

COASTAL COMMUNITY RESOURCE DEPENDENCY ON MAHANADI MANGROVE DELTA OF ODISHA, INDIA

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ABSTRACT

Natural ecosystems such as corals mangroves are fundamental life support system without which human civilization can't exist. Ecosystem has 3 major functions such as, Biogeographic, ecological, and anthropogenic. Mangroves are global ecosystems which function includes storage of water, biological productivity, biogeochemical transformation, it is a major wildlife habitats which maintains species and biodiversity. The mangrove ecosystem provides goods and services to the local community all over the world. It also includes shoreline protection from storm and flood. These functions are called as indirect use value according to economist. Ecosystems are natural capital stock which can provide goods, erosion control, and recreational activities. In this study three objectives are taken into consideration. For this questionnaire survey is conducted for 3 months. And the dependence of community on mangrove delta is observed it includes occupation status of local community, fuel use pattern. In this study human wildlife conflict and attitude of local community towards the conservation of mangrove. In this study it was found that fisheries is the major occupation source of the local people and for fuel most people are dependent on cow dung, coconut leaves and firewood collected from forest. Which will ultimately lead to achieve a community based mangrove conservation action in future.

Introduction

Mangroves are coastal vegetation found in river delta and coastline of India (Day et al., 1987). Their growth can only be possible in the intertidal zones with salinities. They are the habitats for many marine flora and fauna. The leaves of the mangrove trees are highly nutrient rich. It is a detritus based ecosystem so it is highly productive and maintains both terrestrial and aquatic environment. Mangrove wetlands are habitat for sport and commercial fisheries. It conveys both ecological and economical role for human (Kumar 2010). It prevents soil erosion, storms, nutrient such as nitrogen and sulfur cycling (Alongi 1994; Holguin et al. 2001; Rojas et al. 2001). It is also a global carbon sink. They protect coastal populations, support livelihood (Kathiresan and Bingham, 2001) and diverse variety of wildlife (Ong, 1995) due to high leaf production, leaf fall and rapid breakdown of the detritus (Aksornkoae, 1986).

Mangroves of Odisha

Orissa is located between 17°49' N and 22° 34' N latitudes and between 81° 27' E and 87° 29' E longitudes. 52,472 sq.km is forested area, which amounts to 33.7% of the geographical area. Out of 52,472 sq.km of forested area mangrove forests cover constitute 243 sq.km area. It is only about 0.46 % of the total forest area of the Odisha.. The Mahanadi, Brahmani and Baitarani rivers shows tremendous growth of mangrove forests, which are habitat of many organisms and shows high faunal diversity and biomass. Salt tolerant paddy and aquaculture is the major practice of costal belt people of Odisha in the mangrove areas. Large mangrove forest areas have been converted into artificial fishing pond and agriculture land for these purposes. In Paradwip area, large tracts mangroves were cleared for the development of Paradwip port.

There is high dependency of local people in mangrove all over India. In Odisha local people are dependent on mangroves to meet their daily needs. In Bhitarkanika most of the people are dependent on mangroves for their basic livelihood.

Study area

The Batighara panchayat constitute different villages such as Badatubi, Batighara, Hukitola, Kansardia, Sanatubi, Barkolikhol, Hatamundia, Jogidhankud, Nipania, Sarlikud. This panchayat is located on Mahanadi basin which extends over an area of 141,589 sq km which is 4.3 % of total geographical area of the country. This basin is divided into four regions those are Northern Plateau the eastern Ghats, the coastal plains and the erosional plains. The soil type which is seen in this basin are red and black soil, laterite soil, deltaic soil. Annual water potential in the basin is 66.9 cu km out of which 50.0 cu km can be utilized. The major mangrove sps in Mahanadi wetland are *Avecennia*, *Bruguiera*, *Ceriops Dalbergia*, *Agavecerus*, *Heriteriera*, *Sonnarata*, *Exoecaria*, *Kandelia*, *Rhizophora*, *Derris*, *Xylocarpus*, *Phoenix*, and *Tamarix*.

Soil Properties

The soil colour varies from pale gray to pale yellow to deep gray. Soil texture varies from coarse sand to silty clay to day. Silty clay is found mainly in nutrient rich areas. Soil is very fertile with low nitrogen level and presence of phosphoric acid at some place. We can find saline soil and narrow strips of sandy soil within 10 km proximity of the sea. In mangrove blocks of Mahanadi delta salinity is low, soil PH is slightly acidic.

Hydrological Conditions

There is a relationship exist between tidal amplitude and season in Mahanadi delta. During august in tidal amplitude is 6.0 near the river mouth 3.5 m in the inner part. During Feb March amplitude reduces to 3.5 m in the mouth region to 2.0 m in interior.

Water Salinity and Temperature

Tidal amplitude, amount of fresh water discharged, impact of rain highly affects the water salinity in the Mahanadi delta. During monsoon and summer salinity shows great variation from mouth to interior of river.

OBJECTIVES

1. Dependency of local community on different occupation
2. Fuel items used by local community
3. Human Wildlife Conflict
4. Conservation Attitude

Methodology

This study is based on two aspects (1) First aspect was study of socioeconomic status, land use, different resource use by randomly selected households in 6 villages in the Batighara panchayat nearby Mahanadi mangrove (2) second aspect was assessing the attitude of local people towards conservation of mangrove.

Accordingly followed two different methodologies as described below.

Methodology I; Socio-economic characteristics of study villages, level of dependency on the forest for different resources.

Questionnaire survey

Questionnaire survey is very useful and important tool for the conduction of socioecological studies, resource use and dependency of local people on natural resources. It is very important to design questionnaire to meet the objectives properly. The questionnaire survey is mainly used for getting data about the consumption and collection of fuel wood, fodder, nontimber forest product. In this type of survey, close ended semi-structured questioners has used, households are taken as units to access the resource use dependency of local people and how they sustain their livelihood even their attitudes towards conservation also can be accessed. The questionnaire method is used to assess the level of dependency of local people on natural resources in 6 villages located nearby Mahanadi mangrove.

By using questionnaire survey socioeconomic parameter like household size, occupation, harvesting and use of forest resources was collected.

Sampling: The sampling we used for this study is totally based on the objective. The first purposive sampling was used for selecting the study location such as selection of a district, selecting block, selecting panchayat and selecting village and the mangrove area for conducting the study. The base used for this sampling was coastal people who have been residing besides the mangrove forest for the last fifteen to twenty years

Socioeconomic Assessment

The household were chosen randomly without any biases. Households are selected from different groups; high, middle and low. Only one adult member from the household was selected for interview basically the interviewee was the head of the family and experienced. A single questionnaire was used for the whole interview. First some basic information's such as gender, education level, age, length of residency), household characteristics (household size, land owned, source of household income), occupation, land-use, and resource use pattern was taken into consideration of this survey. An informal discussion was carried out. Each interview took thirty minutes. Each interviewee was cleared about this survey that it is conducted for academic purpose to avoid bias.

Resource use Pattern

Each households was questioned about their source of domestic energy to estimate their dependency on forest resources and their requirement of fuel wood. The data of another substitute of fuel wood was also got by this survey. Their occupation and dependency on mangrove wetlands was also checked.

Methodology 2; Attitude of local people towards conservation of mangrove

For this type of survey a different questioner survey was conducted. This was an informal discussion. People of age class 20 and above were selected for this survey. People were participated by their own interest. The interview was conducted in Odia language.

Results

Analysis of resource use pattern and livelihood of households of Village-I:

Two things basically firewood and fodder are highly collected material from forest in India. We observed that the fuel wood is consumed on a monthly basis. In all 185 household of the surveyed study panchayat most of the families collected fuel wood as a chief source of fuel .Other products are also used by families such as cow dung, woods and leaves from orchard, kerosene, LPG. Few villages in the surveyed panchayat is facilitated by LPG. All households are supplemented with Kerosene by Odisha government's Rashaan card.

Out of 185 households of Batighara panchayat 18 households of a village named as Nipania income source depends on Fisheries. Some of them are Share cropper, Rice cultivator, Daily laborer .Some people have their shops, Boat business etc.

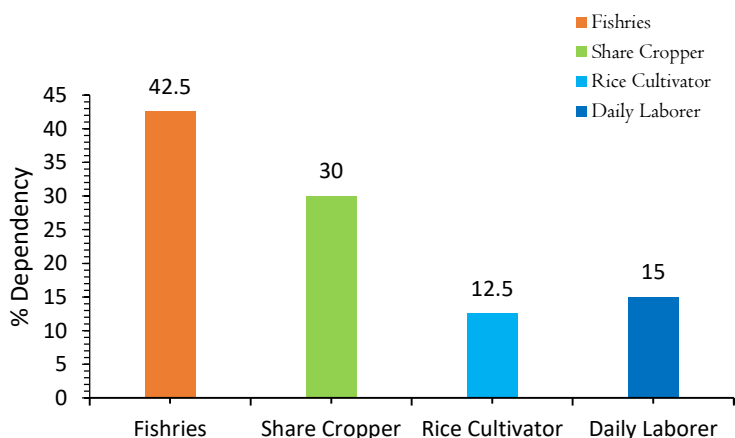


Figure 1: Percentage dependency of local community on different occupation

This above graph shows that in this village out of 18 observation 17 family means 42.5% people are dependent on fisheries. Share croppers are also taken into consideration in this survey out 18 observation 12 people means 30% people are share croppers i.e. they don't have their own farm land and they usually cultivate on other's farm. 12.5% people are rice cultivators. 15% people are daily laborers. The major source of occupation of this this village is Fisheries after that Share cropping then Daily laborer .Least people depends on rice cultivation .

Fuel used by community

There are different aspects for fuel of local people mostly for cooking purpose .This area is broadly divided into different categories such firewood consumption from forest, orchard wood, cow dung, LPG.

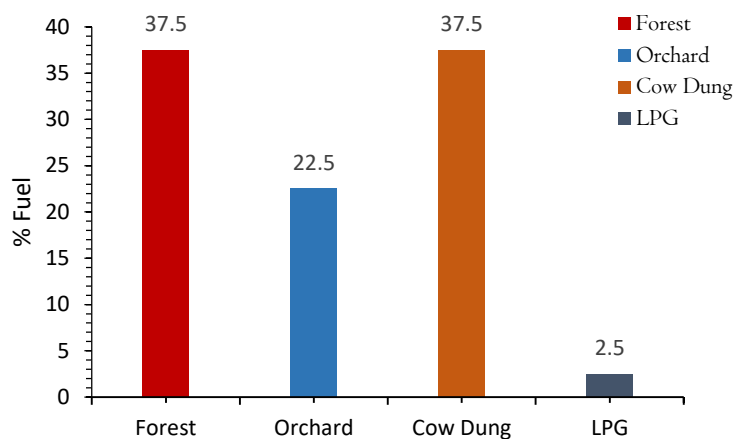


Figure 2: Percentage fuel items used by local community

The above graph shows out of 18 observation responses are - 37.5% people are dependent on forest for firewood, 22.4% people are dependent on orchard wood, and 37.5% people are dependent on cow dung only 2.5% people are dependent on LPG for cooking. Maximum people are dependent on forest and cow dung for cooking. After that people are consuming wood from there on orchard. The least amount of people are dependent on LPG.

Analysis of resource use pattern and livelihood of households of Village-2

Out of 180 observations, 7 observations were taken from another village, namely, Batighara of the same panchayat covering the same aspects. First is the occupation dependency and the next is the firewood consumption.

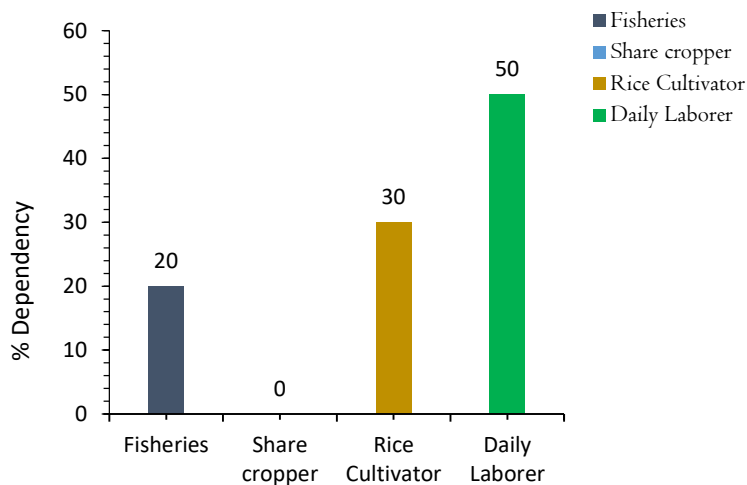


Figure 3: Percentage dependency of local community on different occupation

The above graph shows out of seven observations 20% people are dependent on fisheries, 0% are share croppers, 30% are rice cultivators, and 50% are daily laborers. According to this graph more people are daily laborers after that rice cultivator's then rest of the people are dependent on fisheries. But this that is not that much accurate because of less observation and some short of limitations.

The next aspect is fuel consumption by local community for daily cooking purpose. The figure 4 shows 18.7% people are dependent on firewood from forest, 37.5% people are dependent on orchard for wood collection, 37.5% are dependent on cow dung, and 6.25% people are dependent on LPG. Local people are mostly dependent on orchard wood and cow dung for energy purpose second most thing comes forest from where people gets firewood and the least people use LPG.

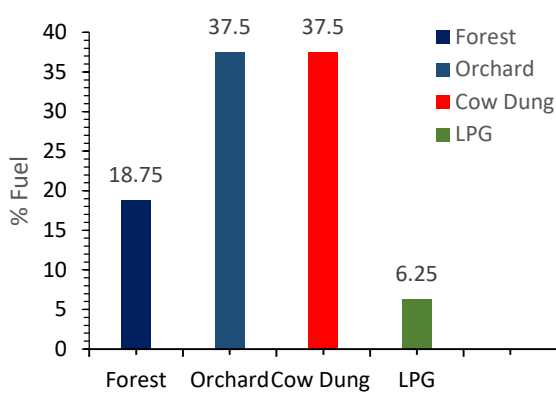


Figure 4: Percentage fuel items used by local community

Out of 170 observation 44 observations are taken from another village of the same panchayat .The observations are same but a different aspect is also surveyed in this village. That is occupation of some people are boat business shops etc.

Analysis of resource use pattern and livelihood of households of Village-3

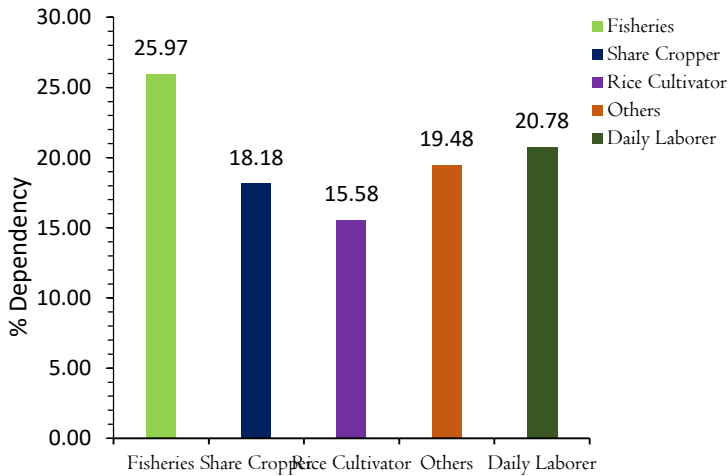


Figure 5: Percentage dependency of local community on different occupation

The above graph shows out of this 44 observations 25.9% people are dependent on fisheries, 18.18% people are share croppers, 15% people are rice cultivators, 19.48% people have ether their own shops and 20.77% people are daily laborers. Maximum people are dependent on fisheries in this village after that daily laborers then alternative occupations such as boat business, vegetable shops, after that people are share croppers and least people are dependent on rice cultivation. The next aspect comes fuel consumption

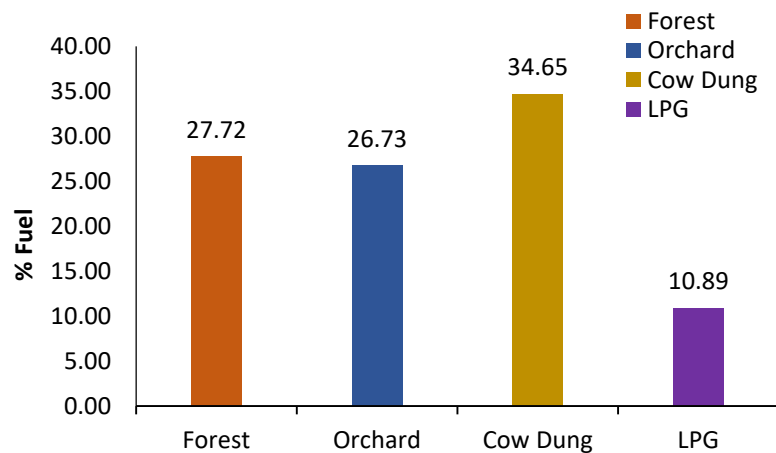


Figure 6: Percentage fuel items used by local community

The above graph shows responses of people towards different fuel item. 27.7%people are dependent on forest for firewood consumption, 26.7% people are dependent on orchard wood, 34.6% people are dependent on cow dung and 10.8 % people use LPG. Cow dung is used by maximum people. Firewood from forest is consumed by people after cow dung. More 38 observations are taken in a village TUBI of the same panchayat.

Analysis of resource use pattern and livelihood of households of Village-4

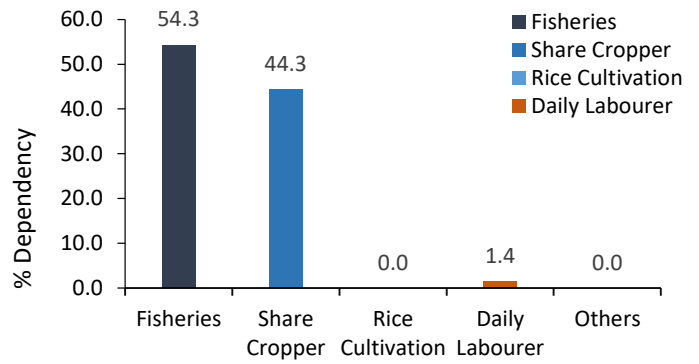


Figure 7: Percentage dependency of local community on different occupation

The above graph shows 54.3% people are dependent on Fisheries for their daily occupation, 44.3 % people are share cropper 0% people are rice cultivator, 1.4% people are daily laborer,0.0% people have other occupation. Maximum percentage is for fisheries most of the people in this village are dependent on fisheries after that share cropping ,after that least people are daily laborers .There is no other occupation source and no own land so people can't able to cultivate rice for their own. The next aspect of this village is fuel use.

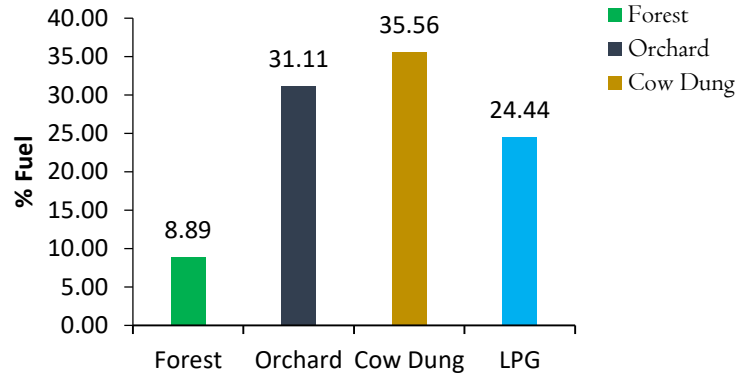


Figure 8: Percentage fuel items used by local community

The percentage of firewood collection from forest is 8.8%, 31.1% for orchards, 35.5% for cow dung , 24.4% for LPG This shows people of this village is highly dependent on cow dung after that comes orchard wood then LPG and least use of firewood from forest.

Analysis of resource use pattern and livelihood of households of Village-5

Further 18 observation is carried out in another village named as kochila

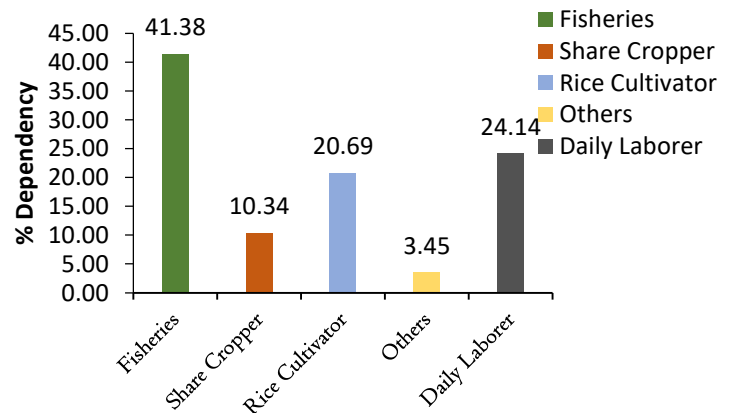


Figure 9: Percentage dependency of local community on different occupation

The above graph shows 41.37% people are dependent on Fisheries, 10.344% people are dependent on share cropping, 20.68% people are dependent on rice cultivation, 3.44% people are dependent on other occupations, 24.13% people worked as daily laborer. Hence in this village maximum people are dependent on fisheries next comes daily laborer.

Next aspect comes fuel consumption

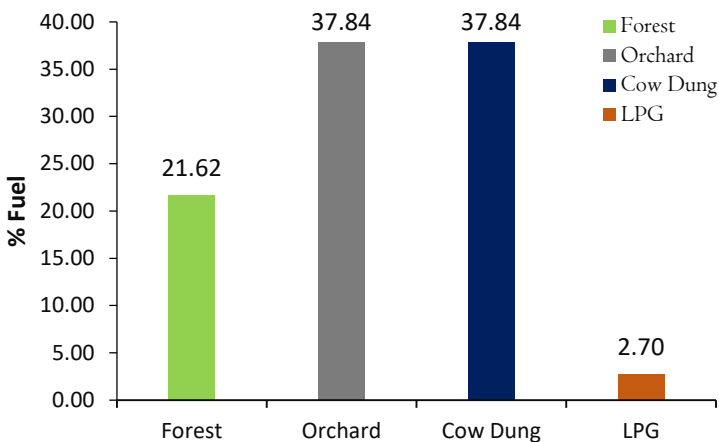


Figure 10: Percentage fuel items used by local community

The above graph shows 21.6% people are dependent on Forest, 31.83% people are dependent on firewood collected from forest, 37.8% people are dependent on orchard wood, 37.83% people are dependent on Cow dung, 2.70% people are dependent on LPG. Here, Maximum used material is cow dung and orchard wood along with second highest commodity being fuel wood consumed from forest. LPG is used by least people.

Analysis of resource use pattern and livelihood of households of Village-6

The Rest 44 observations are taken in the village Kajalpatia.

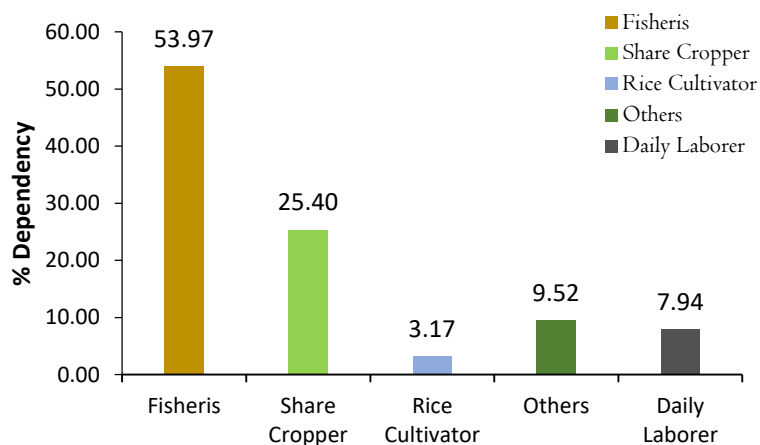


Figure 11: Percentage dependency of local community on different occupation

The above graph shows 53.9% people in this village are dependent on Fisheries, 25.39% people are share cropper, 3.174% are rice cultivators, 9.52% have other source of occupation, 7.93% people are daily laborer. The maximum number of people are dependent on Fisheries after that share cropper comes least number of people are rice cultivators.

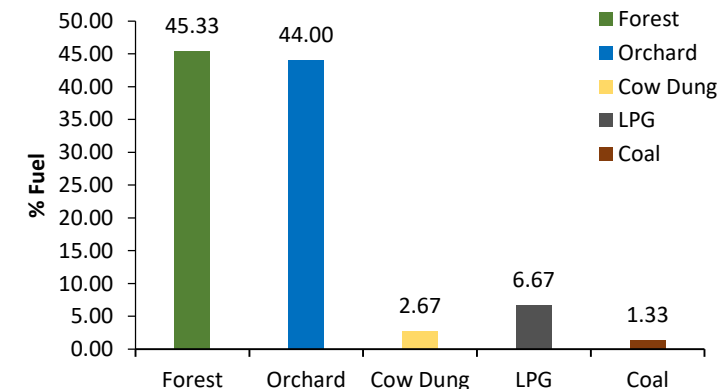


Figure 12: Percentage fuel items used by local community

This graph shows 45.33% people are dependent on forest for firewood, 44% people are dependent on orchard wood, 2.66% people are dependent on cow dung, 6.66% people are dependent on LPG, and 1.33% people are dependent on Coal. This shows maximum number of people are dependent on Forest for firewood consumption after that orchard wood comes, least number of people are dependent on cow dung and coal.

Analysis of total resource use pattern and livelihood of households

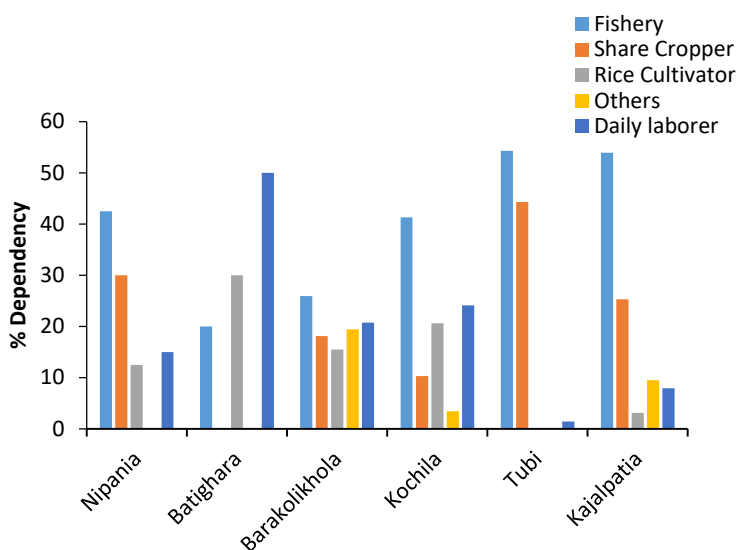


Figure 13: Percentage dependency of local communities on different occupations

The above graph is the representation of dependency of local people in total 6 villages of Batighara panchayat. Out of 6 villages 5 villages are highly dependent on Fisheries. The second most occupation is Share cropping in all villages excluding Batighara. In 3 villages (Barkolikhola, Kochila, Kajalpatia) there is alternative source of income. In all the villages excluding Batighara Share croppers are more than Rice cultivators even daily laborers are also more than rice cultivators due to lack of land ownership.

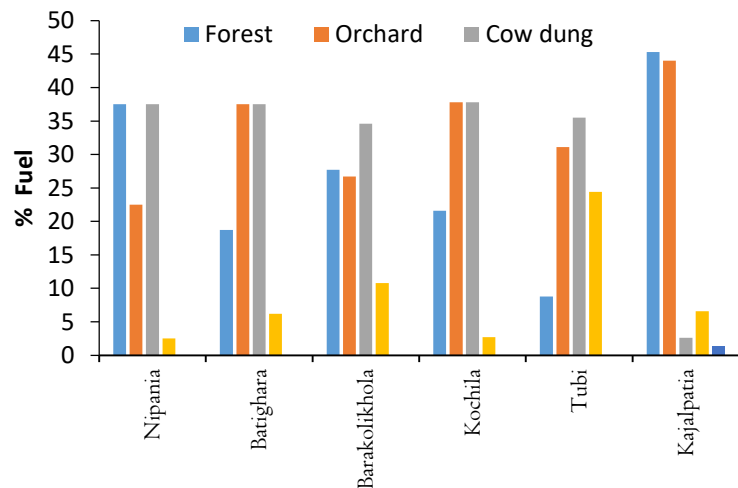


Figure 14: Percentage fuel items used by local communities

The above graph shows the fuel consumption in 6 villages of study area. In 2 villages (Nipania, Kajalpatia) firewood collection from the forest is high. In 4 villages (Batighara, Barkolikhola, Kochila, tubi) uses of cow dung is high followed by firewood from forest. The second most used energy is cow dung which is used by all the villages excluding Kajalpatia village. Coal is another source of fuel is only observed in 1 village Kajalpatia during surveying period. LPG is used by almost all the villages but in less amount but in the village Tubi it is preferred more than other villages. People from every village used to go forest twice or thrice in a month. Only one person is allowed from one family to go to the forest according to the village people. People mostly goes for the wood collection and can collect firewood only once in a collection time. One female can carry 20-25 kg per head load. The emerging problem in that area now is wild boar and crocodile conflict.

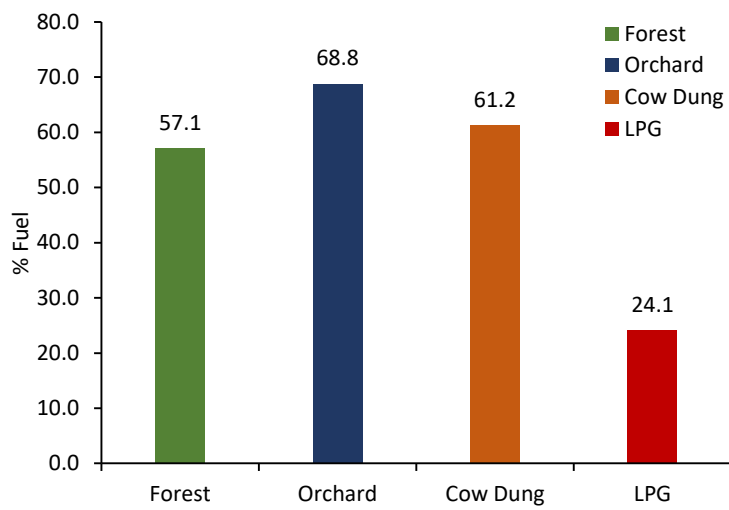


Figure 15: Total fuel tendency by community

This graph represents the responses of 170 respondents which holds 57.1% for forest, 68.8% for orchard, 61.2% for cow dung and 24.1% for LPG.

Human wildlife conflict

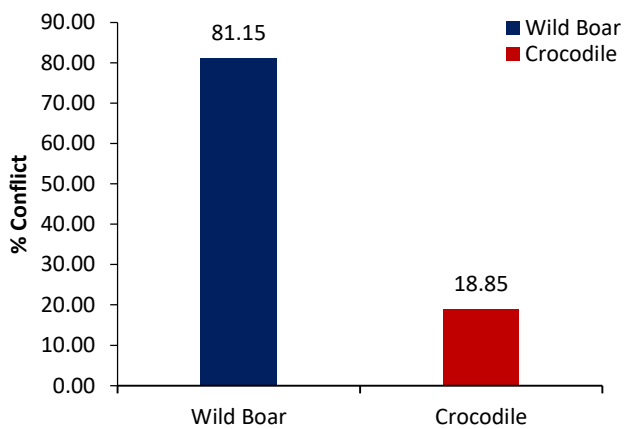


Figure 16: Human Wildlife Conflict

During this survey 81.15% respondents of 6 villages asked for wild boar conflict and 18.84% people told about Crocodile conflict. According to the respondent's wild boar are mainly seen in the month of Oct to Dec during winter because of paddy cultivation season. In the other months of the year also conflict happens. Other months Boar mainly prefer sweet potato and other vegetables in the orchard of local people.

The last objective of the study is attitude survey of local people towards conservation of mangrove.

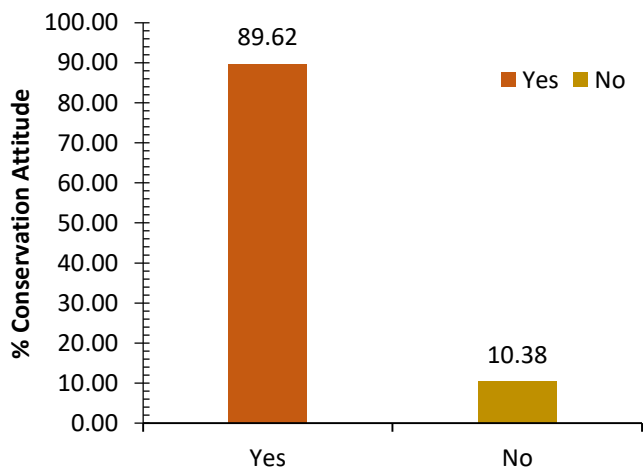


Figure 17: Percentage of Conservation Attitude

This graph shows 89.6% people shows positive attitude towards mangrove conservation. According to some people Mangrove are the protector of their village during 1999 super cyclone in Odisha. People are aware about the positive effect of forest. 10.37% people doesn't show positive attitude towards forest conservation. According to them forest are the main reason of human wild boar conflict.

Conclusion

Mangrove are Tropical and coastal vegetation found in coastal river delta. They are highly adapted to these areas. According to different studies it is stated that 100% people are dependent on forest for firewood consumption.

According to the survey not all villages are fully dependent on forest for firewood collection. The villages in which people have large Orchard they collect wood mostly from there, and the villagers those who have their own cow and calf they are mostly dependent on cow dung for fuel and least dependent on forest for firewood collection. Those villages in which LPG is abundantly used those villagers also less dependent on forest. Firewood collection also dependent on distance of villages from the forest. Those villages which are nearby forest people are highly dependent on forest for firewood collection which needs a detailed study further. According to survey it can be stated that abundance of wild boar in the forest is another reason which limits people to enter into the forest. Those villages which don't have cow and orchard they are highly dependent on forest for firewood collection. The strictness of forest department, general awareness and alternate source of energy such as kerosene also limits the use of firewood collection from forest in some villages. Number of family member also influences the extraction of firewood from forest. The more the number of family member the high is extraction of firewood from forest. The less the number of the family member less extraction of firewood from forest and manage their energy need from orchard wood and cow dung. Similarly, occupation of most villages like Nipania, Barkolikhola, Tubi, Kajalpatia and Kochila is fisheries. These people are economically very poor so they are highly dependent on fisheries. These people don't have their own crop land so next maximum income source is share cropping. Due to wild Boar conflict most of the people are not interested in doing cultivation over there. Third maximum income source is daily labor. Inside those villages there is no alternative source of income that's why many people used go outside like Pradwip town to work. They work as daily laborer and sharing cropper to meet their daily needs. Very few people have their own shops inside village. According to some people, crocodile conflict also a growing problem for the fishermen.

So according to this view of local people it is concluded that the amount of firewood collection can be minimized by giving people alternative source of energy like LPG, Kerosene, increase in general awareness may also help in reduction of firewood collection from the forest. Giving local people an alternate source of income can increase their economic condition so their quality of livelihood will increase and pressure on mangrove will decrease and threat of overfishing also can be decreased. We can develop Ecotourism over there. Few people used to come there but if it will be more developed then local communities can easily get employment.

The growing problem is human wild boar conflict which should be mitigated by government so that people can cultivate paddy easily. Though in that area we can find only saline land, rice is only crop which can be cultivated in the form of paddy. By this local people can get hay from it and they can easily use it in cooking and pressure on forest will decrease. Overfishing also can be managed.

Another problem which was noticed during study period is pollution. Pollution is the major threat to the mangrove ecosystem. Polluted water from industries present in Paradwip port highly influences mangrove growth. Effluents and polluted water from pesticide industry is easily released without treatment and gets mixed with river water which effects leaves of mangrove vegetation nearby and leads to their turning black.

Another problem in that area that some people from outside of village cut mangroves and make artificial ponds (Gheri) for fish culture, shrimp culture etc. That affects the mangrove population. Those people also clear forest for paddy cultivation. Due to strictness of forest department, some ponds are converted into mangrove forest but still some artificial ponds remain to be converted into mangrove forests.

According to some people Mangrove are the protector of their village during 1999 super cyclone in Odisha. People are aware about the positive effect of forest. This shows attitude of local people towards conservation is positive so it will be easier to conserve mangrove and we can involve local community in development and conservation in the area.

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