

Contribution of NTFPs in the Livelihood of Mangrove Forest Dwellers of Sundarban

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ABSTRACT Sundarbans are the world's largest mangrove biomes having highest mangrove biodiversity, which are used for subsistence and commercial purpose by the local inhabitants. It is one of the essential components of the livelihood of the forest dependant population of the area. The paper tries to explore the spectrum of NTFPs being collected from Sundarbans and its contribution in the livelihood of the people. It also attempts to assess the livelihood assets of the people and how much of it is attributed to NTFPs. It explores the livelihood vulnerability and stress coping mechanisms of the local population and how NTFPs help as a "safety net". For the purpose of the study 4 EDCs from 2 ranges of Sundarbans were sampled, viz: Bally II and Bijoy nagar, from Bidya Range; and Dulki and Hamiltanabad (Anpur) from Sajnakhali Wildlife Sanctuary Range. The parameters of the study included: (i) range of NTFPs being collected; (ii) seasonality and duration of collection; (iii) method of collection; (iv) extent of dependence; (v) total household income and contribution of NTFPs. The respondents were selected from different occupation class and income groups. The study shows that the contribution of NTFPs is quite high as it contributes almost 79% (Rs. 80,000) on an average to the annual income of the collector's family. Of course not every family of the village goes for NTFP collection but nonetheless their number is significant. The major NTFP that are being collected includes firewood, prawn, fishes, crab, honey and bee wax. The collection of NTFPs is a daunting task, which involves risk from man-eater tigers. High livelihood vulnerability was also observed with little help from government. If, these biomes are to be conserved it is necessary that Sundarban Development Authority must consider the role of NTFPs in the livelihood and develop the Sustainable Livelihood Framework accordingly so that the biomes as well as people's need could be sustained.

INTRODUCTION

The Sundarban mangroves are located at the mouth of Gangetic delta at Bay of Bengal and have a total area of around 10,000 sq. km of which the area of Indian Sundarban region is about 4,263 sq. km (WBFD 2003) and the rest is in Bangladesh. The Indian part of Sundarban is divided in: (i) Sundarban Tiger Reserve (STR) covering an area of 2600 sq. km. and (ii) Reserve Forest Area covering an area of 1600 sq. km (WBFD 2003). The name Sundarban has three possible derivations, these being the forest of "Sundari trees" (*Heritiera fomes*); beautiful (*Sundar*) forest (*ban*); and forests of the ocean (Ocean= *samundra*; Forest= *ban*). But the once lush vegetation of Sundari trees of Sundarbans is now on the verge of extinction due to over harvesting for timber.

People of Sundarbans

Sundarban, home of about 4 million people, of whom 56% are landless, is considered to be one of

the most backward regions in West Bengal. Literacy rate is below 35%. Most of the communities do not have electricity or safe drinking water and agricultural productivity is lower than the state average. Inadequate infrastructure, poor communication facilities, lack of access to clean drinking water, health, education services and a fragile and limited natural resource base have contributed to a low level of development and high poverty incidence in the region (ADB 2001). Despite such high population pressure on its forest resources and environmental hazards such as siltation, cyclone, flooding and rise in sea level, the extent of the Sundarban mangrove forest cover of West Bengal has not changed significantly in the last 25 years and it is a unique example of coexistence of human and terrestrial life (UNEP 2003). But there have been some drastic changes in the composition of the Sundarban mangrove forest at ecosystem level (FSI 2005).

NTFPs of Sundarbans

The mangrove forest of Sundarban is valuable

because of its rich biodiversity, which are commercially exploited particularly, the Non Timber Forest Produce (NTFPs), which is one of the epitomes for the livelihoods of many forest fringe dwellers (Bhattacharya, 2004). The NTFPs collected from mangrove forest of Sundarban includes tannin bark (most Sundarban species like *Ceriops decandra*, *Ceriops myrobalans*, *Phoenix paludosa* yield around 30-42% tannin); *Nypa fruticans* (Golpata), natural honey from *Apis dorsata*, cultured (apiary) honey (*Apis indica*) and bee wax; fuelwood and small poles and boles; fishes, prawn, crab, shrimps; and lime (manufactured from *jorgran*, *kastura* and *jhinuk*) are the NTFPs which are collected by the inhabitants of Sundarban.

Participatory Forest Management system has been introduced for the management of Sundarbans. Forest Protection Committees (FPC) and Eco Development Committees (EDC) have been formed in the fringe areas of Sundarban to protect a sizeable portion of mangrove forest.

While, many studies have been conducted on its ecology (Banerjee 1964; Das 1981; Naskar and Guha Bakshi 1982; Chakrabarti 1986, 1987; Mondal and Ghosh 1989; Chattopadhyay 2003; Chaudhuri and Chaudhury 1994; Bhattacharya 1998; Hazra 1999; Bhattacharya et al. 2001; Chaudhury 2007) and based on the findings actions have been taken towards its ecosystem management by UNDP, GEF-MAB, UNEP, SDA, UNESCO, Project Tiger, etc. however, no studies have been conducted on the extent of forest dependence for sustaining the livelihood of the people in Sundarbans. Looking at this the present study had been undertaken with the following objectives:

- To understand the extent of dependence of local communities on non timber forest produce:
- To understand the institutional aspects in NTFP sector

The paper makes an attempt to highlight the contribution of NTFPs in the livelihoods of the forest fringe dwellers of Sundarbans. It also links the livelihood vulnerability to the degradation of forest and human resources.

MATERIALS AND METHODS

Selection of Villages

For the purpose of this study, 4 EDCs in 3 villages of the Sajnakhali and Bidya Forest Range

of the Sundarban Tiger Reserve were selected. The selection was influenced by relatively easy access to the villages, excellent rapport of the Forest Department and on the extent of people's dependence on NTFPs. The EDCs selected were (i) Bally and Bijoynagar from village Bally II of Bidya range, (ii) Dulki from village Dulki of Sajnakhali range and (iii) Hamiltonabad (popularly known as village Anpur) from village Anpur of Sajnakhali range. Stratified random sampling technique was applied to select 25 respondents from each EDC belonging to different occupation class and income groups depending on their extent of forest dependence. Total sample size was therefore, 75 respondents.

Primary data was collected through household survey, focused group discussion and Participatory Rural Appraisal. Secondary data was collected through interviews from forest department officials, other line department officials (Fisheries, Sundarban Development Authority and Block Development Officers) and PRI representatives. The primary data were collected through structured and open-ended questionnaires while, the secondary data were collected from the reports of Forest Department, census data and reports and publication of academic institutes and NGOs.

Study Parameters

The following quantitative aspects with respect to the NTFPs were studied: (i) types of NTFPs being collected for sustenance and income generation; (ii) amount on each NTFPs being collected per household; (iii) seasonality and duration of collection; (iv) amount of NTFPs being used for sustenance and for income generation. The qualitative parameters of the study included: (i) technique of NTFP collection; (ii) division of labour in NTFP collection (iii) rules regulations and institutional arrangement for NTFP collection; (iv) indigenous traditional knowledge for NTFP conservation; (v) perception about the trend of NTFPs availability; (vi) stakeholders and institutions involved in the value chain of NTFPs; (vii) role of NTFP in the total livelihood capital of the villages and role of NTFP in mitigation of the livelihood vulnerabilities; and (viii) initiative taken by government, funding agencies and NGOs for improvement of the NTFP based livelihood strategies. The present paper focuses on with the NTFP issues and extent

of NTFP dependency of the residents in Sundarban.

RESULTS

Description of Studied Villages

Almost every side of the village Bally II is surrounded by the tidal river. There are good numbers of natural canal providing irrigation facilities to the farmers. Being a large village it consists of two EDCs, namely Bally and Bijoy nagar with a total household of 1092 and having a population of 11,466. Village Dulki consist of one EDC with a total household of 556 having a population of 2,710. Village Anpur also consist of one EDC and has 748 households with the total population of 3,465. The demographic profile of these villages is shown in table 1. Though, these villages are surrounded by rivers and canals, there are very less sources of fresh water. Thus, the villages have insufficient facilities of irrigation and drinking water. These villages also do not have any electrification. However, forest department provided solar lamps to these EDCs but only few lamps are functional at present. There are no means of telecommunication since these islands are isolated. The only means of

transportation are boats and steamers within the river and cycle vans. Very few education and health service providing establishments are there in these villages.

44% population belongs to Schedule Caste and Schedule Tribe. The level of literacy as well as per capita income is much lower in Sundarbans than in other parts of West Bengal.

Types of NTFPs Collected

Honey, Bee wax, *Nypa fruticans*, *Phoenix paludosa*, etc. are the non timber forest produce which were usually collected by the outsiders annually during the short periods for which permits were issued. However, during the study it was observed that collection of tannin bark, *Nypa fruticans*, lime, fuelwood and small boles and poles are banned at present. *Nypa fruticans* collection has been stopped since 1978. Extraction of *Phoenix paludosa* has also been gradually reduced and discontinued since 1991. About 1000 honey collectors are given permits to collect honey at a fixed tariff per kg. of honey and the honey so collected is deposited at the godowns of Forest Department for storage and subsequent disposal to the West Bengal Forest Development Corporation Ltd. for processing of crude honey.

Fishing was allowed in tidal water provided the fishing boats are registered in the Forest Directorate on payment of usual registration fees plus royalty for dry firewood to be consumed in each fishing trip. Since the creation of Sundarban Tiger Reserve, fishing even with permit, is however, not allowed in the core area. Buffer zone, except Sajnakhali Wildlife Sanctuary, is opened for fishing in case of registered permit holders. Illegal tiger prawn mullet collection also continues in the marine ecosystem. Initially the activity was confined to outside the forest area but during the past few years, they have extended their activities in the forest areas also.

NTFP Dependence

It was observed that the majority of people in Sundarbans are engaged as agricultural labour (66-79%) (Table 2). It was also observed that agriculture, inspite of being the main occupation of the people in Sundarban, is not high yielding (only 10 quintals per hectare for the main crop) due to salinity of the soil, which prevents optimum growth of agricultural crops. Around 50%

Table 1: Demographic profile of studied villages

| Demographic Parameters | Bally II | Dulki | Anpur |
|---|----------|-------|-------|
| Total no. of households | 2229 | 566 | 748 |
| Total village population | 11466 | 2147 | 3465 |
| Total male population | 5849 | 1366 | 1758 |
| Total female population | 5617 | 1344 | 1707 |
| Total SC population | 5330 | 315 | 2994 |
| Total ST population | 437 | 144 | 429 |
| Male literate | 4147 | 828 | 1265 |
| Female literate | 2810 | 552 | 877 |
| Total literate | 6957 | 1380 | 2142 |
| Male illiterate | 1702 | 538 | 493 |
| Female illiterate | 2807 | 792 | 830 |
| Total illiterate | 4509 | 1330 | 1323 |
| Total male work force | 3254 | 740 | 984 |
| Total female workforce | 756 | 127 | 449 |
| Total workforce | 4010 | 867 | 1433 |
| Total male main work population (Agriculture) | 2069 | 465 | 893 |
| Total female main work population | 72 | 27 | 131 |
| Total main work population | 2141 | 465 | 1024 |
| Total non work male population | 2595 | 626 | 774 |
| Total non work female population | 4861 | 1217 | 1258 |
| Total non work population | 7456 | 1843 | 2032 |

(Source: Census of India, 2001)

Table 2: Population involved in NTFP collection (%)

| S. No. | Occupational categories | % of population involved | | |
|--------|-------------------------|--------------------------|-------|-------|
| | | Bally II | Dulki | Anpur |
| 1 | NTFP collection | 6.35 | 6.98 | 9.54 |
| 2 | Agriculture | 7.30 | 10.23 | 9.05 |
| 3 | Agricultural Labour | 79.05 | 72.53 | 66.40 |
| 4 | Household Industry | 0.35 | 0.52 | 5.05 |
| 5 | Other occupation | 6.95 | 9.75 | 9.97 |

Table 3: Distribution of households on the basis of types of NTFPs collected (%)

| Types of NTFPs collected | Household dependence (in %) | | |
|--------------------------|-----------------------------|-------|-------|
| | Bally II | Dulki | Anpur |
| Honey | 15.63 | 20.59 | 15.22 |
| Wax | 15.63 | 20.59 | 15.22 |
| Firewood | 15.63 | 20.59 | 21.74 |
| Pati Grass | 0.00 | 0.00 | 6.52 |
| Fish | 25.00 | 19.12 | 21.74 |
| Prawn | 18.75 | 10.29 | 10.87 |
| Crab | 9.38 | 8.82 | 8.70 |

of agricultural laborers are landless. Therefore, the Reserve Forest area serves as the buffer for their survival and though the percentages of NTFP collectors are less (varying from 6-9%), the contribution of NTFPs is enormous in the total annual household income (79%) (Fig. 5). The livelihood of nearly 2 million people is linked with the non-agricultural sources, which mainly include fishing and allied activities from the rivers and creeks as one of the major sources of income. However, Sundarban being a biosphere reserve and is a protected area under the IUCN Category 1A imposes several restriction for the collection of the NTFPs from forest areas. But, certain relaxations have been made for the collection of few specific NTFPs, which are mostly animal based like honey, fishes and crabs (Table 3). Nearly 19-25% of the households are engaged in fishing activities while 15-20% are engaged in honey collection (Table 3).

The study also revealed that honey and wax collection from forest is one of the major livelihood activities of Sundarban dwellers even though it is not a high income yielding activity

(25%) (Fig.1), but it serves as an additional source of income for the dwellers of Sundarban as honey collection activity is permitted only for 15 days annually.

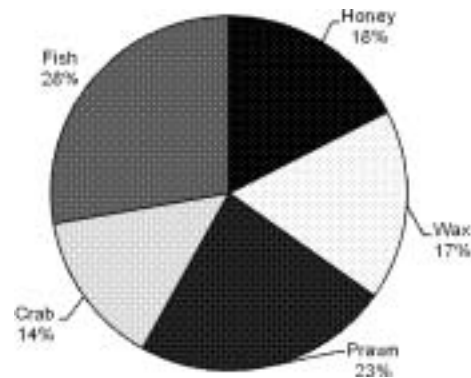


Fig. 1. Involvement of gatherers in various types of NTFP collection (%)

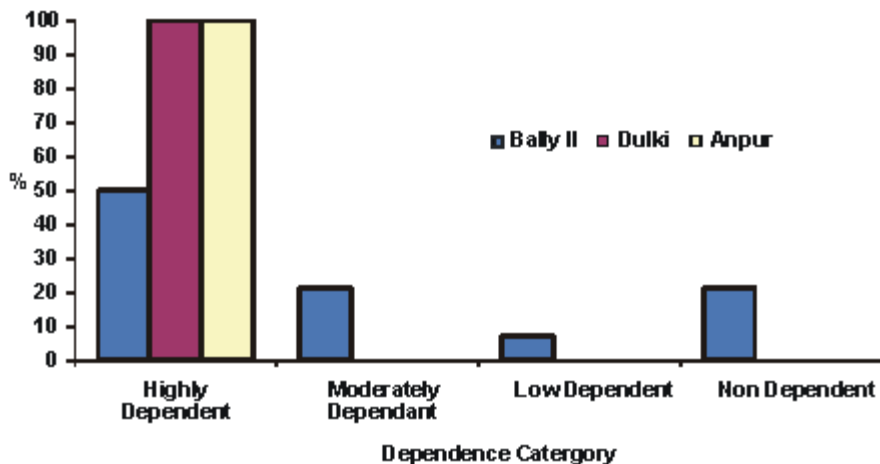


Fig. 2. Level of NTFP dependence in three villages

The level of dependence on NTFP was calculated on the basis of contribution of NTFPs in annual household income and were subsequently categorized in three classes, viz: (i) Highly dependent where NTFPs contributed more than 60% in annual household income; (ii) Moderately dependent with 40-60% contribution; and (iii) Low dependent with <40% contribution. High dependence on NTFPs was observed in all the cases in villages Dulki and Anpur, whereas Bally II showed some variance with 20% of the household having moderate to low dependence on NTFPs (Fig. 2). This is mainly due to the reason that in village Bally II the majority are landholders, who are settled agriculturist and are economically better than the rest of the two villages. The other two villages are comparatively more socio-economically backward than the village Bally II. The collectors from village Bally II are mainly involved in collection of Honey, Beewax and Prawn, which incidentally are most priced catches fetching cash income. Their dependence is hardly for subsistence, for example they collect negligible amount of fuel wood or grass. There were also some households in these villages which were solely dependent on NTFP as their livelihood source, incidentally Bally had the highest number of such households (24) (Table 4).

Highest involvement of total population (both men and women) is seen in fish collection (28%) followed by prawn collection (23%), while honey and beewax share 18% and 17% respectively. This is because only men go to the terrestrial forest for the honey collection (Fig. 1), who are called "Mowallis".

Considerable quantities of honey and wax are collected from the forest and sent to Calcutta Honey Filtration Centre. Filtered and bottled honey is then sold all over West Bengal through

Divisional Forest Office in different districts. Honey hunters and bee keepers have developed their association. Several Bee Keepers Association like West Bengal Bee Keepers Association, Baruipur Apiculture Industrial Cooperative Society, 24 Parganas Bee Keepers Cooperative Society Ltd., Gramin Bharat Udyog and Herbal and Ma Mansa Enterprise send their agents in Sundarbans for setting up Apiary boxes in the villages. The apiary honey collected are then processed and marketed to different companies like Dabur, Baidyanath, Himalaya, etc., which requires systematic assessment and further support in the state.

Contribution of NTFPs in Annual Household Income

The contribution of NTFPs to the total annual household income ranged between Rs. 57000- Rs 1.02 lac that constitutes 76-92 % in all the three villages under study (Fig 3). The total contribution of NTFP in the annual average household income of all three villages combined is Rs. 75000 (Table 5), which makes 79% of the total household income (Fig 4). Income from other sources like agriculture and labour is approximately 12% and 8% respectively, and that from service is minimal (1%) as service holder is found only in village Bally II (Fig. 4). NTFP has the highest contribution in the household income of Dulki (82%) (Fig. 5) followed by Anpur (80%) (Fig. 6) and in Bally II it is 78% (Fig. 7).

Among the various types of NTFPs, the aquatic NTFP - fishes, contribute highest (Rs. 64800, accounting 49%) followed by prawn seeds contributing Rs. 56000 accounting for 42% approximately in the total annual average income per household from NTFPs while, terrestrial NTFP i.e., honey and bee wax contribute only around Rs. 4500 (3.5%) on an average to the average annual household income (Table 6).

The total NTFP worth around Rs. 18.36 crore is extracted each year from the forest and non-forest area by these three villages under study out of which the share of Bally II is highest with

Table 4: Household with 100% income from forest

| Villages | No. of households |
|----------|-------------------|
| Bally | 24 |
| Dulki | 12 |
| Anpur | 18 |

Table 5: Average Annual Household Income (in Rs.)

| Vilages | NTFP | Agriculture | Labour | Service | Total |
|-----------------|--------|-------------|--------|---------|--------|
| Bally II | 125691 | 19265 | 20067 | 14400 | 131168 |
| Dulki | 60577 | 9972 | 3474 | 0 | 74023 |
| Anpur | 57964 | 5658 | 9160 | 0 | 71434 |
| Overall Average | 75032 | 11530 | 7703 | 327 | 94156 |

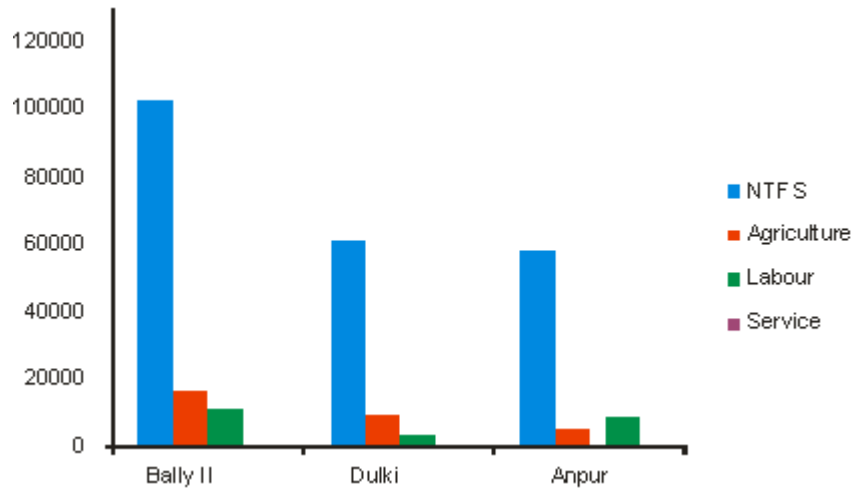


Fig. 3. Average annual household income from major occupational categories in Sundarban

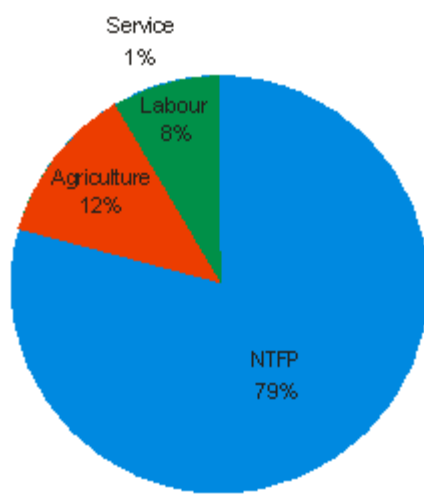


Fig. 4. Overall income distribution from different sources

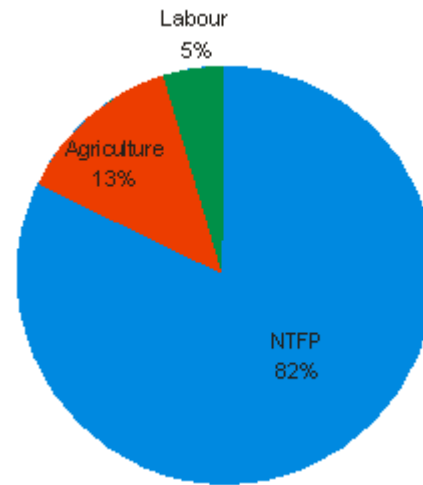


Fig. 5. Household income distribution in village Dulki

Rs. 11.3 crore followed by Anpur Rs. 3.98 crore and Dulki with Rs. 3.05 crore of NTFP (Table 7).

Sector-wise fish accounts for the highest amount of annual collection that is worth Rs. 10 crore. This is followed by prawn seed collection, which is worth Rs. 7 crores. The lowest collection is of honey, which is worth Rs. 50 lakhs only and wax worth around Rs. 10 Lakh (Table 7).

The quantum of NTFP collection in these

villages were estimated to be around 3563 Tons of which collection of fishes is highest 2020 Tons followed by Prawns 1201 Tons. The collection of honey and wax is the least (Table 8). However, the prices for honey and wax are higher than other NTFPs making them the high value NTFP of the region.

Comparatively, consumption of NTFP account much higher than that of income from

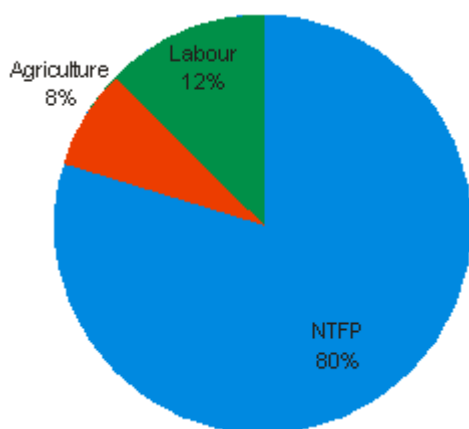


Fig. 6. Household income distribution in village Anpur

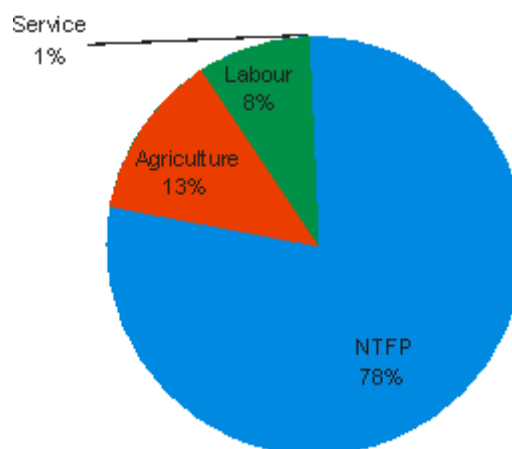


Fig. 7. Household income distribution in village Bally II

NTFPs. This is mainly, due to the reason that fuelwood goes unaccounted as the collection for consumption comes free of cost (Table 9).

The extent of NTFP extraction when compared with the wealth ranking it was observed that the extent of extraction by villagers having higher dependence on NTFP is low whereas those having lower dependence on NTFP their extent of extraction is higher. For instance Bally II village is a well off village with lesser percentage of households engaged in NTFP collection but has highest collection figure. Its total NTFP collection is 2142 MT (Table 8) and average annual

household income (Rs. 1.02 Lakh) is higher than other villages (Table 3).

The core zone is closed for the collection of riverines. Only the buffer is open for collection but due to unsustainable harvesting of the riverines their population in this zone has dwindled as a result of which they are forced to enter into the core zone for collection. Development of buffer zone is required to maintain the resources for fulfilling the requirement of the fishermen as well as maintaining the prey base to avoid the man animal conflict.

Despite such high population pressure on its

Table 6: Average annual income (Rs.) from various NTFPs of the NTFP dependant households

| Village | Honey | wax | Prawn seed | Crab | Fishes | Overall Average |
|-----------------|-------|------|------------|------|--------|-----------------|
| Bally II | 5697 | 1633 | 72527 | 4453 | 134080 | 102125 |
| Dulki | 3181 | 441 | 63945 | 5489 | 44114 | 60577 |
| Anpur | 4412 | 584 | 23404 | 8400 | 39109 | 57964 |
| Overall Average | 3886 | 680 | 56040 | 6443 | 64885 | 80522 |

Table 7: Value (in Rs.) of NTFP collected from Sundarbans (as per market rates of 2004)

| Village | Firewood | Honey | Wax | Prawn seed | Crab | Fishes | Total |
|----------|----------|---------|--------|------------|---------|-----------|-----------|
| Bally II | 26572 | 2073677 | 594321 | 48399685 | 1215760 | 61006595 | 113316610 |
| Dulki | 33425 | 1456295 | 202090 | 12548299 | 646311 | 15630223 | 30516642 |
| Anpur | 24820 | 1500080 | 198560 | 11140145 | 2570400 | 24377887 | 39811892 |
| Total | 84817 | 5030052 | 994971 | 72088129 | 4432471 | 101014705 | 183645144 |

Table 8: Annual household collection of NTFPs (in kg)

| Village | Firewood | Honey | Wax | Prawn seed | Crab | Fishes | Total |
|----------|----------|--------|-------|------------|--------|---------|---------|
| Bally II | 33215 | 41474 | 7429 | 806661 | 33771 | 1220132 | 2142682 |
| Dulki | 41782 | 29126 | 2526 | 209138 | 17953 | 312604 | 613130 |
| Anpur | 31025 | 30002 | 2482 | 185669 | 71400 | 487558 | 808135 |
| Total | 106022 | 100601 | 12437 | 1201469 | 123124 | 2020294 | 3563947 |

Table 9: Annual household consumption of NTFP by collectors (in kg)

| Village | Firewood | | Prawn | | Crab | | Fish | | Honey | | Total | |
|----------|---------------|-------|---------------|--------|---------------|--------|---------------|---------|---------------|-------|---------------|---------|
| | Quan- tity | Price | Quan- tity | Price | Quan- tity | Price | Quan- tity | Price | Quan- tity | Price | Quan- tity | Price |
| Bally II | 33215 | 27236 | 1827 | 109610 | 1107 | 44287 | 49823 | 2989350 | 66 | 3322 | 86038 | 3173804 |
| Dulki | 41782 | 34261 | 537 | 32232 | 1194 | 47751 | 38797 | 2327841 | 84 | 4178 | 82394 | 2446263 |
| Anpur | 31025 | 25441 | 1303 | 78183 | 1241 | 49640 | 20477 | 1228590 | 62 | 3103 | 54108 | 1384956 |
| Total | 106022 | 86938 | 3667 | 220024 | 3542 | 141677 | 109096 | 6545781 | 212 | 10602 | 222539 | 7005023 |

forest resources and environmental hazards, the extent of the Sundarban mangrove forest cover of West Bengal has not changed significantly in the last 25 years (UNEP 2003). This is due to the reason that there is no grazing pressure on forest, also fuelwood collection is very low as it is extracted from the forest at the time of honey collection only; cases of illicit felling, fire, etc. are very few. Pressure on forest is mainly due to honey, which is also sustainably harvested due to fear of tiger attack. Unsustainable harvesting is done for the riverines like fishes, crab and prawn collection.

Management of NTFPs in Sundarbans

For the management of NTFPs in Sundarbans there are already some conservation initiatives like Global Environmental Facility's (GEF) Biodiversity Conservation and Livelihood; UNDP's programme on Man and Biosphere Reserve (MAB) and the State Government's Joint Mangrove Management (JMM) Programme, which are based on participatory mode of planning and management of the forest resources. Under the scheme, the State Forest Department has formed a number of Forest Protection Committees (FPC) around the Reserved/ Protected Forests and Eco-Development Committees (EDC) around the National Park and Sanctuaries of Sundarban region. Till now, 52 FPCs and 14 EDCs have been registered in Sundarban. These committees are undertaking various conservation activities as well as village development activities.

The funds for these activities come from the centrally sponsored scheme of the government of India, which are Conservation and Management of Sundarbans; Conservation and Management of Sundarban Biosphere Reserve, Project Tiger and Wetland Project. Of late the National Rural Employment Guarantee Scheme is also being implemented to provide employment and income sources to the rural poor of Sundarbans. From the year 2001 to 2007 almost Rs. 30 crores has been spent for various developmental activities under different schemes. Sundarban Wetland scheme started in the year 2003- 2004 whereas the UNDP scheme started in the year 2004- 2005. Project Tiger started in the year 2001 and is still continuing under which Rs. 11 crores have already been disbursed (Table 10).

CONCLUSION AND SUGGESTIONS

The ecological significance of Sundarbans is a well-established fact. However, the economic significance and the dependency are less addressed. Due to which the mangroves are in greater threats. The degradation of mangrove forests and encroachments are shrinking these resources on which the local populaces are so heavily dependent. Conservation of Mangrove habitat has been re-emphasized by Government and several development agencies particularly in post-tsunami episode in various parts of the world. This region is concentrated mainly with backward classes, which accounts for more than 45 % of the total

Table 10: Fund Utilization by Forest Department under different schemes

| Name of the Scheme | Utilization Amount (Rs. in Lakhs) | | | | | |
|-----------------------------|-----------------------------------|---------|---------|---------|---------|---------|
| | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 |
| CSS-CMM | 63.3 | 56.8 | 58.5 | 75.2 | 94.7 | 55.87 |
| CSS-ESBR | 49.2 | 68.1 | 72.8 | 58.8 | 91.5 | 55.91 |
| CSS-Sundarban Wetland | - | - | 48.0 | 66.2 | 68.1 | 93.57 |
| CSS-Project Tiger | 115.9 | 176.8 | 201.5 | 300.2 | 195.2 | 151.30 |
| STATE PLAN (AP & 10th Plan) | 131.0 | 107.6 | 34.8 | 26.7 | 30.5 | 269.29 |
| UNDP | - | - | - | 77.0 | 44.3 | 59.28 |

population as against the state figure of around 25 %, who are dependent of various types of forest and non forest based NTFPs for their livelihood. This is mainly due to the aggrieved salinity of the soil, which prevents agricultural crops to grow.

There have been many efforts by both government and international agencies to conserve Sundarban's natural resources. A National Mangrove Committee comprised of experts and representatives of concerned government departments, was established in 1987. The composition of the Committee was reconstituted in 1990 and its task was defined as that of an advisory committee for the conservation, research and training requirements for mangrove ecosystems. In 1992, this Committee was combined with National Wetland Committee to form a single National Committee on Wetlands, Mangroves and Coral Reefs (Chaudhuri and Choudhury, 1994).

These policy developments and activities indicate a growing awareness amongst the researchers and policy makers of the importance of mangroves and the multi-faceted consequences of their destruction. However, information regarding the forest cover and conditions remain hazy and public programmes remain weak. Poor social and economic developments of Sundarbans continue to exert enormous pressure on land and other resources of the ecosystem. As a result, despite efforts at natural regeneration and afforestation and monitoring activities, ensuring their long-term viability is, yet a daunting task. Sundarban requires special conservation impetus and public involvement is an essential component of forest protection and improvement activities in this area.

The Sundarban is gradually coming up as great destination for Ecotourism due to its natural significance. Ecotourism camps have been set-up at Sajnakhali, Dobanki, Netidhopani and Burir Dabri in STR, and at Bonie camp (Sundarikati), Bhagabatpore Crocodile Project, Lothian Island sanctuary and Kalash beach. There are two Nature Interpretation Centres located at Sajnakhali and Bhagabatpore, and one Eco-museum at Sudarikati. The Canopy walk at Dobanki, the mangrove trail at Burirdabri and the tallest Watch Tower at Bonie camp are added attractions for the Eco-tourists. However, involvements of local communities in ecotourism are very less and there exist huge potential for the government to involve local poor in ecotourism (Bhattacharya et al. 2001).

NTFPs and various income generation opportunities provided by nature in these World Heritage Sites need further integrated planning for sustaining the livelihood of local communities.

It is also suggested that a study on Golpata regeneration should be conducted as its collection was banned and also the cess on NTFP collection from Sundarbans should be levied to those who are commercially operating at a high scale of economy and those who collect in small quantities (mainly the rural poor) should be exempted from such taxations.

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