programmes and for the scope and opportunity that the collective endeavour would create for accessing loan.

Only one member of a household is a member of the Farmers' Club and Women are not members of the club which shows the stereotyped male connotation of a farmer.

The members of the Farmers' Club are not engaged in cultivation at the collective level. Each member cultivates in own land. Organizing the farmers in a Farmers' Club has led to promotion of wheat and maize cultivation (by the farmers at individual level), awareness generation through organization of monthly meetings and promotion of Dairy Development.

Four farmers were provided support (hybrid cow) for Dairy Development. At present, 7 farmers own hybrid cows. The farmers sell milk in the market. The Farmers' Club is a membership based group with annual savings of Rs. 6000. Individual farmers also save their profit in the bank.

The members of the Club pointed out that savings would help them access loan and enable them purchase modern agricultural equipment. Farmers, individually, are engaged in vegetable cultivation and during the three months' period of vegetable growing 20 litres of diesel are used. Diesel is purchased from Thakurmunda at a cost of Rs. 50 per litre. Produces like paddy, rice, groundnut, eggplant, cauliflower, sweet potato, tamarind, mango, jack fruit are sold by the farmers in the market.

The farmers are of the opinion that as a result of distress sale they are not being able to get good price of produces like; Paddy and *Mahua*. The primary producers and collectors in the

absence of the wherewithal either of their own or an institutional support system are compelled to sell the produce at a price dictated by the buyers. While the price offered by the procurement agency like Food Corporation of India is Rs. 1080 per quintal of Paddy, delay in opening of the *Mandi* leaves the cultivators with no option but to sell at Rs900-1000. Similarly, the Panchayat has the power to fix the price of Mahua (the village comes under PESA) which is not done making the primary collectors vulnerable to manipulation of price by the buyers. As a result, *Mahua* is sold at the price of Rs. 5 to Rs. 16 per kg, depriving the primary collectors from their due.



Figure 9 Focused group discussions with operating group at Laxmiposi

All the members of the farmers' club are able to read and write. Five of them have passed primary, 2 have passed secondary, 1 has passed higher secondary and 1 has passed graduation. Only one member of the club has undergone vocational training on stenography and typing. The members of the farmers' club point out that **solar operated drip irrigation system, leaf plate stitching machine and flour mill** will be of help in dealing with the existing conditions of disadvantages. To elaborate, farmers use diesel pump set for irrigation when rain water is not available. Diesel is purchased from Thakurmunda (at a distance of 8 kms) and the inconvenience associated with it has been a reason for not many of the farmers opting for cultivation in summer. Installation of solar operated drip irrigation system will be able to do away with the inconveniences making irrigation affordable for the farmers.

## 4.2 BAUNSDHIA

**Maa Malati Gramashree SHG** is located in Baunsdiha village of Thakurmunda block in Mayurbhanj district. The SHG has 18 women members. 15 out of 18 members are able to read and write. 10 members are Primary passed, 3 are Secondary passed and 2 have passed Higher Secondary. A few of the members have attended vocational training on Sewing and

Appliqué-making. The group supplies *sattu*<sup>6</sup> to all the Anganwadi Centres of 4 Panchayats. In a month it supplies 84 quintal of *sattu* to the AWCs.

The raw materials such as Wheat, Groundnut, Sugar and Chana are fried and grinded outside in a mill. The mill charges INR 4 per kg of raw material. The cost of fuel is thus calculated as INR 1 per kg. In other words, the group incurs INR 8400 per month as expenditure for fuel. Similarly; INR 6000 is spent towards transportation. The members of the group are engaged in packaging of *sattu* in packets of ½ kg. The AWCs are supplied *sattu* fortnightly.



Figure 10 Focused group discussions with Maa Malati Gramshree SHG

The members expressed that they have started the activity on the suggestion of the Child Development Programme Officer (CDPO). It has been able to generate interest among the members and all the members happily contribute to the group based work. Except for wheat which is provided by the Civil Supply Department, all the raw materials are purchased from the market. The raw materials are taken to a mill at Thakurmunda for frying and grinding. Frying is done at the mill using coal, while grinding is done using electric power. The members point out that disruption of power causes delay and since the *sattu* are to be supplied within the time frame, it often causes inconvenience. The raw materials and the *sattu* require transportation to the mill as well as from the mill to the village. Following grinding at the mill it is transported back to the village where packaging is done by the members in packets of ½ kg. The packaging machine operates on electricity, however; disruption of power supply which occurs too often makes the matter difficult as sealing the packets has to be done manually. Moreover, packaging is mostly done in the evening when the women are free from their household chores. Needless to mention, disruption of power supply makes the work tedious.

<sup>6</sup> Sattu or Chhatua are ground powders of pulses and cereals like horse gram (chana dal), green gram, jowar, wheat, oat, barley, etc. Sattu is consumed along with fruit slices, sugar or milk.

The group uses electricity for packaging and 100 units of electricity is consumed for it. The cost of electricity is nearly INR 300. The mill where frying and grinding operations are done follows traditional frying system using coal. Electricity is used for grinding.

The perspective on value addition is at a rudimentary stage. The members point out that in future they will supply *Sattu* to the Open Market. Small size packs of lesser quantity, they add, will have good demand. The price of the product has elasticity of being raised to the extent of 15 per cent over the present price. Although market potential couldn't be figured out, the members are sure that there is a market for the product.

The product is supplied to 38 AWCs of as many numbers of villages in four Panchayats. The group directly supplies the product directly to the AWCs. Packaging which is the only work done by the women is mostly done during the day time, therefore; there is no need for lighting arrangement.

Disruption of power supply creates problem. The members of the group put forth the need for solar powered Roasting Machine, Flour Mill and Packaging machine.

**Ashwini Kumar Vaidya Sangha** is a cooperative of 47 *Vaidyas* spread across 17 villages. Nirajan Danakudia is the President of the group. All the members of Ashwini Kumar Vaidya Sangha are able to read and write. While 50 per cent of the members are Primary passed, 30 per cent are Secondary passed, 15 per cent are Higher Secondary passed and 5 per cent have educational qualification of "Graduation and Above".

Organization of monthly meetings for knowledge sharing, health camps and exhibition cum sale of medicine in fairs are some of the activities undertaken by the Vaidya Sangha.

Collection of raw material and preparation of medicine is not undertaken at the collective level. *Vaidyas* collect raw materials, process them and prepare medicine as per their own need. However, 2-3 *Vaidyas* work in association with an experienced *Vaidya*. The trainees collect raw materials and get opportunity to gain knowledge while working with the experienced *Vaidyas*.

Expertise of the *Vaidyas* determine requirement of raw material which is collected through free collection, engaging wage labourer and through purchase. Generally, a few trainees work in close association with an experienced practitioner. The trainees help in collection of raw materials, preparation of medicine; while they gain knowledge on treatment and preparation of medicine. The trainees from different nearby villages link the people in need of treatment with the *Vaidyas*. The programmes and activities of SAMBANDH contribute to the outreach of the *Vaidyas*. For example, its AROGYAM program is aimed at revival and promotion of Indian Medical Heritage systems and practices. Promotion of the folk healers through state level federation spread over 21 districts of the state is a major activity. It facilitates knowledge exchange, validation of knowledge and experience sharing. *Vaidyas*



get the scope to know about each other's expertise and refer the patients of their localities to the *Vaidyas* with experience and expertise in treatment of the disease. Niranjan Danakudia, President, Ashwini Kumar Vaidya Sangha, Thakurmunda has clients from outside the district and Hrudananda Pradhan, President, Rajkusum Vaidya Sangha, Tangi-Choudwar has clients from Jajpur and Keonjhar for treatment of Kidney stone and paraplegia. SAMBANDH has also developed a "Healers' Compendium" with information on the names of the herbal practitioners and the expertise each of them has in treating specific diseases.

The *Vaidyas* take the raw material for grinding to Jashipur which is at a distance of 80 kms from Baunsiha. The grinder at Jashipur runs on electricity and INR 10 per kg is paid for grinding. Non-availability of the facility in the vicinity has been a major inconvenience as a person has to spend an entire day for the work. Often disruption of power supply makes the matter worse. Niranjan Danakudia points out that the inconvenience has been a reason for his inability to keep the medicines readily available with him. Often, the clients have to come once gain for the medicine. Medicine preparation, especially Chyawanprash requires boiling and Niranjan requires one quintal of firewood for the purpose. Although firewood is available in the forest, he either engages a wage labour or purchases it. Firewood collection becomes difficult in the rainy season, a season of peak demand when people fall ill and require medicine.

The *Vaidyas* prepare medicine for treatment of Arthritis, Paralysis and Blood Pressure. For preparation of the medicines, the *Vaidyas* collect raw materials themselves or by engaging wage labourers and purchase raw materials from the market. The raw materials are; RaktaChandan, SwetaChandan, Jai Phala, Jai Patri, Jaitri, KankadaShrunghi, Jeera, Pippali, Maricha, Shunthi, Rasana, Guluchi, BenaChera, Garagada, KuiliakhaManji, Koi Kanda. Padma Alu, Padma Kesar, Padma Kastha, Agar, BhuinAnla, Gokhura, NilaPuspa, Dasakerenta, Pasharuni, PhenaphenaChhali, GambhariChhali, SunariChhali, PataliChhali, Aswagandha, Sugar, Honey etc. Raw materials like Salapani, Krunapani, BenaChera, PhenaphenaChhali, GambhariChhali, SunariChhali, PataliChhali and AnantaMula are available in the forest. Other raw materials mentioned above are purchased from the market. RasnadiGuggulaGoti is prescribed for Arthritis for which raw materials like; Rasna, Guggula and Ghee are used. For Paralysis, BatarajGoti is prescribed for which raw materials like; KochilakhaiChurna, Pepper powder and Betel is used. The medicine prepared for treatment of Blood Pressure requires Patalagaruda powder, Bacha Powder, Pepper, Rasa Sindur and Brahmi as raw materials.

Mr. Niranjan Danakudia says that medicines (Chyawanprash & Modaka) of 10-15 kgs are required in a month. On an average, 20-25 patients are treated and in winter and rainy seasons 60-100 patients are treated. The *Vaidyas* get clients from nearly 50 villages. Even persons from outside the district also come for treatment.

Electricity is used for grinding of raw materials (15 kgs per month) and grinding is done at Jashipur, a place at a distance of 80 kms. Rs. 10 per kg of raw material is paid for grinding. Nearly one quintal of firewood per month is also required for boiling of raw materials.

Members of the Vaidya Sangha have received training on GMP and GACP. They point out that both community development and income enhancement motivate them to take up operations of the Solar Multi Utility Centre. The members of the Vaidya Sangha demand for a solar powered Grinder.

### 4.3 POTAPOLASAHI

Healing Heritage, a Producers' Company promoted by SAMBANDH prepares medicine which is sold in the market. It is an association of 41 Vaidya Sanghas across 14 districts. It has 1100 members and the Board comprises of 14 members. As per the legal provision, a traditional herbal practitioner can't sell his/her own product. He/she can prescribe medicine. Vaidya Sanghas don't fulfil the legal provisions required for production of medicine. Therefore; herbal medicines are prepared under the proprietorship of Healing Heritage. Dr. G.B. Sahoo, CEO, Healing Heritage said that the change in law has rightly been made by the government for protecting people from fake herbal practitioners. Nearly 60 per cent of the products of Healing Heritage are sold through the Vaidya Sanghas. Dr. Sahoo said that Vaidyas associated with Healing Heritage sell their own products also. He goes on to add that all the Vaidyas have been trained and are well-versed in the process and method of medicine preparation and doses of application.

Finalization of the requirements, district-wise, is done in the beginning of the year. Vaidya Sanghas of the respective districts finalize the requirements at their own level and place the order with Healing Heritage. There are 8 collection centres of Healing Heritage- 1. Bhanjanagar, Ganjam, 2. Thakurmunda, Mayurbhanj, 3. Palam, Kalahandi, 4. Titlagarh, Bolangir, 5. Daringbadi, Kandhamal, 6. Ambadala, Rayagada, 7. Jhumpura, Keonjhar and 8. Sohela, Bargarh. . The collection centres provide raw materials to Healing Heritage. That apart, Healing Heritage encourages cultivation of medicinal plants such as; Lemon Grass. The raw materials required by Healing Heritage are; Harida, Bahada, ArjunChhali, BhuinNimba, Ghee Kuanri, Tulsi, Anla, Pepper, Guluchi, Bhringaraj, Brahmi, Ganga Siuli, Manjuati root, Ashok Chhali, Ashok Flower, Methi, KababChini etc. Healing Heritage fulfills all the legal requirements and is GMP Certified (Good Manufacturing Practice). Facilitated by SAMBANDH, the Vaidyas have enrolled themselves in the Certification Course began by IGNOU.

Dr. Sahoo, CEO, Healing Heritage pointed out that achieving the target of production has always been a difficulty owing to failure of power supply. He added that some of the products like Juice require water and Healing Heritage has to purchase Mineral Water leading to escalation of production cost as the water purification system running on electricity didn't work. Amla requires refrigeration and without power it has been a difficulty.

Healing Heritage has 22 products (Chyawnprash, TrifalaChurna, PanchasakarChurna, AbhipatkarChurna, AswagandhaChurna, Diacure, AmlaChurna, Ache Oil, Pain Balm, Feet Care, Face Pack, MahanarayanTaila, Herbal Tea, Fresh Amla Drinks, Fresh Podina Drinks, Ginger Honey, Trikatu Honey & Lemon Honey) and nearly 5000 members are associated in

its marketing network. Products of Healing Heritage are sold in Herbal Fare and GramashreeMelas so also in Outlets and Vaidyasalas. Dr. Sahoo pointed out that some of the products of Healing Heritage have market demands which it is unable to meet and there is some season specific demand of products. He added that Amla and Pudina Juice have demands in summer than in other seasons and Chyawanprash, Feet care, Mahanarayan Oil have demands in the winter season. AbhipatkarChurna and TrifalaChurna are mostly in demand irrespective of the season.

Delineating the issues and problems of associated with production; Dr. Sahoo said that firewood is mostly used for preparation of Chyawnprash. Since electricity/power is required for production, interruption in the supply always creates problem.

There are 8 Collection Centres cum Outlets of Healing Heritage and one Outlet in Bhubaneswar. Products are also supplied to shops and NGOs. Healing Heritage has a Centres in Nandankanan, Wild Life Park situated at a distance of 12 kms from Bhubaneswar.

All the 14 members of the Board are able to read and write. All of them have been trained on manufacturing and marketing. They have received training on Sustainable Harvesting, Good Agricultural & Collection Practice (GACP), Good Manufacturing Practice (GMP). Board members have been trained by Training Foundation for Revitalization of Local Health Tradition, Bangalore, INWENT, Munich, Germany. All the Board members are aware of the Solar Multi Utility Centre and its utility.

There are 3 Female members in the Board. One among the female members is active. Among the 14 Board members, 7 are Traditional Health Practitioners, 3 are cultivators and one is a Nursery Entrepreneur. Healing Heritage has got the support from Department of Science & Technology (DST), Government of India. All the members of Board of Directors belong to Tangi-Choudwar and Athagarh.

41 VaidyaSanghas are affiliated to Healing Heritage. At the district level there is District Level Vaidya Coordination Committee (DLVCC). The Executive Board of the State Level VaidyaMahasangha comprises of members from each of the DLVCC.

With the financial and technical support of SAMBANDH, cultivation of Lemon Grass, Aswagandha, Tulsi, Patalgaruda, Bacha, Aloe vera, Pudina, Amla has been promoted.

The Annual Meeting is held in March of every year. Sustainable Agriculture Practice, Good Agricultural and Collection Practice, Marketing are the important themes on which orientations are held too often.

Healing Heritage has 6 Responsibility Holders; i) CEO, ii) Marketing Manager, iii) 2 Stock Supervisors, iii) Assistant Manufacturer, iv) Laboratory Technician, and v) Quality Control supervisor.

Healing Heritage has the following equipments-i) Electric Dryer (1 no.), ii) 3 HP Grinder (2 no.s; 3HP 3 Phase and 3 HP Single Phase), iii) 3 HP Pulvizer, iv) Pouch filling and Sealing Machine, v) Bottle filing and Sealing Machine, vi) Pulper and vii) Sealing Machine

State Level VaidyaMahasangha holds tri-monthly meetings. Pricing decision is taken annually. Upon necessity, pricing decision is also taken in the Tri-Monthly Meeting.

Healing Heritage sources raw materials with the help of the Vaidyas. The Vaidyas bring their collection to the Monthly Meeting of the VaidyaSangha. Vaidyas also place their requirement of medicine in the Monthly Meeting. The raw materials aggregated by the VaidyaSanghas are sent to the Collection Centre from which the raw material is brought to the Production Centre. Medicines from the Production Centre are sent to the Collection Centres cum Outlets from which the VaidyaSanghas collect the medicines. Transaction is mostly done through the VaidyaSanghas. VaidyaSangha enjoys maximum credit limit of Rs. 50,000. The VaidyaSangha gets a discount of 5 % from Healing Heritage.

Healing Heritage sourced a loan of Rs. 15 lakhs which has already been repaid. Stock verification is held every 2-3 months. CEO, Healing Heritage, Secretary, SAMBANDH and Coordinator, District Level Vaidya Coordination Committee together in a team undertake stock verification.

Price determination is done on comparative basis i.e.; comparing the price of similar products by other manufacturing agencies and in the case of some monopoly products; price is determined by cost of production and the demand for the product.

Expansion Plan of Healing Heritage includes; production of Value Added Honey, Herbal Tea, National Level Tie-up. Dr. Sahoo point out that Healing Heritage is sustainable and the only constraint is the machinery for production.

## 4.4 INFERENCE

All the four operating groups are actively involved with income generation activities also linked to development in terms of enhancing agricultural productivity, child nutrition and local health. The groups are linked to SAMBANDH from their formative days. The education, skill and motivation level of the groups as per day makes the groups the best village level institution to operate and maintain the solar multiutility centres, though training and handholding is required initially. The groups would maintain and operate the multiutility centre using a decided share of their profit. Other villagers can also avail the

facility by paying for the services. The service charges shall be decided by the operating groups in consultation with SAMBANDH.



## 5. ENERGY NEEDS

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The chapter draws upon the broad energy needs assessment based on the previous chapters on situational analysis.

### 5.1 LAXMIPOSI

In Laxmiposi, nearly two-third of the households is engaged with agriculture while 90 per cent with *Saal*/Leaf collection and leaf plate making. On an average, a household earns INR 830 per month making leaf plate. However, the difficulty in enhancing the income lies in manual stitching which is cumbersome and time-taking. Leaf plates pressed and stitched with the help of machine with leaf atop hard paper has demand and fetches higher price in the market. Such leaf plate helps in judicious use of the forest produce i.e; *Saal*/leaf. A shift in the mode of production with the use of appropriate technology addressing the energy needs entailed in such technology holds the promise of increasing the economic condition as well as sustainable use of the forest resource.

Netaji Farmers' Club, an informal Farmers' Cooperative has been formed by the farmers for development of agriculture and dairy. However, absence of irrigation facility and dependence on diesel for irrigation which includes inconvenience of purchase and transportation of diesel from Thakurmunda, a place 8 kms away from the village have resulted in not many farmers showing interest for crop diversification or bringing about change in the pattern of agriculture.

Provision of solar lantern under LaBL has helped the households in extending their work hours (Leaf plate stitching). However, possibility of solar homelight systems can be explored as only 2-3 households reported use of solar lanterns in as source of light during evening hours to pursue livelihood activities. For enhancing household income the following facilities need to be created;

1. Leaf plate stitching machine
2. Pressing and drying machine for leafplates
3. Drip Irrigation System
4. Solar home light systems

### 5.2 BAUNSADHIA

In Baunsadiha, nearly three-fourth of the households is engaged in *Saal*/Leaf collection and leaf plate making. On an average, a household earns Rs. 648 per month making leaf plate. The technology need assessed for Laxmiposi in the context of Leafplates holds true for Baunsadiha.

Ashwini Kumar VaidyaSangha is a cooperative of 47 *Vaidyas* spread across 17 villages. The *Vaidyas* prepare medicine for treatment of arthritis, paralysis and blood pressure. Electricity is used for grinding of raw materials and in the absence of the facility grinding is done at Jashipur, a place at a distance of 80 kms. INR 10 per kg of raw material is paid for grinding.

Nearly 1 quintal of firewood per month is also required for boiling of raw materials. The inconvenience associated with non-availability of the facility has entailed difficulties on the parts of both the herbal practitioners and the people who come for treatment. The herbal practitioner loses a day's work travelling and it is made worse with disruption of power supply. Since boiling is done using firewood, its availability is difficult in rainy season. The difficulties boil down to inability on the part of the herbal practitioner to maintain a stock of required medicines. The clients in such a circumstance face the difficulty of coming to the Vaidya at least twice; once to consult the Vaidya and when the medicine is not available once again to collect the medicine.

18-member Maa Malati Gramashree SHG of Baunsiha village supplies Sattu to all the Anganwadi Centres of 4 Panchayats. In a month it supplies 84 quintal of Sattu to the AWCs. The raw materials such as Wheat, Groundnut, Sugar and Chana are fried and grinded outside in a mill. The mill charges INR 4 per kg of raw material. The group incurs INR 8400 per month as expenditure for fuel. The mill where frying and grinding operations are done uses traditional frying system that runs on coal. Electricity is used for grinding. Non-availability of appropriate technology and assured power supply cause inconvenience as the raw materials and the products have to be transported to and fro between the village and the mill and disruption of power supply leaves the members with no option but to seal the packets manually. The matter becomes worse since women do the work in the evening when their household chores are over. Even though the perspective on value addition among the members is at a rudimentary stage, they point out that small size packs has market potential and has pricing elasticity of being raised to the extent of 15 percent over the present price. The village in general and the operating groups in particular need the following facilities

1. Leaf plate stitching machine
2. Pressing and drying machine for leafplates
3. Community cook stove
4. Grinder
5. Packaging Machine

### 5.3 POTAPOLASAHI

Healing Heritage, a Producers' Company promoted by SAMBANDH prepares medicine which is sold in the market. It has 22 products and nearly 5000 members are associated in its marketing network. Products of Healing Heritage are sold in Herbal Fare and Gramashree Melas so also in Outlets and Vaidyasalas.

Products of Healing Heritage have market demands which it is unable to meet and there is some season specific demand of products. Achieving the target of production has always been a difficulty owing to failure of power supply. Some of the products like Juice require water and Healing Heritage has to purchase Mineral Water leading to escalation of production cost as the water purification system running on electricity didn't work. *Amla* requires refrigeration and without power it has been a difficulty.



Expansion Plan of Healing Heritage includes; production of Value Added Honey, Herbal Tea, National Level Tie-up is possible with creation of facilities i.e.; machinery for production with assured supply of power (solar power).

1. Water purification system
2. Community cook stove
3. Grinder
4. Refrigeration system

**Table 45 Broad assessment of felt and actual needs for equipment operated by renewable energy sources with proposed ownerships**

Village	Scenario	Ownership			Expected output
		Village level	Operating group	Households	
Laxmiposi	96% households un-electrified , scattered households, households engaged in leaf plate stitching uses kerosene lamps to stich leaf plates during evening times, 54% of the households owns mobiles		Mobile charging station	Solar home light systems	Increased hours for income generation activities, increased hours for study
Buansadhia	80% households un-electrified, households engaged in leaf plate stitching uses kerosene lamps to work during evening hours	Solar micro grid			Increased hours for income generation activities, increased hours for study
Laxmiposi, Buansadhia, Kochila Nuagoan	No streetlight	Solar operated streetlights			
Laxmiposi, Buansadhia, Kochila Nuagoan	Small holdings, rainfed agriculture, agriculture is the major occupation	Irrigation facility			

## Clean Energy Interventions for Livelihood Enhancement in Rural Odisha: Baseline and Way Forward

Laxmiposi	Maize grown in 15-20 acres maize			Solar/ biomass dryer, packaging	Drying and packaging of maize
Laxmiposi, Buansadhia,	Almost all households engaged in Saal leaf plate making			Drying and pressing machines for Saal leaves, stitching machine	Reduced drudgery and better finished products
Laxmiposi, Buansadhia,	Mahua seed and Kusum seeds are dried and sold by considerable number of poor households			Solar/ biomass dryer, packaging	Drying and packaging of Mahua seeds
Laxmiposi, Buansadhia,	Mahua oil extraction and tamarind, though not practiced by majority of the households			Deseeder	Deseeding for Mahua oil extraction, value addition in tamarind
Laxmiposi, Buansadhia, Kochila Nuagoan	99% households depending on traditional biomass for cooking			Improved cook stoves at household level through village level entrepreneurs	Reduced drudgery and time in collection of firewood, more time available for livelihood activities
Baunsadhia	Maa Malati SHG go for manual packaging		Power for packaging		Reduced drudgery, quality packaging
Baunsadhia	The Vaidyas (Traditional healers) and Maa Malta group travels a distance of 80 kilometres for grinding		Grinding machine, packaging machine		Reduced drudgery
Baunsadhia	Maa Malti group uses char-drums to roast grains		Improved community cook stove		Reduced drudgery and smoke
Kochila Nuagoan	Poor quality drinking water	Water purifier		Solar water filter	Reduced water related diseases

Kochila Nuagoan	Expansion plan of Healing Heritage that includes production of Value Added Honey, Herbal Tea, National Level Tie-up is possible with creation of facilities			Improved community cook stove, grinder, refrigerator	
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The subsequent chapter assesses the feasibility of the technology and cost, and then identifies technologies for interventions.



## 6. RENEWABLE RESOURCE ASSESSMENT AND TECHNOLOGY DETAILS

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The technology proposed for the project is a clean energy based integrated multi-utility platform that utilizes the locally available renewable energy resources to generate electricity. The clean energy based Multi-Utility platform will act as the energy hub for meeting energy requirements of the community for running a variety of high market valued applications. The platforms would be located near the energy utilization points in villages to provide electricity services as per the need of the community. The generated electricity would then be used for variety of applications such as charging lanterns, powering other appliances such as computer, mobile phones, water purifier, grinder, driers, etc. Benefits of energy supply will be three-fold, as outlines below, which will lead to not only revenue generation but also save time.

- Increased throughput of already mechanized processes, due to more reliable and regular power supply; e.g. increased production of honey because of more hours of production.
- Mechanization of those processed which were otherwise manual; e.g. saal leaf plate stitching
- Initiation of new value-added activities, which fetch high revenue but were otherwise ignored, for want of power; e.g. tamarind processing and brick making. With no energy supply raw tamarind was sold is being sold in the market at a very low price without any processing.

The idea is to bridge the gap in energy demand and supply, which hamper economic development of these remote rural areas which otherwise have a high potential for revenue generation, with the use of renewable energy sources. The aim is to make Solar Multi-Utility (SMU) Platform a focal point for economic and social growth that would promote sustainable development in rural areas it serves.

For piloting the project three locations in Odisha have been selected. Odisha, being a state facing the irony of natural resources endowment along with economic and infrastructural deprivation, offers the most appropriate locations for this genre of projects. On one hand, the state is blessed with abundant renewable energy sources and on the other, it required technological and institutional interventions for them to translate into tangible and usable benefits for the communities. The three sites proposed for the project are Baunsadiha, in Thakurmunda block of Mayurbhanj district, Laxmiposi, in Thakurmunda block of Mayurbhanj & Kochila Nuagoan in Tangi Choudwar block of Cuttack district.

While the Cuttack pilot, is expected to benefit Kolha, Sahar, Munda tribes, the scheduled caste community and small and marginal farmer's in around 52 villages of Choudwar and

blocks; in Mayurbhanj, tribes like Gonda, Santala, Bhumija, Khadia, Mankedia, Bathudi, Kolha, the scheduled caste community and poor small & marginal farmers of villages will be the target beneficiaries. Livelihood opportunities such as processing of medicinal plants and herbs, honey processing, *saal* leaf plate making and grinding will get promoted as a result of this project.

The Multi-Utility platform is based on an entrepreneurial model of electricity service delivery that integrates a range of applications to provide for various end uses of electricity by a rural consumer. The model is designed so as to benefit both the service provider as well the consumer. Each facility will be operated by a local solar entrepreneur chosen from the selected villages. These local solar entrepreneurs will be trained to manage and operate the platform. The operational cost (which is primarily the salary of the operator) required for operating and managing the Multi-Utility platform would come from the revenue that would be generated through the electricity services provided by the Multi-Utility utility.

While the facility will create income generation for the local solar entrepreneurs at one end, the end user gets the benefit of electricity services within his/her region on the other end. This model, besides bringing electricity services to many lives in rural area, will also become a source of income generation for local entrepreneurs, thereby contributing to not just the social and economic development of the rural communities, but will help accelerate the regional economic development as well.

## 6.1 INTRODUCTION TO SMU

The project envisages setting up of clean energy based, primarily Solar Multi-Utility platforms for meeting a variety of energy needs of the community which has a high market value. A Multi-Utility Platform is a platform that utilizes the locally available energy resources to generate electricity. The generated electricity would then be used for variety of applications such as charging lanterns, powering other appliances such as computer, mobile phones, water purifier etc. Such platform is located near the energy utilization points in a village to provide electricity services as per the need of the community. In the case of this project, since the renewable energy used is mainly solar (along with wind at one site) the platform may also be called a Solar Multi-Utility Platform (SMU).

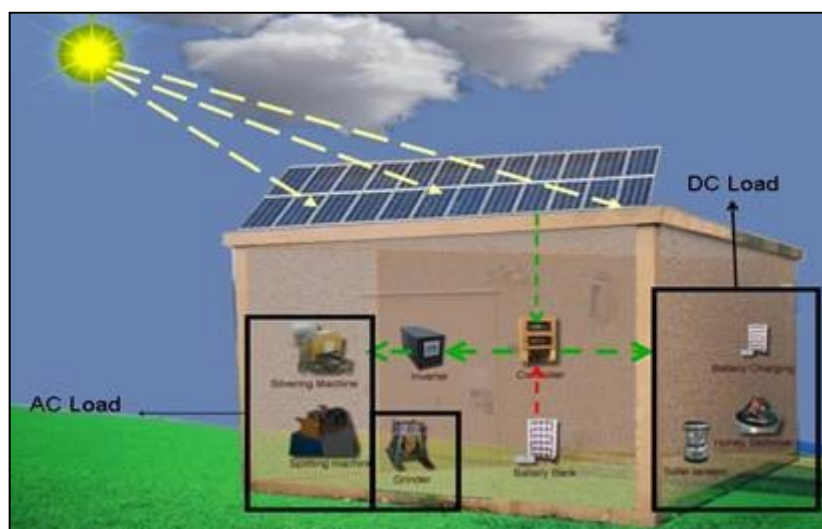


Figure 11 Schematic representation of an SMU

## 6.2 DESIGN & DEVELOPMENT OF AN APPROPRIATE SMU

A complete scoping study was carried out to assess the energy requirement of the local communities in Baunsadiha, Laxmiposi and Kochila Nuagoan villages in Odisha. The very objective of carrying out this activity was to identify those livelihood generation activities which are required by the community and which can enhance the income generation of the beneficiaries by increasing the market value through improvement in quality and production output. The energy intervention required to strengthen such activities and the added appliances that could enhance productivity and give a boost to the revenue generated were also identified for each of these livelihood options.





Table 46 Technology details of the identified technologies at Village Baunsadiha

S. No	Livelihood Appliances	Rated Power Requirement (H.P.)	Rated Power Requirement (KW)	No. of machines	Total Power Required for each appliance (KW)	Energy Requirement				
						Time	Hrs/Day	KWh/Day	No. of Days in a Month	KWh/Month
	<b>Community Purposes</b>									
1	Grinder (medicinal herbs grinding)	2	1.4912	1	1.4912	10am-2pm	4	5.9648	16	95.4368
2	Sewing machines (leaf stitching)	0.25	0.1864	10	1.864	9am-5pm	8	14.912	26	387.712
3	Grinder (Sattu grinding)	2	1.4912	1	1.4912	9am-5pm	8	11.9296	26	310.1696
4	ICT		0.15	1	0.15	9am-10am, 2pm-5pm	4	0.6	30	18
5	Freezer (Medicine Storage)		0.15	1	0.15	12am-11pm	24	3.6	30	108
<b>A</b>	<b>TOTAL</b>				<b>5.15</b>			<b>37.01</b>		<b>919.32</b>

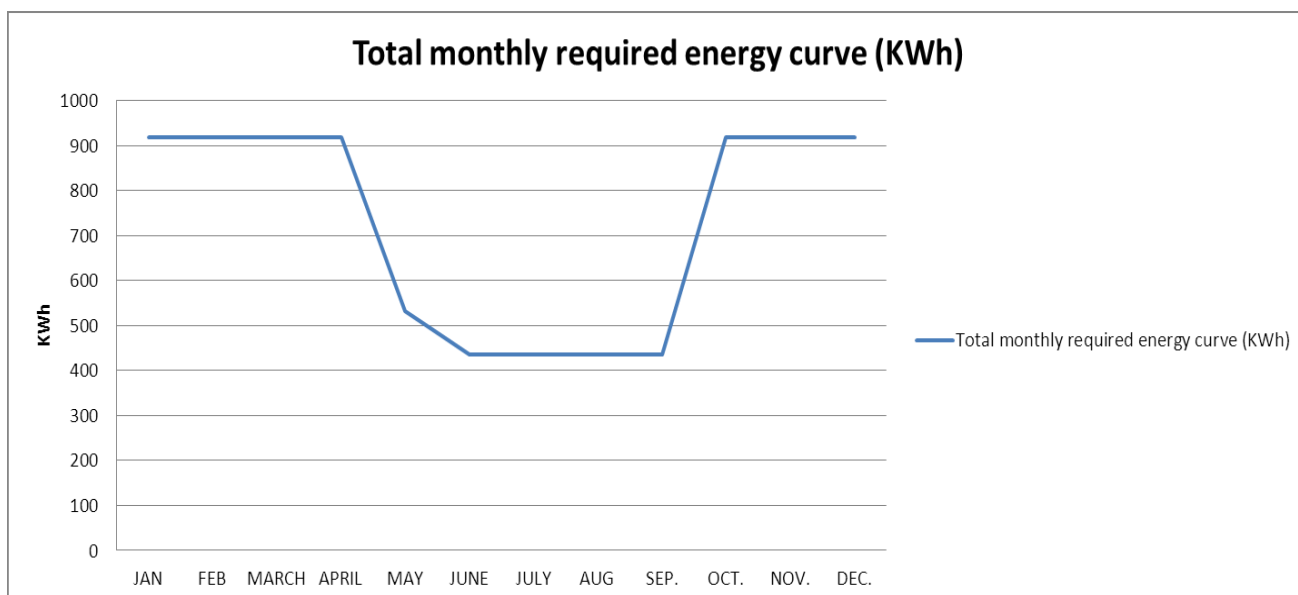


Figure 12 Total monthly required energy curve (KWh) in Baunsadiha village

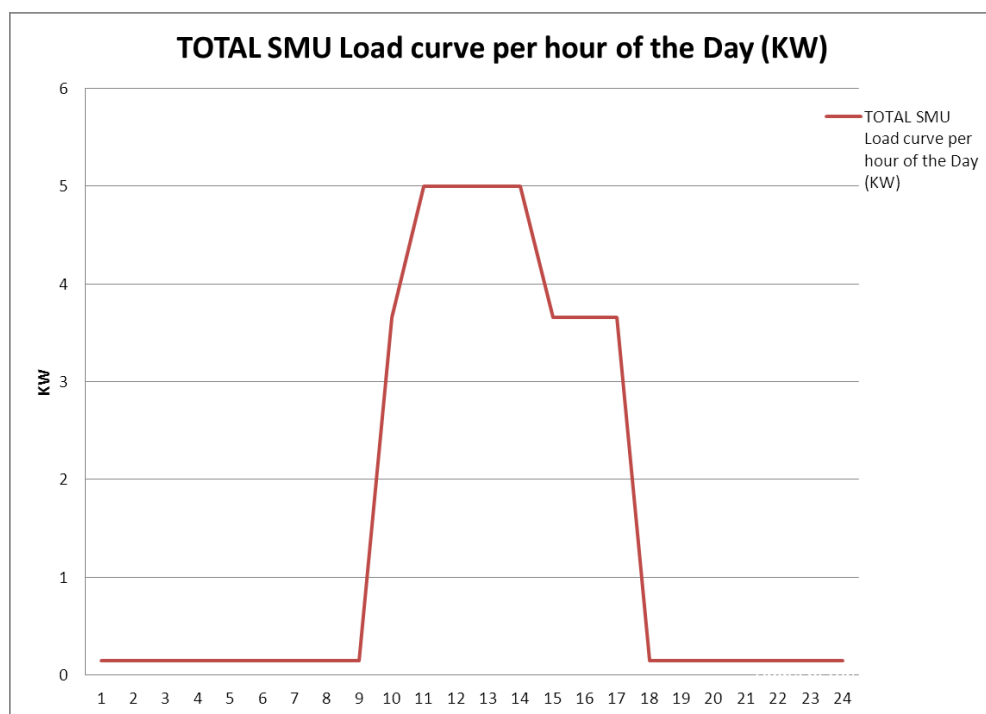


Figure 13 Total SMU Load curve per hour of the Day in Baunsadiha village

Table 47 Technology details of the identified technologies at Village Laxmiposi

S. No.	Livelihood Appliances	Rated Power Requirement (H.P.)	Rated Power Requirement (KW)	No. of machines	Total Power Required for each appliance (KW)	Time	Energy Requirement			
							Hrs/Day	KWh/Day	No. of Days in a Month	KWh/Month
	<b>Community Purposes</b>									
1	Motorized Sewing machine	0.25	0.1864	10	1.864	9am - 5pm	8	14.912	25	372.8
2	Pulper (Tamarind Processing)	1	0.7456	1	0.7456	10am - 1pm	3	2.2368	16	35.7888
3	Deseeder (Tamarind Processing)	1.5	1.1184	1	1.1184	2pm- 5pm	3	3.3552	16	53.6832
4	Water Purifier		0.075	1	0.075	9am- 5pm	8	0.6	30	18
5	Pulper (mango pulping)	1	0.7456	1	0.7456	11am- 3pm	4	2.9824	26	77.5424
6	Freezer (Medicine Storage)		0.15	1	0.15	12am- 11pm	24	3.6	30	108
<b>A</b>	<b>TOTAL</b>				<b>4.6986</b>			<b>27.6864</b>		<b>665.8144</b>

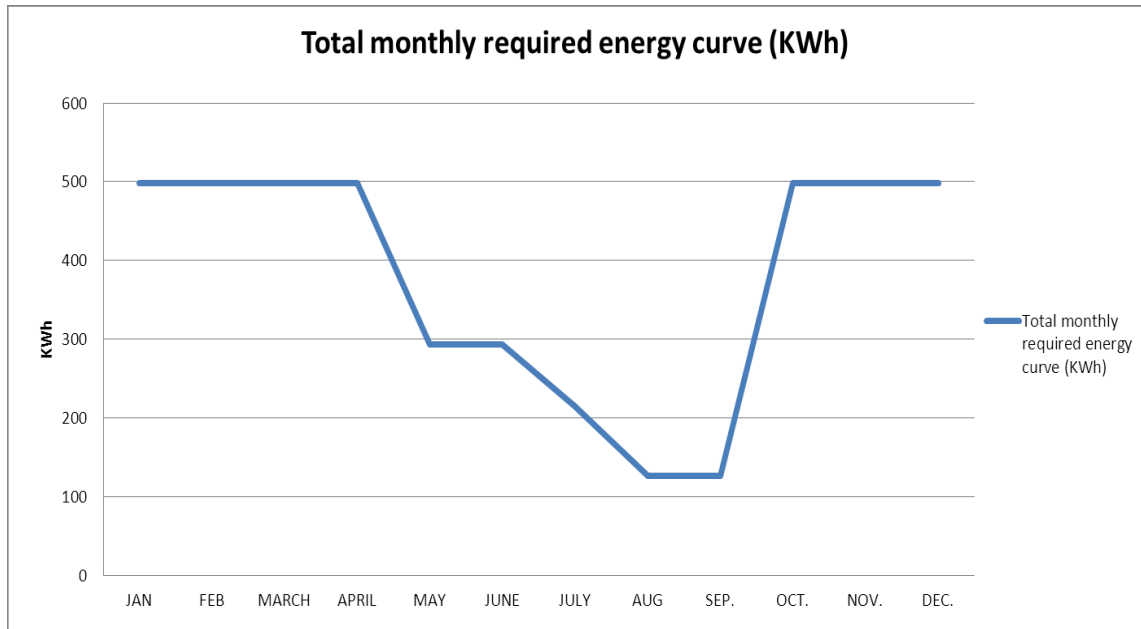


Figure 14 Total monthly required energy curve (KWh) in Laxmiposi village

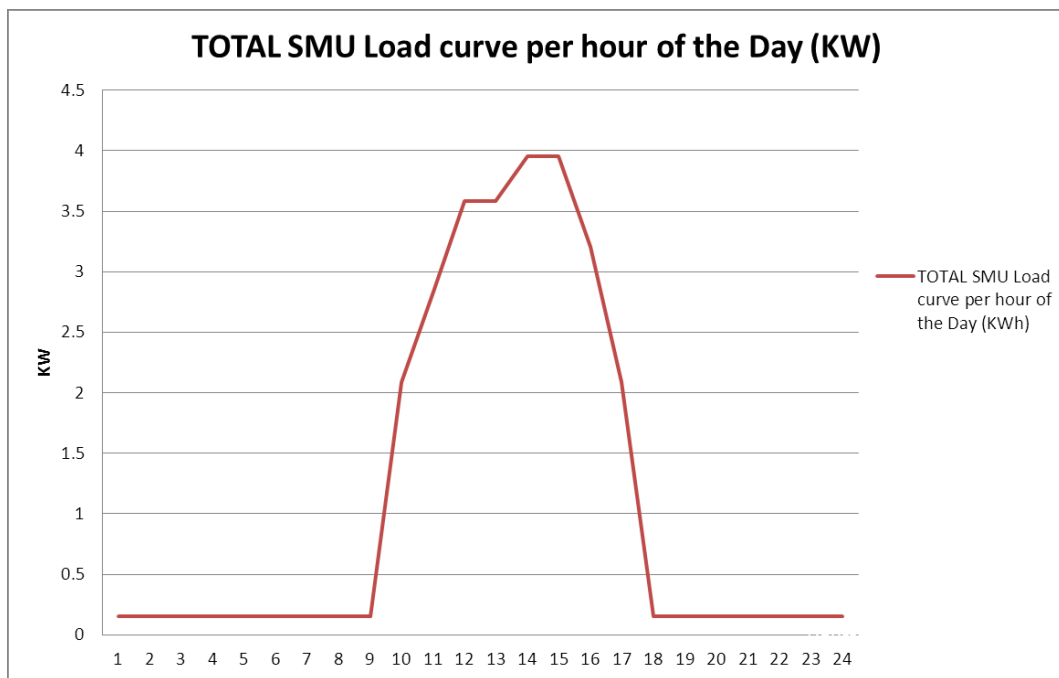


Figure 15 Total SMU Load curve per hour of the Day in Laxmiposi village

Table 48 Technology details of the identified technologies at Village Kochila Nuagoan

S. No.	Livelihood Appliances	Rated Power Requirement (H.P.)	Rated Power Requirement (KW)	No. of machines	Total Power Required for each appliance (KW)	Time	Energy Requirement			
							Hrs/Day	KWh/Day	No. of Days in a Month	KWh/Month
	<b>Community Purposes</b>									
1	Organic manure Grinder	2	1.4912	1	1.4912	10am-2pm	4	5.9648	11	65.6128
2	ICT		0.15	1	0.15	1pm-5pm	4	0.6	30	18
3	Water Purifier		0.075	1	0.075	9am-5pm	8	0.6	30	18
4	Pulverizer	3	2.2368	1	2.2368	2pm-4pm	2	4.4736	15	67.104
5	Freezer (Medicine Storage)		0.15	1	0.15	12am - 11:59 pm	24	3.6	30	108
<b>A</b>	<b>TOTAL</b>				<b>4.103</b>			<b>15.2384</b>		<b>276.7168</b>

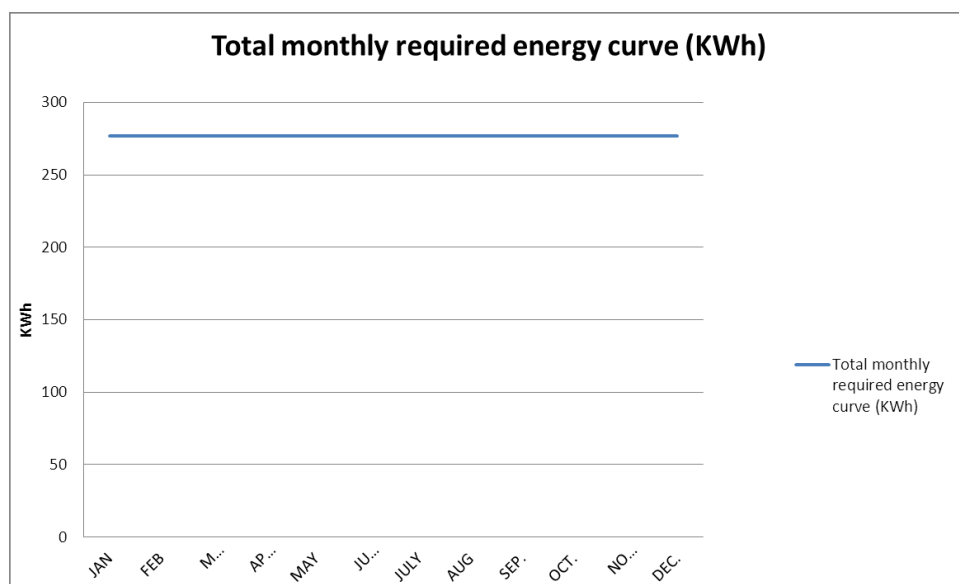


Figure 16 Total monthly required energy curve (KWh) in Kochila Nuagoan village

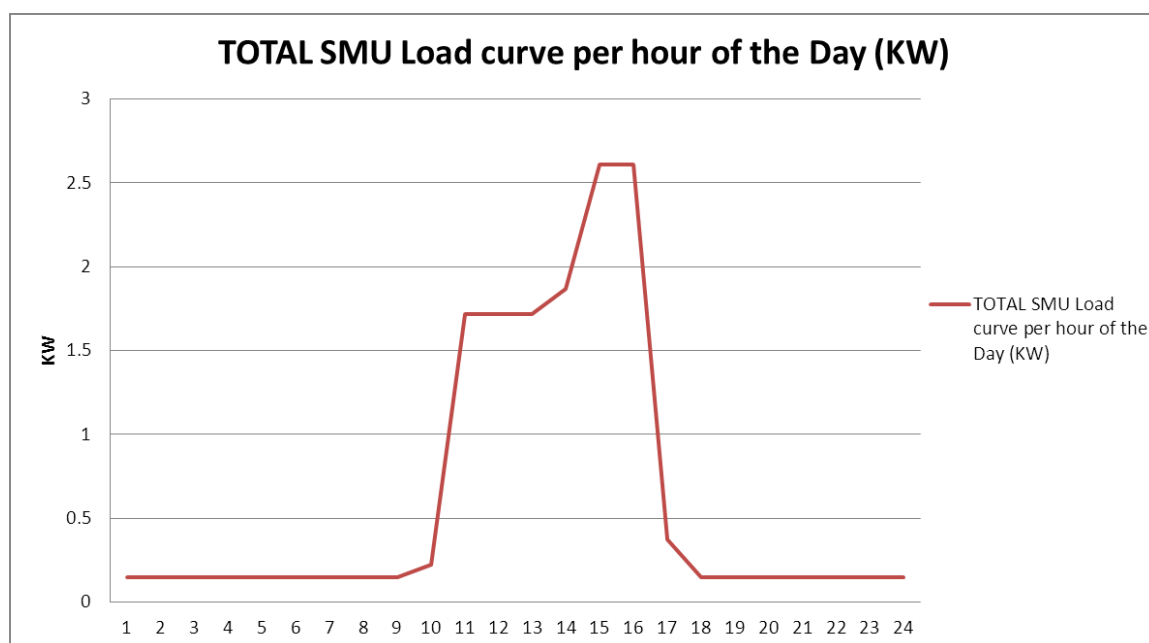


Figure 17 Total SMU Load curve per hour of the Day in Kochila Nuagoan village

## 6.3 CLEAN ENERGY RESOURCE ASSESSMENT

Planning and operation of renewable energy conversion systems need a detailed knowledge of the availability of energy resources. For a precise characterization of renewable energy based electricity generation systems, the system response under the influence of the varying resources has to be analysed. Availability of different RE resources such as solar, woody biomass, hydro, and wind was assessed. The details of the RE resource availability are described in the following sections.

### 6.3.1 SOLAR ENERGY RESOURCES ASSESSMENT

The average annual solar radiation in Odisha ranges between 3.9 to 6.5 kWh/m<sup>2</sup>/day. Odisha, because of its sub-tropical geographical location between the latitudes of 17 to 23°N, **receives an abundance of solar radiation throughout the year** except for some interruption during the monsoon and winter seasons. Occurrence of number of sunny days in a year and average daily solar radiation at the horizontal surface at the nearest locations from the proposed project site were considered. The secondary information (from NASA for the nearest locations) for the month of July was validated with primary data collection on the average daily solar radiation on horizontal surface at the three project sites. Subsequently the secondary data is used for estimating the size and configuration of the clean energy based Multi-Utility Platform. Month wise averaged solar radiation data at Laxmiposi, Baunsadiha and Patapolasahi is given below in Table 4.1 and Figure 4.1a and 4.1b.

Table 49 Monthly average solar insolation at the three village sites (Source: -NASA)

Month	Average Monthly Radiation at LAXMIPOSI (kWh/m <sup>2</sup> /day)	Average Monthly Radiation at BAUNSADIHA (kWh/m <sup>2</sup> /day)	Average Monthly Radiation at PATAPOLASAHI (kWh/m <sup>2</sup> /day)
Jan	4.217	4.217	4.317
Feb	4.810	4.810	4.963
Mar	5.664	5.664	5.676
Apr	6.311	6.311	6.334
May	6.004	6.004	5.981
Jun	5.063	5.063	4.937
Jul	4.345	4.345	4.092
Aug	4.549	4.549	4.413
Sep	4.471	4.471	4.436
Oct	5.077	5.077	5.130
Nov	4.351	4.351	4.499
Dec	3.996	3.996	4.158

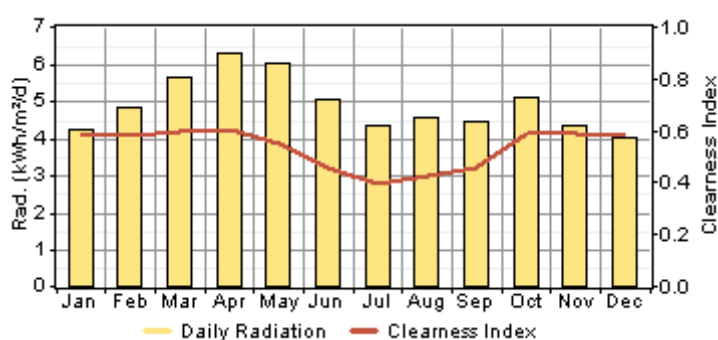


Figure 18 Solar resource in Laxmiposi

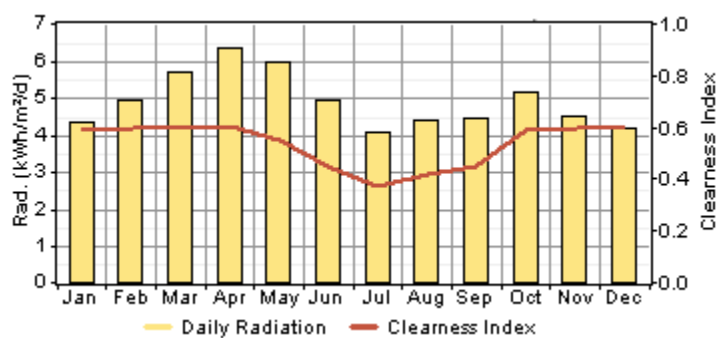


Figure 19 Solar resource at Patapolasahi

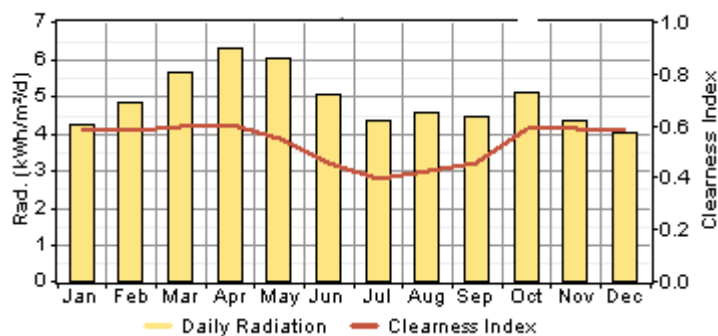


Figure 20 Solar resource at Bausadiha

### 6.3.2 WIND ENERGY RESOURCES ASSESSMENT

The power from wind flow is proportional to the cube of the instantaneous wind velocity and for this reason wind measurement is very crucial. For accurate estimation of wind resources, site - specific wind monitoring is essential. Since there is no C-WET’s wind monitoring station near the proposed project sites, and as per the interaction with Orissa Renewable Energy Development Agency (OREDA), there is no detailed information available on the wind energy resources at the proposed project sites. Therefore the wind resource assessment relies on the secondary information collected from NASA website for the three selected project sites. Tables 4.2a and 4.2b below shows the 10 year monthly average of wind speeds at the three village site at a height of 50 meters and 10 meters respectively.

Table 50 Wind resource at the selected village sites for 50 m height (Source: -NASA).

At 50 m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
10-year average at Laxmiposi	2.24	2.62	3.35	3.87	3.63	3.5	3.57	3.18	2.76	2.35	2.52	2.31	2.99
10-year average Patapolasahi	3.15	3.48	4.32	4.68	4.24	4.37	4.63	4.3	3.45	3.35	3.78	3.42	3.93
10-year Average Baunsadiha	2.24	2.62	3.35	3.87	3.63	3.5	3.57	3.18	2.76	2.35	2.52	2.31	2.99

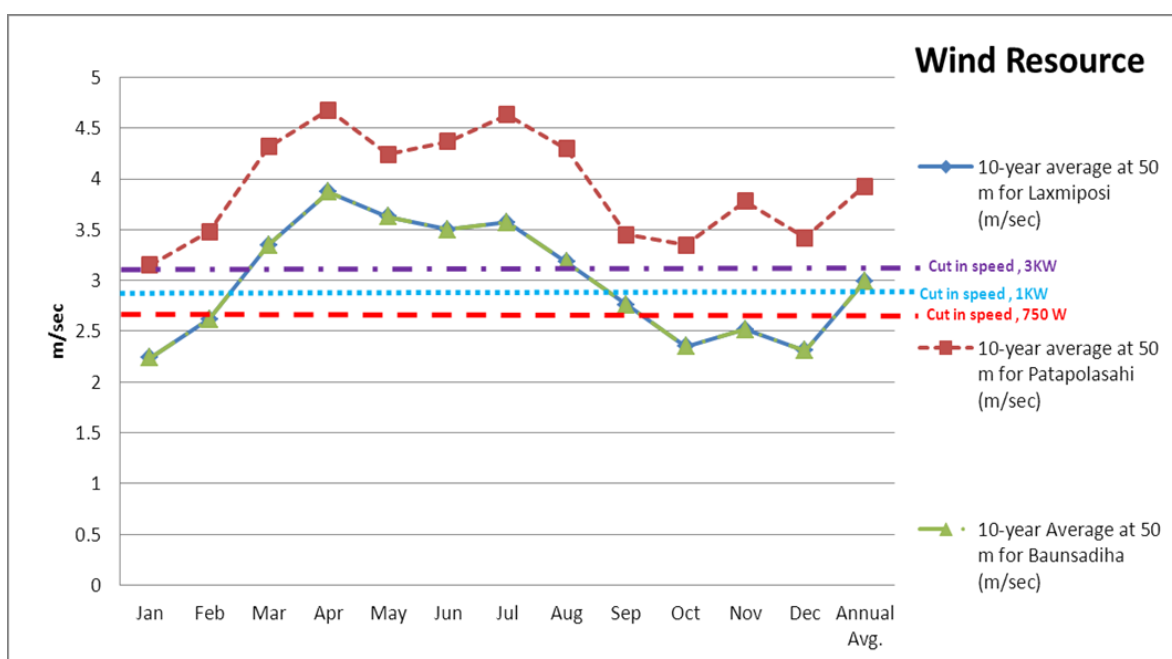


Figure 21 Wind resource for the village site at 50 m height.

Table 51 Wind resource at the selected village sites for 10 m height (Source: -NASA)

Site at 10 m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
10-year average at 10 m for Laxmiposi (m/sec)	1.77	2.06	2.65	3.06	2.87	2.77	2.82	2.5	2.18	1.86	1.99	1.83	2.36
10-year average at 10 m for Patapolasahi (m/sec)	2.49	2.75	3.41	3.7	3.35	3.45	3.67	3.4	2.73	2.65	2.99	2.7	3.1
10-year Average at 10 m for Baunsadiha (m/sec)	1.77	2.06	2.65	3.06	2.87	2.77	2.82	2.5	2.18	1.86	1.99	1.83	2.36

Monthly Averaged Wind Speed at 10 m above the Surface of the Earth for Terrain Similar To Airports (m/s)



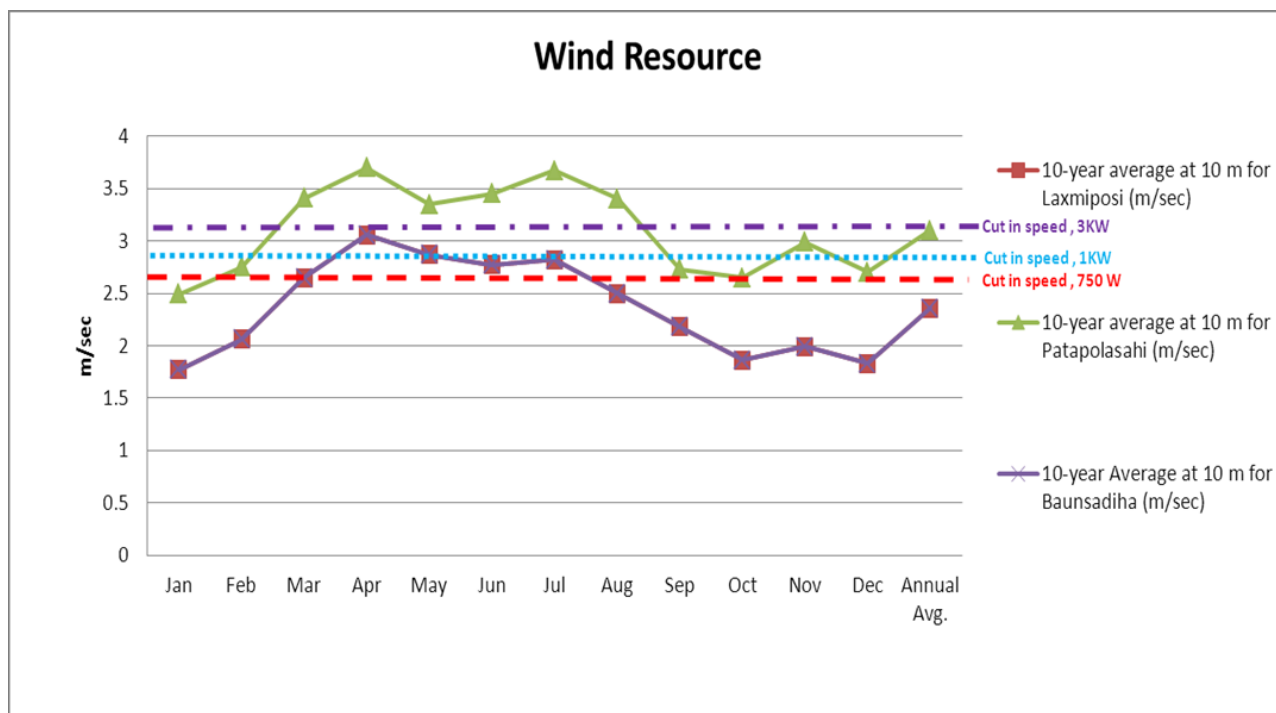


Figure 22 Wind resource for the village site at 10 m height.

From the information gathered and careful calculations it is found that the availability of wind resource profile is not sufficient and sustainable to be techno-economically viable at the three project site locations.

### 6.3.3 WOODY BIOMASS RESOURCE ASSESSMENT

Availability of woody biomass for power production and land availability for energy plantation were the two options that were checked. Step-by-step approach is described below.

Sustainable production of biomass from forests was estimated using the data on area of forest land and the expected yield per hectare. The right to access to forest was also checked. The availability of biomass for power generation on a sustainable basic was estimated by deducting the existing biomass consumption for domestic purposes.

The current domestic requirements of biomass for the villagers were obtained from the household level questionnaire. It is observed that the fuel wood consumption was mainly for cooking and found to be 5-6 kg per household / day (with 4-5 members in a household).

It is found that the availability of woody biomass is not sufficient and sustainable supply of biomass is not ensured for both the locations.

### 6.3.4 HYDRO RESOURCE ASSESSMENT

There was no hydro source or perennial stream found nearby the village to be techno-economically feasible for the project, therefore, hydro was not considered in the final power plant configuration.

## 6.4 RENEWABLE ENERGY TECHNOLOGY (RET) ASSESSMENTS

Table 52 Shows the suitability of different RET's for the three village sites.

Villages	Daily Peak Load (KW)	Solar	Wind	Hydro	Biomass
Baunsadiha	8	Solar PV	Not Sufficient Resource	Not Available	Not Sustainable
Laxmiposi	6.9	Solar PV	Not Sufficient Resource	Not Available	Not Sustainable
Patapolasahi	4.9	Solar PV	Not Sufficient Resource	Not Available	Not Sustainable

### 6.4.1 PROSPECTIVE SUITABLE RET OPTIONS

Based on the energy need assessment and renewable energy resource availability in the targeted areas, following technological options along with the estimated broad specification of the components of the SMU are proposed for the three sites. HOMER simulation for RET selection and system configuration of villages of Laxmiposi, Patapolasahi & Baunsadiha is shown in figure 5.1a. From HOMER simulation it is observed that a Solar PV is the best suited RET for the selected sites to generate electricity.

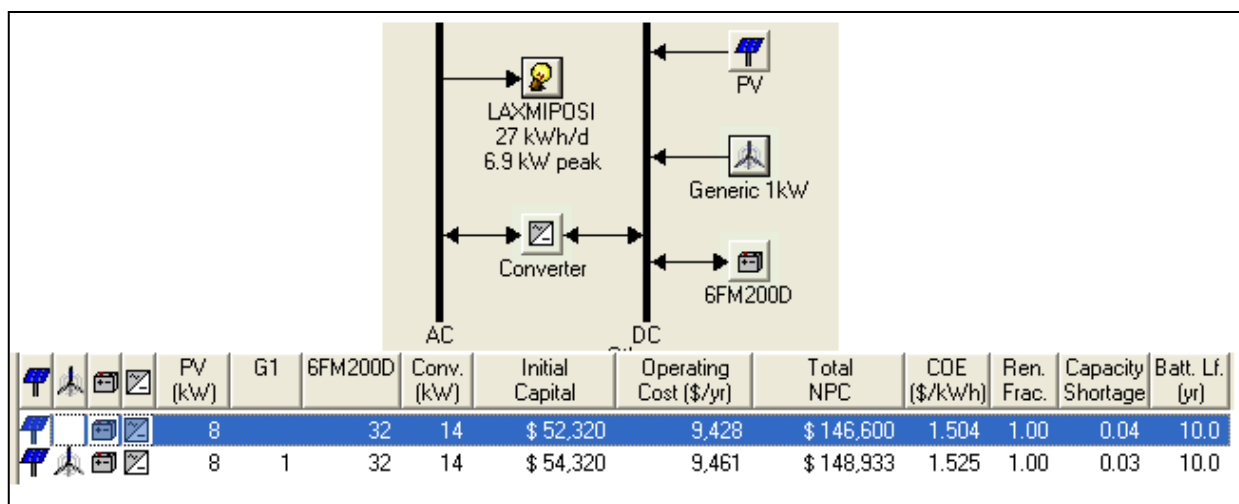


Figure 23 System Configurations

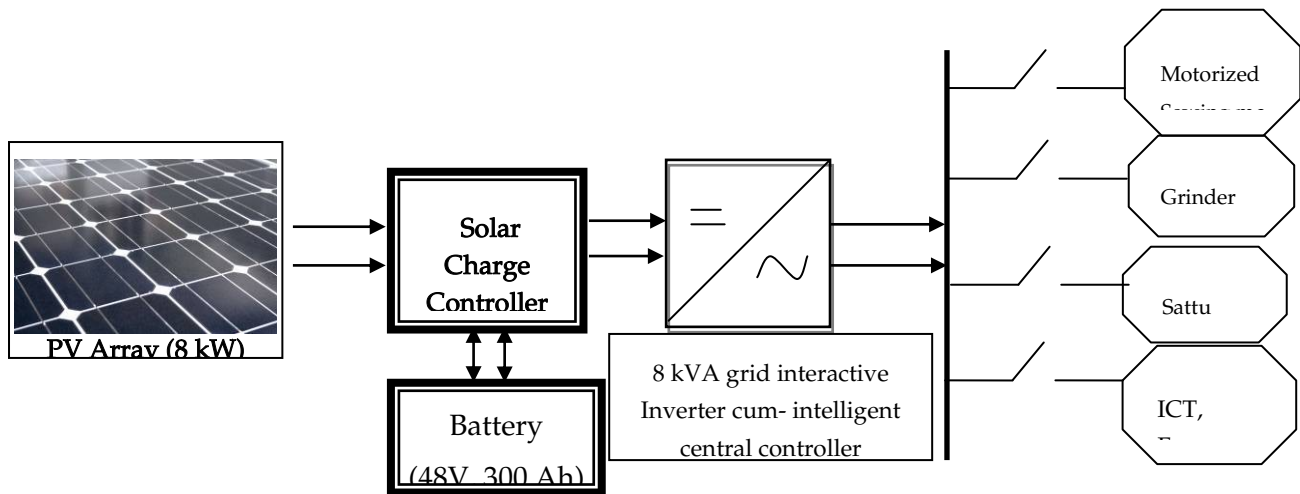


Figure 24 System Configuration for Baunsadiha

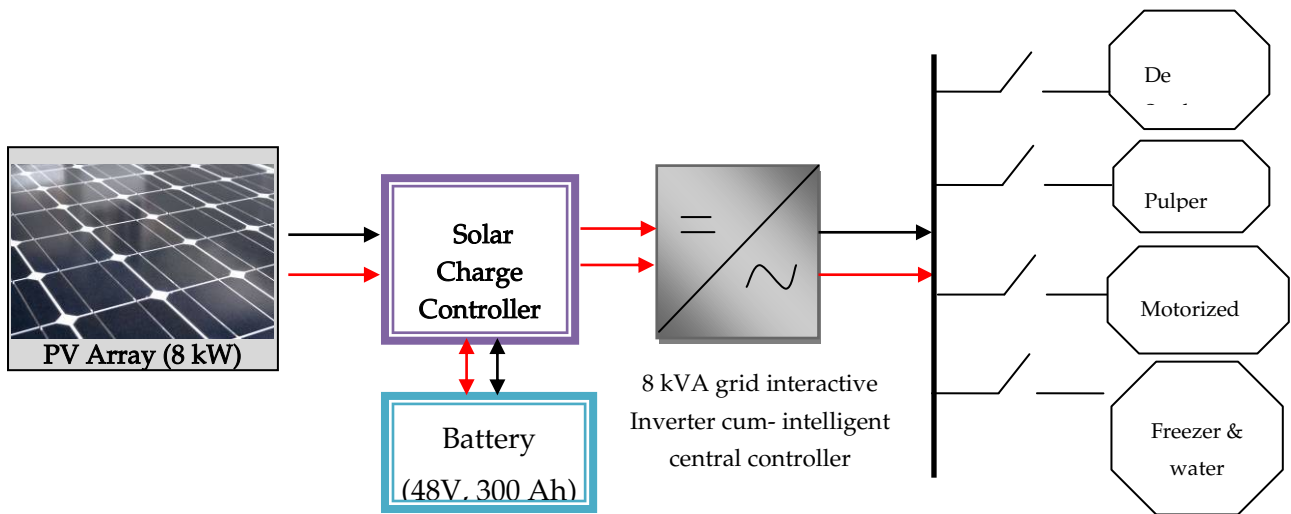


Figure 25 Schematic of the system line diagram at Laxmiposi village

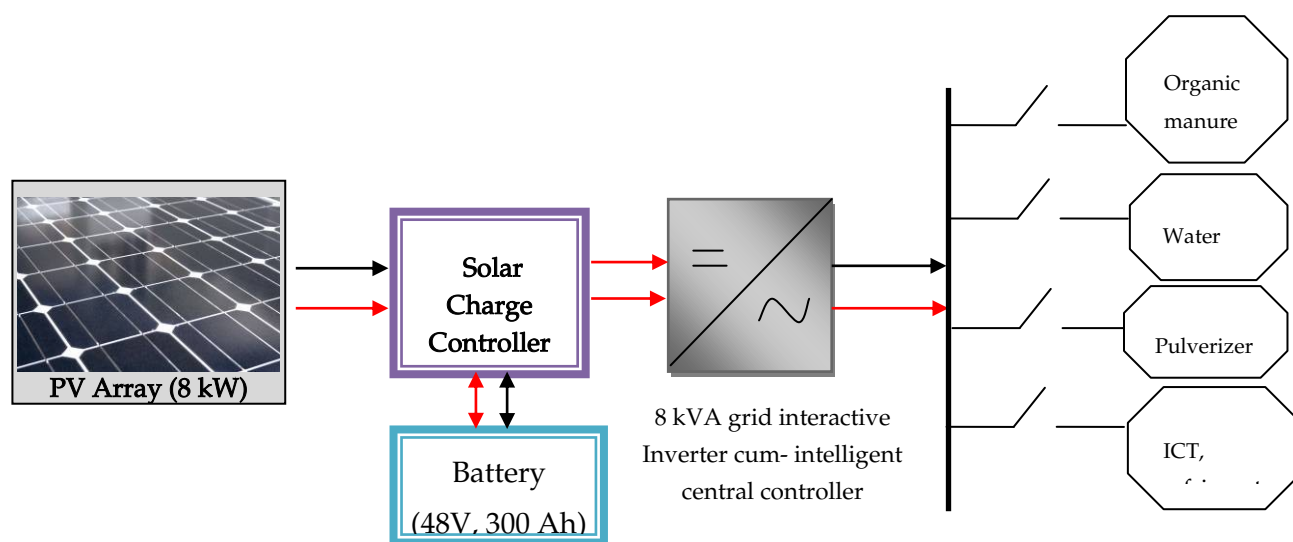


Figure 26 Schematic of the system line diagram at Patapolasahi village

## 6.5 TECHNICAL SPECIFICATIONS

Table 53 Technical specifications of the components of the power plant system at the three village sites

Components	Specifications
<b>Technology and Size of the clean energy based Multi-Utility</b>	Solar
Total SPV array capacity	8kW
<b>Power Conditioning Unit (estimated)</b>	
Inverter type	Bidirectional inverter
Solar charge controller type	MPPT
Array input voltage (nominal)	96V DC
Battery voltage (nominal)	96 V DC
Inverter AC Output (nominal)	240V AC, Single phase, 50Hz.
PCU Inverter rating	8 kVA
PCU charge controller rating	8.0 kW
Mounting	Floor Mounting Type

Solar Charge Controllers (estimated)	
Solar Charge Controller Type	Solid State
Operating Temperature	0° to 50° C
Mounting	Wall mounting type
Battery Bank	
Type	Lead Acid Flooded Electrolyte Tubular Plate Batteries
Total battery bank capacity - nominal	96V,500 Ah @ C10
Remote monitoring system(Optional)	

**Table** As per the resource assessment, currently non-availability of hydro source, wind and woody biomass, defers our opportunistic objective of using the solar PV/wind/biomass/hydro hybrid system. Hence for the three village sites, Solar PV is used to supply power to the SMU. In the table 6.2 above is the detail technical specification of the system configuration and figure 5.2 below shows the systematic line diagram of the proposed 8KWp SPV system.

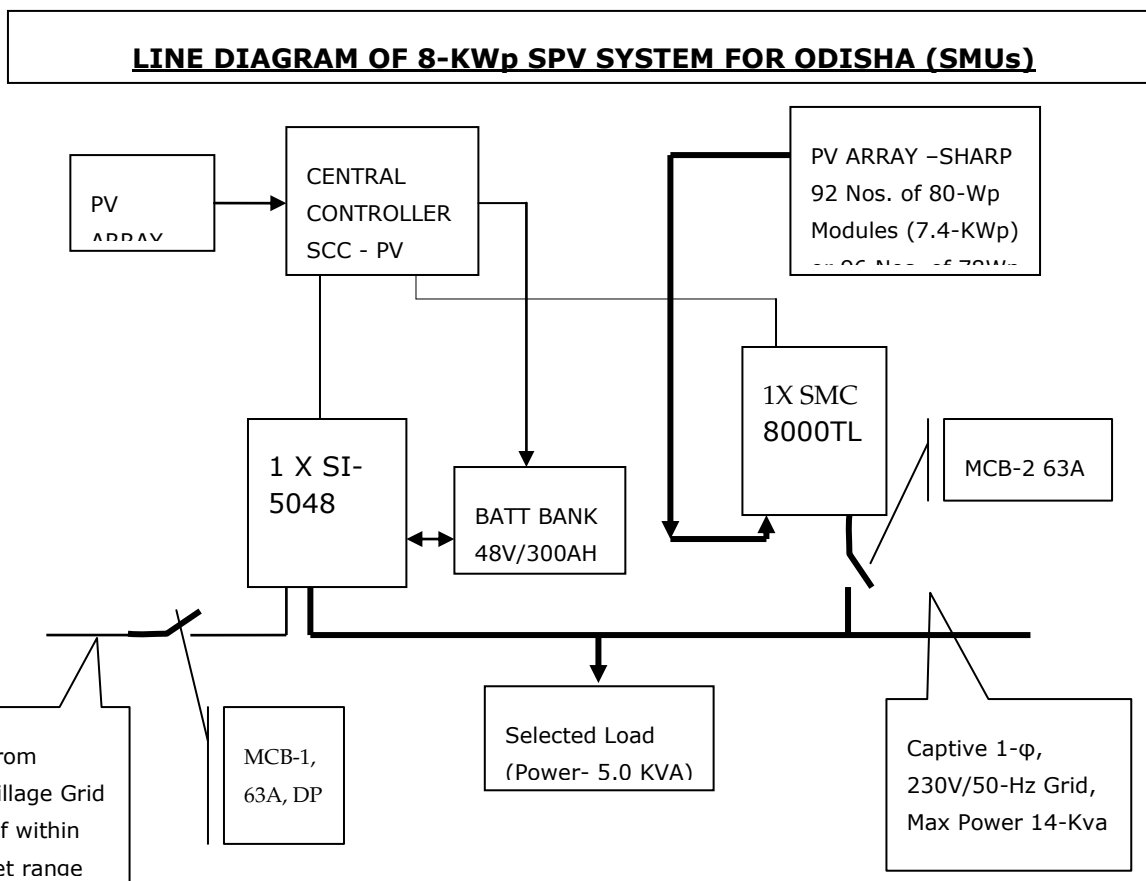


Figure 27 Systematic line diagram of the 8 KWp SPV system.

## 6.6 SYSTEM TECHNICAL DETAILS

### 6.6.1 TECHNICAL DETAILS OF SOLAR MODULE

The rated output power of the module as provided by the supplier should not vary more than 2% from the specified power rating of the modules. The module should have a power output warranty for 10 years. The performance of the module should not be degraded more than 10%. The efficiency of the module should be more than 14% with good transmittivity of the top glass. Plastic weatherproof terminal box should be provided at the back of the module. Bypass diode should be mounted on each module terminal. Table shows the technical specification of solar module

### 6.6.2 ARRAY SUPPORT STRUCTURE

Module should be mounted on a support structure suitable for site condition. After installation, the array structure should be capable of withstanding a substantial wind load.

### 6.6.3 POWER CONDITIONING UNIT (PCU)

The PCU converts DC power produced by SPV array into AC power. The capacity of the PCU depends on the load requirement of the village. The PCU should be so chosen that hybridization of power plant based on other technologies would be easily done. While choosing the PCU, its reliability and durability in the field condition has to be checked. Table 12 shows the technical features of PCU.

**Table 54 Technical features of PCU**

Type	Self-commuted, current regulated, high frequency, IGBT (Insulated Gate Bipolar Transistor)/MOSFET based
Output voltage	40V, 50 Hz, single phase
Total harmonic distortion	Less than 5%
No load power consumption	2.5% of total output rating
Frequency	50±0.5Hz
Wave form	Sine wave
Maximum current ripple	4-5% peak to peak
Inverter efficiency	More than 90%
Voltage regulation	Good

Some protection has to be followed for short circuit, battery deep discharge/overcharge, battery reverse polarity, over current, input surge voltage etc.

### 6.6.4 BATTERY BANK

The battery bank capacity will be different depending upon the load requirement and capacity of the system. Acid proof storage racks has to be provided to accommodate the cell. Table shows the technical specification of tubular lead acid battery

**Table 55 Technical specification of tubular lead acid battery**

Self-discharge	Less than 4%/month
Ampere hour efficiency	>96%
Watt-hr efficiency	>80%
Maximum depth of discharge (MDOD)	80%
Discharge cycle life at maximum DOD	More than 1200

### 6.6.5 JUNCTION BOXES

It is used for termination of connections from various arrays.

### 6.6.6 DC AND AC DISTRIBUTION BOXES

DC Distribution Boxes (DCDB) receives the DC power from SPV array through junction boxes, which shall be terminated on copper bus bars of suitable capacity. Meter shall be provided for measurement of voltage, current. Suitable arrangement should be made for controlling the DC power output from PV array. AC Distribution Board (ACDB) shall control the AC power from PCU to distribution feeders. Ampere meter should be provided.

## 6.7 SMART LOAD MANAGEMENT

Smart Load Management in distributed generation can reduce the peak loading on the grid. It can also help support line voltage at the end of long distribution circuits. The first step towards better peak load management is identification of potential peak shortage situations.

In these three sites for implementation of the SMUs in Odisha under the NFA project, the smart load management has been done in a way, where the types of loads have been divided into CRITICAL (in RED) and NON-CRITICAL Load (in GREEN). It is designed in such a way that the critical loads will be met with their requirement 24X7, and the non-critical load will be met as per their priority during load shedding schedules. In the tables

6a, 6b, and 6c below the segregation of the loads at the three village sites are enlisted. In the figures 6a, 6b and 6c the line graphs, comparing the total load, critical load and non-critical load can be studied. It is observed from these figure graphs that with smart load management that load peaks and load troughs are removed and a straight line load curve is obtained.

Table 56 Smart load management – Load segregated into critical & non-critical load at Baunsadiha.

S. No.	APPLIANCE	Smart Load Management
	<b>Community Purposes</b>	
1	Grinder (medicine grinding)	CRITICAL LOAD
2	Sewing machines (leaf stitching)	NON – CRITICAL LOAD
3	Grinder (Sattu grinding)	NON – CRITICAL LOAD
4	ICT	NON – CRITICAL LOAD
6	Freezer (Medicine Storage)	CRITICAL LOAD

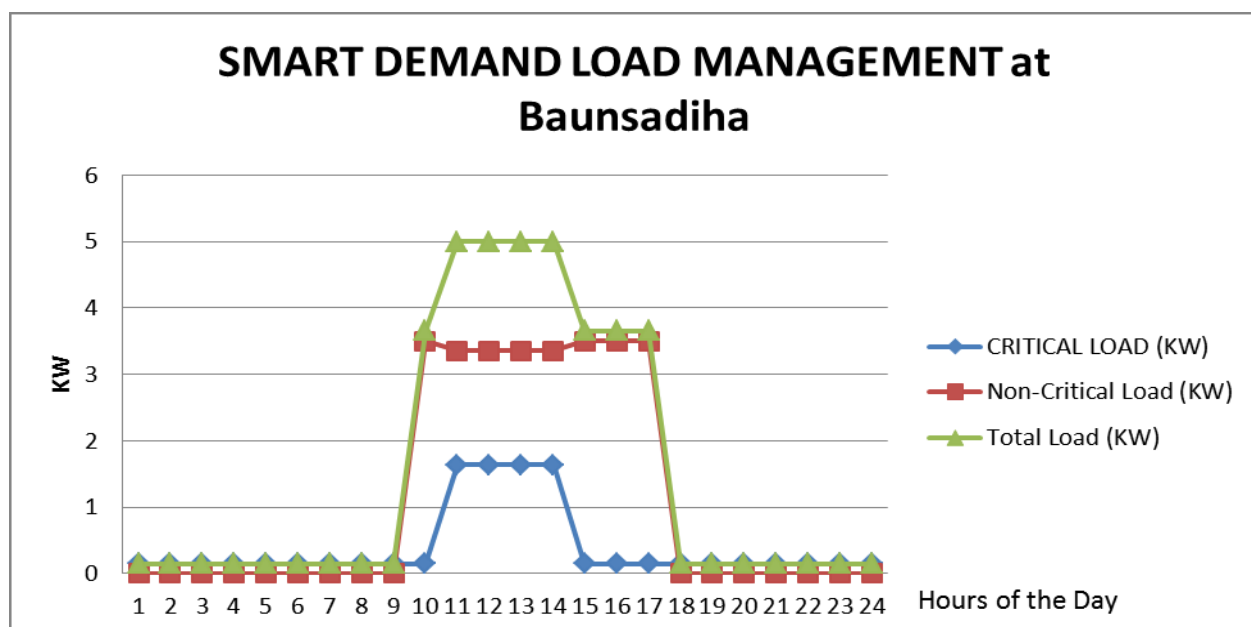


Figure 28 Smart Demand Load Management at Baunsadiha



Table 57 Smart load management – Load segregated into critical & non-critical load at Laxmiposi.

S. No.	APPLIANCE	Smart Load Management
	<b>Community Purposes</b>	
1	Motorised Sewing machine	CRITICAL LOAD
2	Pulper (Tamarind Processing)	NON – CRITICAL LOAD
3	De Seeder (Tamarind Processing)	NON – CRITICAL LOAD
4	Water Purifier	CRITICAL LOAD
5	Pulper (mango pulping)	NON – CRITICAL LOAD
6	Freezer (Medicine Storage)	CRITICAL LOAD

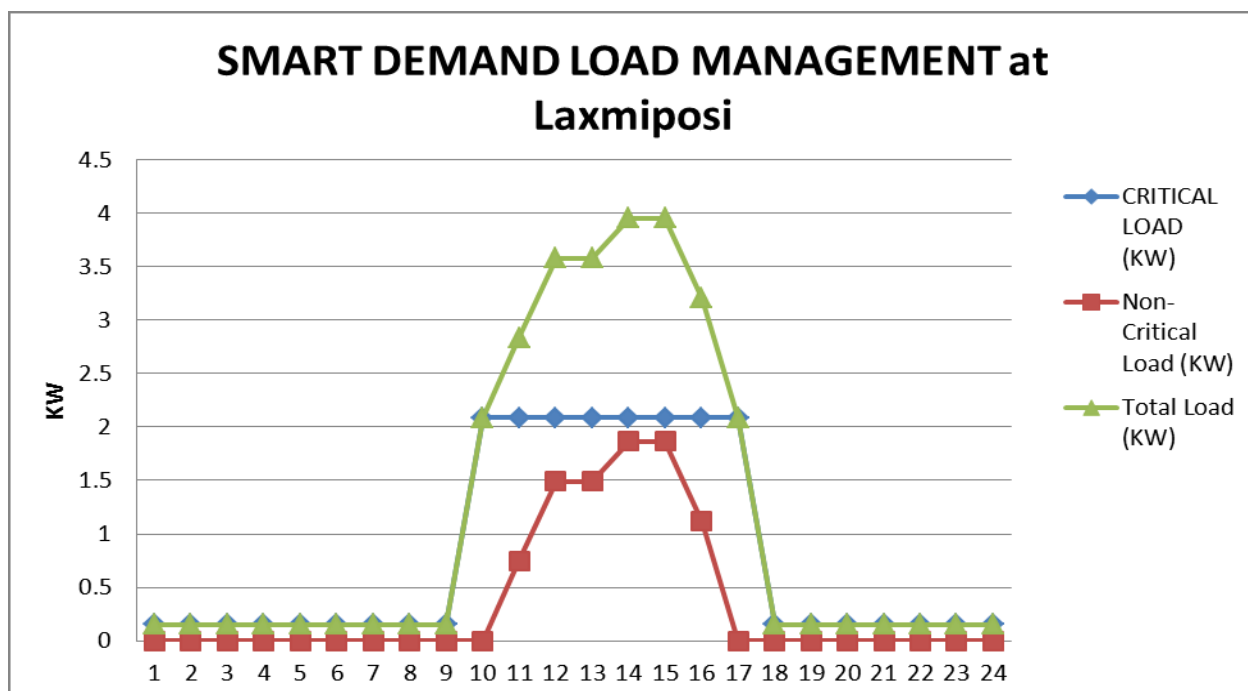


Figure 29 Smart Demand Load Management at Laxmiposi.

Table 58 Smart load management – Load segregated into critical & non-critical load at Patapolasahi.

S. No.	APPLIANCE	Smart Load Management
	<b>Community Purposes</b>	
1	Organic manure Grinder	NON – CRITICAL LOAD
2	ICT	NON – CRITICAL LOAD
3	Water Purifier	CRITICAL LOAD
4	Pulverizer	NON – CRITICAL LOAD
4	Freezer (Medicine Storage)	CRITICAL LOAD

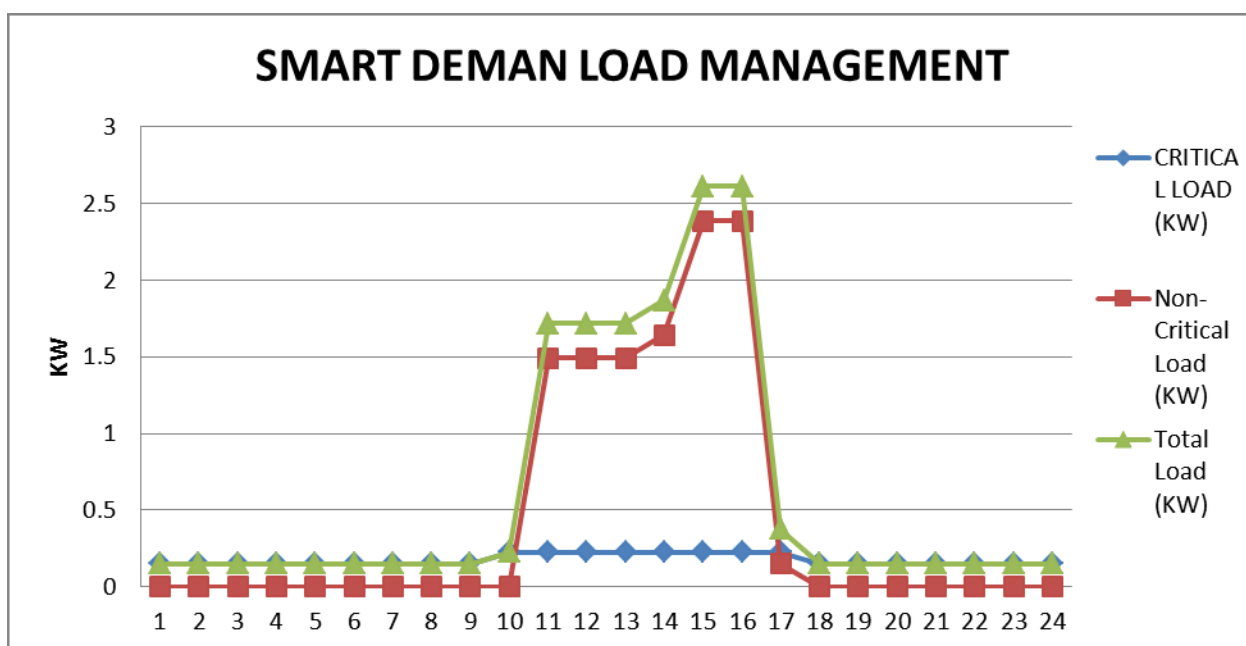


Figure 30 Smart Demand Load Management at Patapolasahi.

## 7. RATIONALE FOR SELECTION OF TECHNOLOGIES

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The Ministry of New and Renewable Energy (MNRE) led 'Energy for Livelihood' projects have demonstrated the importance of renewable energy for reducing poverty through improved quality of life and sustainable livelihood opportunity in the un-electrified villages. With similar objectives, the NFA project executed by TERI in partnership with local NGOs has initiated livelihood related interventions in 1 village in Cuttack and 2 villages in Mayurbhanj districts of Odisha. The project intends to provide sustainable energy solutions to ensure growth in household income as the community in the villages are overwhelmingly dependent on agriculture and forest produce for meeting their livelihood needs. While dependence on agriculture is for 6 months in a year, the remaining 6 months they depend on the forest produce, which is considered a period of income or economic insecurity for the impoverished families. During this phase of the year, few families migrate to nearby towns in search of work and some of them look for jobs under MGNREGS or any other public work to earn a livelihood.

The initiative under the project is primarily aimed to provide round the year sustainable livelihood to the families in the villages. The livelihood initiative would be operated at the community level, in which TERI's local partner (SAMBANDH) would ensure macro management of the solar multi-utility systems and the operating groups in different villages will have the responsibility of day to day management.

A solar multi-utility centre in each of the villages with provision of technology such as *Saal* leaf stitching machine (Laxmiposi and Baunsadiha) is going to be used by all the families, because leaf stitching is one of the major source of income for households in these two villages. Other technologies such as: tamarind processing, mango pulper and solar freezer have been provided in the Laxmiposi village. The utility of the technologies would be further ensured by the community or operating groups. In Baunsadiha, a *Sattu* grinding and traditional medicine grinding machine has been provided to enable the SHGs and Vaidya Sanghas to increase the volume of processed product. The *sattu* is usually supplied to the anganwadis in nearby villages. This is an initiative by village women to bring economic sufficiency to the households. In Patapolasahi village of Cuttack district, SAMBANDH facilitates the activity of ('Vaidya Sangha'-a federation of traditional healers), for whom access to different technology (grinder, water purifier, freezer, water heater, juicer and ICT center) would be provided under the project. Since, a market channel already exists for the traditional healers in this case; outreach activity would be a step forward in that direction. In this village, the technology would cater to Vaidya's from nearby villages also and the operation of the technology will be managed by staff members of SAMBANDH.

The intervention under the project is based on the premise that use of technology would lead to increase in income and saving of time and energy for the households, who are living on the meager income generated through subsistence agriculture and other kinds of labour work. The extra earning could be used by the families to invest on children's education and health of the family members. The other important consideration in this was empowerment

of women self-help groups, who are supplying fortified food to the anganwadis in the block. Yet another objective of the intervention was to enhance the outreach of the traditional healers through maximizing the Ayurvedic medicine production and further marketing of the product across the state and outside of the state, so that the dying wisdom is restored. In all the interventions, the main stakeholders are the community & operating groups, who are responsible for micro management of the multi-utility centers. To make the interventions sustainable, training and handholding activities have been planned, which are going to be administered with the help of local partner SAMBANDH.

## 7.1 RATIONALE FOR SELECTION OF TECHNOLOGY

### 7.1.1 LAXMIPOSI AND BAUNSADIHA, MAYURBHANJ

An analysis of the geographical and socio-economic profile of the villages and the region helps us to understand the need for technologies chosen for this particular intervention. Selection of the technology takes into account, availability of natural resources in the vicinity and its extensive use for livelihood generation. For example, choice of Sal leaf stitching machine was done after examining the extent of involvement of families and necessity of this particular technology for majority of the households in the selected villages. Moreover, the necessity of such a technology was further estimated by doing an assessment of the availability of *saal* leaf in the surrounding forest area in the Thakurmunda block of Mayurbhanj district. An assessment of the incremental demand for *saal* leaf in the market through a demand assessment led us to decide on the technology. The baseline survey conducted by TERI was intensive in nature and during interaction with the community, demand for *saal* leaf stitching machine was put forth by them. The female community stressed on the need of the technology, because this particular occupation is remunerative for the females.

Similarly, for Laxmiposi village, tamarind deseeder was chosen, while looking at the volume of tamarind output in the village. Our first hand assessment shows, only 10 families in this village earn a livelihood by selling deseeded tamarind. The deseeded tamarind has multiple use, in cooking and especially used for making pickles. Though value addition in the case of the product is done by the merchants in the nearby market, its cleaning and deseeding is done by the community. Since, the deseeded tamarind has a higher value compared to usual tamarind, it was a specific demand by the community that a tamarind deseeder may be provided in the village, which will maximize their output per hour. This will save their time, which they could utilize for other productive purposes.

The tamarind output in this village in one season could be about 5 quintals, collected by close to 10 households, who specifically do tamarind deseeding to sell it in the nearby market. In the present circumstance, the families are only deseeding the tamarind, which does not fetch them the desired market price, if we compare that with the person hour utilized for this specific activity. A first hand assessment and interaction with the community gave the realization that value addition in the product could give them a better price, which may also work as an incentive for other families to take up this secondary

occupation. By looking at the community need, it was decided that a tamarind pulper could be provided to the community, which will enhance the scope of better return from this particular forest produce. This could also result in involvement of some more families in this occupation, who are dependent only on subsistent farming as their primary occupation and saal leaf stitching as the only secondary occupation. This will help them earn a little extra money, which could be utilized for other productive purposes of the family.

Mango is one of the forest produce, which has the potential to sustain the economic need of majority families. Since, the produce of this fruit varies on a year to year basis, the community needs to get the maximum value from this forest produce. The usual return accrued by selling raw or ripe mango is very limited, because the contractor, who do bulk purchase at village level do keep the prices at a lower level. In the absence of proper communication to block or district level market, the tribal prefer to sell the mango at a lower cost to the contractor at the local level. The technology team of TERI evaluated that a mango pulper has the potential to give 50 per cent more benefit to the households, if the family sells mango pulp instead of raw or ripe mango. During the visit of the baseline team, a clear need was felt for the installation of the mango pulper. This has dual benefit to the community, one – it adds value to the primary product and secondly, it gives the option to the community to do bulk selling of the pulp to pickle industry in the nearby area.

In the Laxmiposi and Baunsadiha village cattle rearing is a secondary economic activity, which provides income to a large number of families. The difficulty in this occupation is, the households have to depend on public transport to go to the nearest market (Thakurmunda) to sell the milk, which is more than 15 kms from the village. The unavailability of transport sometimes makes the villagers using bicycle to go to Thakurmunda. Since, the villages are located close to the forest area and there is a fear of wild animals, they community prefer consuming the milk rather than risking their life. Since, selling milk gives them some earning for at least 5 months in a year, the community expressed their interest for a freezer, which will help them to store the milk to produce some milk product. This will substantially increase their income as the return from selling 2/3 litters of milk is less than INR 60 per day, but selling of butter milk, curd and cottage cheese may bring them better return to the extent of INR 150 per day.

The grinder in Baunsadiha is going to contribute to self-reliance of SHGs. An enhancement in the overall income of SHGs will contribute to the family income of the SHG members. The fortified product that is supplied to the anganwadis in the area is prepared manually at the moment. This consumes a lot of productive person hour per each female of the SHG. Apart from this income activity, the females have the responsibility to do household chores. Hence, managing time between both the activity becomes unsustainable for the females. By looking at the problem faced by the female community in Baunsadiha, it was decided that one grinder would be provided to the SHG, which will help them to maximize their productivity. This will enhance their capability to meet the demand of the anganwadis, by which the SHG members will get a lot of direct and indirect benefits. The capacity of the grinder is 50kg/per hour, which will drastically reduce the time contributed by each SHG member in the village.

A close interaction with the traditional healers in the Baunsadiha village gives us an idea about their effort to keep their traditional knowledge alive. With limited outreach, unavailability of raw material and limited technology support, the traditional healers have minimized this occupation to a personal choice rather than a livelihood option. Our discussion with the healers revealed the extent of the problem they are facing due to unavailability of desired technology and market. TERI's assessment of the problem in this regard helped in taking a decision to provide technological support to these healers, who are the only medium of keeping this traditional knowledge alive. One grinder to prepare Ayurvedic medicine is provided to the Vaidya Sangha. Members of this Sangh are facing enormous problem as they have to travel to the extent of 50 kms to get access to such a grinder to further prepare the medicine. While looking at the technology provision vis a vis the economic benefit of this occupation, it is felt that access to grinder will drastically reduce their expenditure on travel and time invested to prepare medicine, which does not have a potential market also.

### 7.1.2 PATAPOLASAHI, KOCHILA NUAGOAN

In Patapolasahi, the use of technology is meant to help the traditional healers to retain their traditional knowledge and expertise, which they are also using to earn a livelihood. Their outreach has been furthered by activity of SAMBANDH, but the importance of their occupation will be justified, if they utilize the available technology to serve a larger geographical area. Keeping this objective in mind, a grinder is provided, which the healers would use to grind the raw produces that they collect from nearby forest or buy from local market. This grinder would be used by the members of the Vaidya Sangh to increase their output. Since, this would be run on solar power, the operational cost for this would not be borne by the healers, which will minimize their expenditure on processing of Ayurvedic medicines, which they are selling to the patients.

The need for a water purifier was felt because purified water is used for multiple purposes, including cleaning of containers for keeping the processed product, jars meant for packaging and for using the purified water during production. Solar water purifier does not use conventional energy hence the cost incurred for running it is less compared to water purifiers that use conventional energy.

The processing of raw produces procured from forest and local markets is carried out on a phased manner. This is done because different types of forest produces meant for Ayurvedic medicine is processed simultaneously. To keep the processed produce for further processing after the initial grinding, the use of freezer is very important. Apart from this, some final product need refrigeration owing to the hot and humid condition prevailing in the area. The need for the freezer was felt more after discussion with the members of Vaidya Sangha and the members of the traditional healing foundation set up by SAMBANDH.

## 7.2 USAGE OF TECHNOLOGY

From the above discussion, it is understandable that each of the technology chosen for livelihood intervention has certain economic and social relevance. Some of the technology

has higher economic value, when compared to the others. The saal stitching machine has the highest economic value, because of the extent of its use by families in both villages of Laxmiposi and Baunsadiha. Once used by the household, it has the potential of triggering demand for more such technology as it will push the production of saal leaf plate, ultimately resulting in income sustainability of the household's dependent on this particular forest produce for their livelihood.

Likewise, the use of tamarind deseeder and mango pulper has higher economic value, if the community believes in maximization of economic return through value addition. Training of the community to know about the potential use and benefit of the technology is a vital aspect for the success of the proposed livelihood intervention. For value addition in these two products, some financial help may be necessary, which could possibly bring more families to use the technology for livelihood generation. Presently, only 10 families are using tamarind to earn a livelihood. In the case of mango processing, the families who are not dominantly into this occupation may prefer it as a remunerative source of livelihood.

The use of freezer is going to serve the need of majority of the families in the two villages as they are expected to process the milk further to sell it as a value added product. In this regard, technical and financial support may be provided to the community. This is going to bring economic and social security to the families living in these two villages. The freezer could be utilized to store processed product and may be sold in the nearest market to get a better price.

The use of grinder although serves an economic purpose, it has a higher social value, when it benefits the women SHGs and the traditional healers. The dependence of the women SHGs would increase their efficiency as technology will replace manual work. Moreover, it will give self-reliance to the women as their individual income would rise in proportion to the time contributed by them. This will work as a model for women in different villages, who may like to take up such economic activity for bringing economic self-reliance to the women folk.

The use of grinder by the traditional healers will minimize the time wasted for preparing medicine. They usually travel long distances to get access to technology, which is not cost effective. They will save time and energy and devote that time to prepare the medicine. An assessment of the prices of the medicine shows that they are usually low priced, but looking at the quantum of time given for that leave alone profit, feasibility of such a profession is questioned by members of Vaidya Sangha. Hence, use of technology will minimize per unit cost and would help them to save time, cost and energy, thus motivating them to keep this profession alive.

### 7.3 WAY FORWARD

The initiatives taken by TERI to bring economic and social sustainability in the tribal villages under NFA have small but positive impact, if we consider income growth of the households using renewable energy. Though necessity of the renewable energy technology is being

given increased attention in the present context of development, implementing such initiatives in remote villages is replete with challenges. The initiative taken by TERI may culminate into a new model of rural development, but sustaining such initiative needs continuous engagement with the community through interaction, awareness and training.

We have already discussed the possible benefits of the renewable energy technology to the households as an individual unit and the community as a whole. However, our discussion has been limited to the economic and social aspects related to technology led development. Regardless of the fact that use of technology by the community or the user group is going to benefit each and every family in the selected villages, the focus must now be to build the capacity of the community to own and sustain the initiative.

Our frequent visits to the villages remind us of some existing realities in the villages. The first one is extreme poverty conditions coupled with restricted economic choice. Hence, further intervention need to focus on innovating ways to make the use of existing natural resources more equitable. This could be possible through social engineering. One more important aspect is creating an enabling environment – provision of backward and forward linkage to the poor households, who are going to benefit the most from such an initiative. Although social disparity in these villages is very less, the distinction between the literates and illiterates need to be bridged so that everyone gets equal opportunity to grow economically.

While the focus of the analysis here has been use of renewable energy for economic sustainability, we now focus on each economic and social groups, who have a certain need for training and capacity building. The women SHG group has a clear advantage over any other gender based occupation. However, they have restricted access to market. This problem needs to be addressed so that SHGs like this will work as a model of development in these remote areas. Similarly, issues associated with the Vaidya Sangha in both the contexts (Mayurbhanj & Cuttack) are not professional but they are practical (linked to backward and forward linkage). The resource base for such occupation is drying up apart from the challenges they are facing due to higher reliance of people on modern medicine. Hence, the challenge here is to give them access to raw material and market outreach. The third and most important aspect is – preaching the households on the economic benefits through value addition. They are selling saal leaf plate, milk and other forest produce at sub-optimal prices, because they have no possibility of adding value to the product. This could be done after introduction of the technology to them. However, the intervention should not be confined to these technologies as these areas offer the scope for using more such technologies, for example – technology for Kusuma oil production etc.

The three important aspects in this model of development is technology, financial and market support, out of which TERI is focusing on the first component. The approach henceforth may be to provide financial support to such initiative apart from creating a market base for the product, then only the initiative will become sustainable.



## 8. WAY FORWARD: HOW DO WE MEASURE CHANGE/OUTPUT?

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After one year of installations of the technology, the team would revisit the households (interviewed during the baseline) and the operating groups.

### 8.1 CASE STUDY MODEL

The output assessment would develop case studies and compare with the baseline scenarios for:

1. Operating groups
2. Two individual households belonging to operating groups from each village
3. Two individual households belonging to end users from each village

### 8.2 HOUSEHOLD LEVEL ASSESSMENT

The households shall be revisited to measure change on the indicators discussed in the situational analysis chapter. The assessment shall measure the change in quality of life in terms of proportion of households in the defined categories.

### 8.3 HOUSEHOLD LEVEL SCHEDULE FOR MEASURING CHANGE/OUTPUT

Based on the baseline scenario, the tentative household schedule for measuring change is discussed in the subsequent section.

#### Section 1: General information

1. Barcode number during baseline survey
  - i. Four digit
2. Name of the state
  - i. Uttar Pradesh
  - ii. Odisha
  - iii. Madhya Pradesh
  - iv. Assam
3. Name of the village
  - i. Baunsadiha
  - ii. Laxmiposi
  - iii. Kochila Nuagoan

4. Category of household
  - i. End user
  - ii. Operating group
  - iii. Micro grid entrepreneur
5. If operating group member; mention the name of the operating group?
  - i. Rajkusum Vaidya Sangha, Kochila Nuagaon, Tangi-Choudwar
  - ii. Netaji Farmers' Club, Laxmiposhi
  - iii. Ashwini Kumar Vaidya Sangha, Baunsdiha
  - iv. Maa Malati Gramashree SHG, Baunsdiha
  - v. None of the above
6. Does the household possess BPL card?
  - i. Yes
  - ii. No

## Section 2: Livelihood scenario

7. Primary income source of the household
  - i. Labour work in industry/ public works
  - ii. Labour work in agriculture
  - iii. Leases out agricultural land
  - iv. Sale of agricultural produce
  - v. Collection and sale of NTFP - Non-timber forest produce
  - vi. Production and sale of handloom/handicraft products
  - vii. Owns small business
  - viii. Works in shop/restaurant/tea shops/sweet shops
  - ix. Government service
  - x. Regular service in private sector/industry
  - xi. Pension / remittance/ investment in banks
  - xii. Provides health services/ traditional healing/local doctor
  - xiii. Micro grid enterprise
  - xiv. Revenue from Solar Multi utility centre
  - xv. No income source
  - xvi. Others
8. Secondary income source
  - i. Labour work in industry/ public works
  - ii. Labour work in agriculture

- iii. Leases out agricultural land
  - iv. Sale of agricultural produce
  - v. Collection and sale of NTFP - Non-timber forest produce
  - vi. Production and sale of handloom/handicraft products
  - vii. Owns small business
  - viii. Works in shop/restaurant/tea shops/sweet shops
  - ix. Government service
  - x. Regular service in private sector/industry
  - xi. Pension / remittance/ investment in banks
  - xii. Provides health services/ traditional healing/local doctor
  - xiii. Micro grid enterprise
  - xiv. Revenue from Solar Multi utility centre
  - xv. No income source
  - xvi. Others
9. Does the household sells any of the agricultural produce in market? If yes, then mention the produce
- i. Rice
  - ii. Wheat
  - iii. Pulse (all types)
  - iv. Vegetable
  - v. Fruit- any other than mango
  - vi. Fruit- mango
  - vii. Cotton
  - viii. Cashew nut
  - ix. Any other
10. Do you use any equipment/machinery/ devise for postharvest processing?
- i. Yes
  - ii. No
11. If yes, is the equipment equipment/machinery/ devise is installed in the Solar Multi Utility Centre?
- i. Yes
  - ii. No
12. What are the end products prepared using NTFP are sold by the households?
- i. Saal leafplates
  - ii. Bamboo basket

- iii. Broom
  - iv. Dry leaves
  - v. Honey
  - vi. Dry Mahua/ Kusum/ Saal seeds
  - vii. Kusum oil
  - viii. Raw tamarind
  - ix. Deseeded and packed tamarind
  - x. Packed mango bar / mango juice
  - xi. Herbal medicines
  - xii. Others
  - xiii. None
13. Do you use any equipment/machinery/ devise for drying/pressing/deseeding/splitting/oil extraction of the NTFPs?
- i. Yes
  - ii. No
14. If yes, is the equipment equipment/machinery/ devise is installed in the Solar Multi Utility Centre?
- i. Yes
  - ii. No
15. Does the household practices traditional healing?
- i. Yes
  - ii. No
16. If yes, do you use any equipment/machinery/ devise for medicine preparation?
- i. Yes
  - ii. No
17. If yes, is the equipment equipment/machinery/ devise is installed in the Solar Multi Utility Centre?
- i. Yes
  - ii. No
18. What are the facilities used by the household in the solar multi utility centre?
- i. Grinding machine to grid medicines
  - ii. Grinding machine to grid cereals
  - iii. Mango pulper
  - iv. Tamarind deseeder
  - v. Mobile charger

- vi. Battery charger
  - vii. None
19. Which facility you used most in the last year?
- i. Grinding machine to grid medicines
  - ii. Grinding machine to grid cereals
  - iii. Mango pulper
  - iv. Tamarind deseeder
  - v. Tamarind pulper
  - vi. Mobile charger
  - vii. Battery charger
  - viii. None
20. What is the frequency of usage of the facility?
- i. Daily
  - ii. Once in three days
  - iii. Once a week
  - iv. Once in two weeks
  - v. Once in a month
  - vi. Once in three months
  - vii. Once in six months
  - viii. Once in a year
  - ix. Never
21. Approximate amount paid by the household to the Solar Multi Utility Centre in the last year for using the facilities?
- i. None
  - ii. Less than Rs. 50
  - iii. Rs. 50- Rs. 100
  - iv. Rs. 100- Rs. 150
  - v. Rs. 150- Rs. 200
  - vi. Rs. 200- Rs. 250
  - vii. Rs. 250- Rs. 300
  - viii. Rs. 300- Rs. 400
  - ix. Rs. 400- Rs. 500
  - x. Rs. 500- Rs. 700
  - xi. Rs. 700- Rs. 1000
  - xii. Above Rs. 1000

22. Is any member from the household has responsibility related to operation/ maintenance/management of the SMU?
  - i. Yes
  - ii. No
23. If yes, then mention the responsibility?
  - i. Record keeping
  - ii. Repair
  - iii. Operating the equipment/device
  - iv. Security
  - v. Cleaning
  - vi. Any other
24. Cash income directly received from the SMU for the abovementioned responsibility?
  - i. None
  - ii. Less than Rs. 1200
  - iii. Rs. 1200- Rs. 2400
  - iv. Rs. 2400- Rs. 3600
  - v. Rs. 3600- Rs. 4800
  - vi. Rs. 4800- Rs. 6000
  - vii. Above Rs. 6000

### Section 3: Employment status

25. Males (18 -60 years) involved in income generation activities
  - i. Two digits
26. Males (18 -60 years) searching for Income generation activities/ not involved in income generation activities
  - i. Two digits
27. Females (18 -60 years) in income generation activities
  - i. Two digits
28. Females (18 -60 years) searching for Income generation activities/ not involved in income generation activities
  - i. Two digits
29. Level of involvement of members (aged 7-14 years) in income generation activities
  - i. Full time
  - ii. Daily, during the time available after attending the school
  - iii. Occasional

- iv. Never
  - v. No member in the household is aged between 7-14 years
30. Number of adult males (18-60 years) who attended any training related to operation and management of SMU in the past 1 year?
- i. Two digits
31. Number of adult females (18-60 years) who attended any training related to operation and management of SMU in the past 1 year?
- i. Two digits
32. Mention the broad topic covered in the training
- i. How to operate the entire SMU
  - ii. How to operate equipment/ devices in the SMU
  - iii. Minor repairs
  - iv. Record keeping/ basic accounts
  - v. Awareness on SMU
  - vi. Other
  - vii. None
33. Are the members who attended the training/s are able to use the skills learned for practical purpose?
- i. Yes
  - ii. No

#### Section 4: Women Empowerment

34. Nature of women involvement in managing household income and expenditure
- i. Buying of raw materials
  - ii. Buying of equipment/machinery
  - iii. Selling of produce
  - iv. Direct labour contribution in cultivation/collection of NTFP
  - v. Processing of agricultural/ NTFP
  - vi. Work as labourer/daily wage worker
  - vii. Work as salaried employee
  - viii. Member of SHG involved in income generation activity
  - ix. Member of SHG not involved in income generation activity
  - x. Expenditure on food/ clothes
  - xi. Expenditure on children's education
  - xii. None

## Section 5: Income security

35. Total cash income of the household in the past one year
  - i. Less than INR 6000
  - ii. INR 6000 to INR 9000
  - iii. INR 9000 to INR 12000
  - iv. INR 12000 to INR 18000
  - v. INR 18000 to INR 22000
  - vi. INR 22000 to INR 32000
  - vii. INR 22000 to INR 34000
  - viii. INR 34000 to INR 46000
  - ix. INR 46000 to INR 58000
  - x. Above INR 58000
36. Total savings of the household
  - i. Nil
  - ii. Rs 10 and Rs 400
  - iii. Rs 400 and Rs 1000
  - iv. Rs 1000 and Rs 1500
  - v. Rs 1500 and Rs 3000
  - vi. Rs 3000 and Rs 6000
  - vii. Rs 6000 and Rs 12000
  - viii. More than Rs 12000
37. Is any member of the household under any form of debt?
  - i. Yes
  - ii. No

## Section 6: Household Cooking Energy

38. Primary cooking fuel used by the household
  - i. Firewood
  - ii. LPG
  - iii. Kerosene
  - iv. Solar
  - v. Electricity
  - vi. Biogas
  - vii. Other
  - viii. None



39. Expenditure per month on primary cooking fuel, if purchased by the household
- i. None
  - ii. Less than Rs. 50
  - iii. Rs. 50-Rs. 150
  - iv. Rs. 150-Rs. 250
  - v. Rs. 250-Rs. 350
  - vi. Rs. 350-Rs. 450
  - vii. Above Rs. 450
40. Secondary cooking fuel used by the household
- i. Firewood
  - ii. LPG
  - iii. Kerosene
  - iv. Solar
  - v. Electricity
  - vi. Biogas
  - vii. Other
  - viii. None
41. Primary source of firewood collection
- i. Forest
  - ii. Market
  - iii. Agricultural field
  - iv. Roadside
  - v. Wasteland
  - vi. Other
  - vii. None
42. Members primarily responsible for firewood collection
- i. Adult men
  - ii. Adult men and adult women
  - iii. Adult men and children
  - iv. Adult women
  - v. Adult women and children
  - vi. Children
  - vii. Not applicable

## Section 7: Household Lighting Energy

43. Is your household electrified?
- Yes
  - No
44. If yes, when was it electrified?
- Recently
  - One year back
  - Two years back
  - Three years back
  - Before three years
45. If yes, when was it electrified?
- Recently
  - One year back
  - Two years back
  - Three years back
  - Before three years
46. If electrified under any scheme, name the scheme?
- RGGVY
  - Biju Gram Jyoti
  - Other
  - None
47. Source of household electrification as today
- Grid connection
  - Solar grid
  - Grid connection and solar grid
  - Micro/Mini hydro
  - Diesel generator
  - Any other decentralized generation
  - Grid connection and diesel generator
  - Grid connection and off grid generation (including hydro)
  - Solar homelight system
  - Grid connection and solar homelight system
  - Any other
  - None

48. Source of household electrification two years back
- i. Grid connection
  - ii. Solar grid
  - iii. Grid connection and solar grid
  - iv. Micro/Mini hydro
  - v. Diesel generator
  - vi. Any other decentralized generation
  - vii. Grid connection and diesel generator
  - viii. Grid connection and off grid generation (including hydro)
  - ix. Solar homelight system
  - x. Grid connection and solar homelight system
  - xi. Any other
  - xii. None
49. Primary device for lighting during evening hours
- i. CFL
  - ii. Incandescent bulb
  - iii. Tube light
  - iv. Solar lantern
  - v. LED light
  - vi. Battery operated light
  - vii. Kerosene lamp
  - viii. Any other
  - ix. None
50. Do you get regular power for supply during evening hours?
- i. Yes
  - ii. No
51. What was the power situation for lighting purpose during evening before 2 years?
- i. Regular
  - ii. Power cuts 1-2 hours were daily affair
  - iii. Power cuts for 2-3 hours were daily affair
  - iv. Household was not electrified
52. Average cost of per litre kerosene?
- i. Rs 10
  - ii. Rs. 10- Rs. 20

- iii. Rs. 30- Rs. 40
  - iv. More than s. 40
53. Average monthly electricity bill
- i. NA
  - ii. Less than Rs. 50
  - iii. Rs. 50 Rs. 100
  - iv. Rs. 100-Rs. 150
  - v. Rs. 150-Rs. 200
  - vi. Rs. 200-Rs. 250
  - vii. Above Rs. 250
54. Average monthly rentals paid to the solar micro grid operator
- i. NA
  - ii. Less than Rs. 50
  - iii. Rs. 50 Rs. 100
  - iv. Rs. 100-Rs. 150
  - v. Rs. 150-Rs. 200
  - vi. Rs. 200-Rs. 250
  - vii. Above Rs. 250

#### Section 8: Energy usage for livelihood purpose (Odisha, MP specific)

55. Energy source used for livelihood purpose
- i. None
  - ii. Electricity
  - iii. Solar
  - iv. Kerosene
  - v. Diesel
  - vi. Petrol
  - vii. Battery
  - viii. Any other
56. Specific purpose of fuel usage
- i. Not applicable
  - ii. Irrigation
  - iii. Operating agricultural equipment
  - iv. Lighting

- v. Refrigeration
- vi. Cooking tea/food in restaurant
- vii. Welding
- viii. Pressing
- ix. Stitching

### Section 9: Education

- 57. Number of boys attending primary school  
Two digits
- 58. Number of girls attending primary school  
Two digits
- 59. Number of boys attending secondary school  
Two digits
- 60. Number of girls attending secondary school  
Two digits
- 61. Number of boys aged between 7-14 who never went to school  
Two digits
- 62. Number of girls aged between 7-14 who never went to school  
Two digits
- 63. Reasons for never going to school / dropping out of school for boys
  - i. Not applicable
  - ii. Contributing to daily household work
  - iii. Contributing to household income
  - iv. Lack of fund to support education
  - v. Not interested in studies
  - vi. Parents/grand parents were thought that education was not required
  - vii. School was located at distant location
  - viii. There were no teacher in the school
- 64. Reasons for never going to school / dropping out of school for boys
  - i. Not applicable
  - ii. Contributing to daily household work
  - iii. Contributing to household income
  - iv. Lack of fund to support education
  - v. Not interested in studies
  - vi. Parents/grand parents were thought that education was not required

- vii. School was located at distant location
  - viii. There were no teacher in the school
65. Average number of hours for which children (Aged between 7 and 14 years) study at home
- i. Not applicable
  - ii. None
  - iii. Up to 2 hours
  - iv. More than 2 hours
66. At what time of the day do children study at home
- i. Not applicable
  - ii. None
  - iii. Morning
  - iv. Afternoon
  - v. Evening
  - vi. Morning and evening
67. What is the accessibility level to computers by the children in the age group 6-17
- i. None
  - ii. At school
  - iii. At home
  - iv. At internet café
  - v. At Solar Multi utility centre

#### Section 10: Health

68. What are the kind of health institutions normally accessed by the household
- i. None
  - ii. Sub centre
  - iii. Public health centre
  - iv. Private dispensary
  - v. Traditional healer/ baidya
  - vi. Other
69. What is the nature of treatment
- i. Allopathic
  - ii. Homeopathy
  - iii. Ayurveda
  - iv. Unani

- v. Any other
70. Common health problems reported by the members in the past one year
- i. Malaria
  - ii. Dengue
  - iii. Diarrhoea
  - iv. Typhoid
  - v. Cholera
  - vi. Jaundice
  - vii. Tuberculosis
  - viii. Skin infection
  - ix. Fever
  - x. Others
71. Specify the primary source of drinking water
- i. Water tanker coming to village
  - ii. Tap water
  - iii. Hand pump
  - iv. Stand post – 5-10 taps in one place in the village
  - v. Open well
  - vi. Stream
  - vii. River
  - viii. Pond
  - ix. Others
  - x. None
72. Quality of drinking water
- i. Clear
  - ii. Brackish
  - iii. Infested with chemicals like arsenic or flouride
73. Methods used for purification of drinking water
- i. None
  - ii. Boiling
  - iii. Chorine tablets
  - iv. Filtering
  - v. RO system
  - vi. Any other

## Section 11: Ownership of assets

74. Please specify the kind of telephone facility accessed by you in general
- i. None
  - ii. Mobile
  - iii. Landline
  - iv. Public telephone booth
  - v. Neighbour's phone/mobile
  - vi. Any other
75. Where do the member charge their mobiles
- i. Not applicable
  - ii. Home
  - iii. Solar Multi-utility Centre
  - iv. Charging place at Energy Provider's place
  - v. Shop in village
  - vi. Shop in nearby village or town
  - vii. Other
76. In case, the members charge their mobile phone outside home, then how much they pay for the service
- i. Not applicable
  - ii. None
  - iii. Less than INR 2
  - iv. INR 2 to INR 4
  - v. INR 4 to INR 6
  - vi. More than INR 6
77. Does the household own a radio
- i. Yes
  - ii. No
78. Does the household own a television
- i. Yes
  - ii. No
79. Does the household own a refrigerator
- i. Yes
  - ii. No
80. Do you use refrigerator installed at solar multi utility centre?
- i. Not applicable



ii. Yes

iii. No

81. Do you use refrigerator installed at solar multi utility centre?

iv. Not applicable

v. Yes

vi. No



## 9. WAY FORWARD: STRENGTHENING OF PRESENT INTERVENTIONS

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The proposed interventions using renewable energy technology in the selected villages of Mayurbhanj and Cuttack is not extensive, as it caters to a small section of the population. Moreover, the proposed technology is going to address the livelihood generation issues partially. The foremost reason for this is: the technology does not have anything for the youths in the village, who are incidentally not very literate to take up jobs outside their locality. Secondly, it only addresses a few options for livelihood, which is dominantly held by women groups in the village. It is a common knowledge that use of non-timber forest produce (NTFPs) has been very limited after Forest Rights Act, 2006 came into effect. Moreover, the social forestry programme, which checks indiscriminate use of forest produce has made the livelihood options limited for the tribal community living close to the forest.

Looking at the limited livelihood options and higher dependence of tribal community on the scarcely available resources, the baseline team applied an exploratory approach to know, what other NTFPs could be added to the existing set of NTFPs to provide a sustainable livelihood to the households in the villages. The study found that there are many other NTFPs like *Mahua* flower and fruit, *Siali* leaves, *Jhuna* and *Kusuma* seed do keep the potential to enhance the household income by 50 per cent for a particular family. However, this could only be possible with provision of more such renewable energy technology, which may be used by the community for getting some marketable products. More important than the production of such products, creation of market for such product is necessary. Looking at the location of the village and the distance of potential market from the region, it is understood that an innovative approaches such as: product buy back is the only solution.

Our exploratory study to understand the potential of other NTFPs for creating provision for a sustainable livelihood gives the understanding that focus on technology with higher potential to engage the youths in the villages, identification of a specific market for the produce and micro-finance support for the initiatives could strengthen the present interventions. In addition to the above, training and capacity building of all sections engaged in livelihood generation activity is one of the vital component to strengthen the present interventions.

### 9.1 EXPLORING PROVISION OF MORE RETs

In this section, we will justify the necessity of few more RETs, which have the potential of providing sustainable livelihood to the families in the area. More than justifying the use of such technology in a limited periphery, we will argue about their up-scaling in the nearby villages.

It has been discussed in other chapters that more than three-fourth of the household in the village are engaged in collection and sale of *Mahua*. Close to 50 per cent households earn livelihood by selling *Mahua* seed. Households in the village use *Mahua* oil for cooking,

which is manually extracted after drying, deseeding and crushing. This particular livelihood option consumes a lot of time, as every step of processing is done manually. This work could be done by use of RETs, which will maximize their output per household, while giving them time to devote for other livelihood occupation.

Similarly, there are other NTFPs, which have the potential to substantially increase the income of the some families at least by 20-30 per cent in a particular season. In the villages of Mayurbhanj, majority of the households are engaged in collection and sale of *Saal* and *Kusuma* seed. However, in the absence of value addition to these NTFPs, the primary collectors are forced to sell them at sub-optimal prices to the local buyers. The distance of the local market (Thakurmunda 8-9 kms) also restricts their access to a market, which could give them a remunerative price. Close to 10 households also collect *Chara* (a fruit) and after drying, sell it either to the trader who comes to the village or sell it in the market in Thakurmunda. Income from selling of *Chara* does not contribute substantially to household condition and the produce is vulnerable to weather condition. About 10-15 households also collect *Jhuna* (substance used as mosquito repellent) and sell it in Thakurmunda market. Kusuma oil (fragrance oil) has multiple use in the commercial market, but due to no access to technology, the community deseed and crushes it manually, which is sold to traders in Thakurmunda or any other nearby market. The entire chain of processing of *Kusuma* flower is done manually.

Our community level interaction with women groups gave us the realization that fortified Sattu production requires frying of different commodity, for which the SHG group members go as far as 5 kms. Although it is transported using vehicles, cost of transportation and the person hour needed to pack the commodities and then unpack it for further grinding consumes a lot of time. This cuts into their net earnings from selling *sattu* to the anganwadis. To check this expenditure, provision of a community cook stove may be made, which will save resources as well as time devoted for frying the commodities.

Looking at the above analysis on the availability of NTFPs, manual processing of different raw materials, dependence on external processing unit and low pricing of the produce due to absence of potential market, it is understood that provision of few more RETs along with facilitation of backward and forward linkage could address the underlying issues. Further, capacity building of some literate youth members is necessary to help them act as a channel between the community and commercial traders. More important than these two elements, extending the reach of such technology to the villages in the vicinity. This could be possible by adopting a macro approach while making provision of RETs. Macro approach here connotes, making provision of high capacity technology, addition of new technology and more importantly getting the financial support for the above is necessary.

An exploratory field assessment of the available resources around Kochila Nuagoan village in Cuttack district gives an understanding that apart from subsistent farming, community members in the hamlets are engaged in horticulture. Agriculture being largely rainfed, water availability during Rabi season is very low, hence farmers face enormous problem in getting water for the standing crop in the horticulture season (Nov-Jan). While making water available at the farm level is difficult, tapping of pond water was suggested as an

option, but due to over-dependence on a limited source of water, drip irrigation using renewable energy is considered a viable option. For this, a ground level assessment of the need for drip technology may be done to prior to deciding the technology for this specific purpose.

## 9.2 CAPACITY BUILDING OF COMMUNITY

In the previous section, the discussion was largely on the possibility of adding more technology options to make community's livelihood sustainable. Given the fact that, intervention of this nature has direct benefit for a small section of the population, building the capacity of the operating groups and the some selected youths from the village on operation, maintenance and marketing of the product will lead to creation of larger skilled human resource pool. This particular group, who will receive training, may be utilized to strengthen future technology interventions. They could be utilized as a resource group to create awareness about the benefits of technology and may be instrumental in increasing the market outreach for the product produced by community and the operating groups in the village.

For the available renewable technology in villages of Laxmiposi and Baunsadiha, a sound training model may be adopted so that each and every individual associated with the intervention will get an opportunity to build his/her capacity. In the subsequent paragraph, we will highlight the training needs for each group in the village by considering the present human resource skill in mind.

The most common and remunerative occupation for the community here is *saal* leaf stitching machine, which does not need much technical training for manning. The technology needs proper handling so that it does not break out on a frequent basis. To ensure this, at least 2/3 people from each strata including women in the village may be given technical training on its operation, maintenance and repairing of the technology. The second level of training could be given to the users (male and female) to acquaint them on the uses and abuses of the technology. More than technical training they need to be given managerial training so that everyone using the facility manages his/her work in a stipulated time. The most important objective of providing RETs was to maximize output and to promote commercial selling of saal leaf plate. To make this possible, training on strategies of business development may be provided to a selected number of youths in the village. This may include – module on identification of potential market, buyer, price determination, negotiation skills with buyer etc. so that day to day dealing with trader is replaced with long term business, which will provide the community an assured income.

There are different forest produces like tamarind and mango, which needs processing to attract much higher value compared to the unprocessed product. For this, technical training to deseed tamarind, preparing pulp for tamarind and mango may be provided to the concerned. This could be followed by training on packaging of the processed product, which is going to substantially increase the prices of the product. Hence, a two level training – one for managing the processing and the other for packaging the processed product may be given to the selected women from the community. Similar training on the marketing of the product may be given to the selected literate youths. Market for these kinds of processed of

product is more in nearby towns, where business units and households buy these products, hence training on expanding the outreach of marketing may be given to these youths to get best prices for the product.

The present practice in milk selling in the villages is that 3-4 households sell their milk together in Thakurmunda, for which they have to rely on erratic public transport. This sometimes led to spoiling of milk as it can't be stored in a refrigerator. An alternative approach may be adopted to make this business a remunerative one for all the households engaged in this occupation. Formation of a village level co-operative and collection of milk could be systematized so that the losses incurred due to un-availability of transport and refrigerator does not mount up. The community may be given training on the importance of co-operative formation and may be provided hand holding support to form milk co-operatives at the village level. This will make the milk collection system efficient and the marketing of the milk in nearby towns would provide them good returns.

The most important economic activity in Baunsadiha village is grinding of sattu for further supply to the anganwadis in the locality and nearby villages. This is a state government supported programme, wherein SHGs have been given the responsibility to undertake the task. The present approach adopted by the SHGs amount to wastage of time and resources, which is negating the possible economic benefit that may be obtained from this work. To make this more efficient and cost-effective, apart from provision of technology, training on technology operation and management of the enterprise is necessary. This may also be supported by training on marketing skills so that the activity of the SHGs can expand and more female members could become member of the SHG to earn a sustainable livelihood.

Since, this initiative could work as a model for other SHGs in the locality, objective of the training could also be to create resource persons, who can further impart training to a new group and disseminate their skills to other SHGs in the area.

One of the most important livelihood options in the village of Baunsadiha remains neglected, which has thus led to declining interest among the present generation to take up traditional healing as a profession. The traditional healers are exposed to a small area and audience, belief in this form of treatment is there, but people are looking for convenient mode of treatment rather than adopting cumbersome treatment pattern adopted by traditional healers. Hence, the traditional healers in Buansadiha need to be given training on technology management in addition to outreach support. In the case of traditional healers living in and around Kochila Nuagaon, SAMBANDH has been giving training on technological aspects apart from the outreach support for years.

After looking at the training need of the community and the operating groups pertaining to the RETs installed in the three villages, it is imperative that a robust approach with a dedicated team need to provide training to the concerned. In this regard, TERI has already taken steps – identification of the training agency is going on, which will be followed by general, technical and special training to manage the multi-utility platforms in the villages. The method of training could be interactive and demonstrative, which may further be enriched by exposure visit to sites to help the participants gain practical experience. The

major problem though is literacy level in the villages, a practice and output oriented training could be the game changers in this regard. Hence, the training agency, which is to impart training, needs to have sufficient experience in the field of capacity building.

This training effort may be compounded with experience sharing and other community methods so that outputs of the initiative are properly disseminated to the community and operating group in particular. It is going to help other SHGs in neighbouring villages to develop interest in this kind of RET based livelihood generation initiative.

### 9.3 FURTHER RESEARCH/STUDY

The interventions planned under the project are long term in nature, but since the present interventions are limited to 3 villages with less than 500 households, further scoping research could be initiated in the vicinity to generate demand for specific RETs like saal leaf stitching machine, tamarind and mango pulper, freezer and grinder for processing of traditional herbs and fortified sattu supplied to anganwadis. The villages close to the project villages also have a similar livelihood pattern as they are dependent on NTFPs to eke out a living. A scoping research along with baseline study is necessary to understand the need and impact of such RETs on the social economic pattern of the rural households.

In addition to this, inclusion of further technology in the multi-utility centre may be customized to the need of the local population. Selection of such technology and its operation may be done in a consultative process, in which the operating groups or the Panchayat or community at large may be involved. To ensure this process, a systemic documentation apparatus need to be in force so that each stage of technology use, its advantages, pitfalls are documented apart from drawing learning from the past mistakes.

To summarize, two most important thing need to be carried out – scoping study for future installation of technology and documentation of the technology use, its advantages and disadvantages to draw a lesson, which could be utilized before deciding such other intervention in other parts of the state or the country.

### 9.4 MONITORING MECHANISM

Engagement of the local NGO, operating groups etc. from the beginning of the project were meant to monitor the initiatives on a day to day basis. Our first hand assessment of the need for technology in the villages show, the community is itself aware about the importance of such RETs for their livelihood. The community understands that the technology is going to enable them to earn more, save their time and energy, which may be utilized for other productive purposes. While, we understand that community is very responsible and takes interest in operating and maintaining the RETs, smaller efforts like creating a monitoring framework, administering the same involving the community may be done so that technology use serves the larger interest. The monitoring framework could take into account – community involvement in auditing the financial performance of the operating groups. It could work on the pattern of social audit, in which accountability lies with each member of the operating group. Economic and technical performance of each of the RERTs may be

monitored by staff members of SAMBANDH, apart from collecting feedback from the community to further improve the functioning of the technology.