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**Contribution of Non Timber Forest Products to the
Livelihood of the Adjacent People in the
Sundarbans Mangrove Forest**



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APRIL 2014

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People in the Sundarbans Mangrove Forest**



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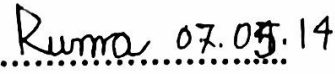
A thesis submitted to the Forestry and Wood Technology Discipline, School of Life Science, Khulna University in partial fulfillment of the requirements for the award of the degree of Master of Science in Forestry

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Declaration

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Dedicated
To
Lord Krishna

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All praises to the Supreme Being, Creator and Ruler of the universe, whose mercy keeps us alive and enables us to pursue my education in Forestry, FWT Discipline, Khulna University, Khulna and to complete my thesis paper. Then, I would like to express my gratitude to my parents. Without their continuous inspiration, the present achievement is not possible.

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Abstract

This study was conducted with 90 households at three upazilas adjacent to the Sundarbans Reserve Forest to know the contribution of NTFPs to the rural livelihoods. Data were collected by face to face interview with the help of semi-structured questionnaire during the period from 01 November to 31 December 2013. The sampling design for the survey was purposive sampling. The major NTFP that are being collected includes firewood, prawn, fishes, crab, honey, Nypa leaf and wax. Author finds that NTFPs collector annually average harvest 560 kg of crabs and consume 45 kg for own household. However, average household consumption of white fish is 180 kg followed by crustaceans 32 kg, honey 12 kg, Nypa leaf 2 *Kaon*, fuelwood 3392 kg and wild fruits 25 to 30 kg. Data reveals that NTFPs collectors' net average income per trip (Goan) is Tk. 7838 whereas crustaceans income Tk. 4238, white fish income is 3602 Tk., shrimp fries and prawn fries income is Tk. 8860 and 2742 respectively. Author also finds that on an average 7 to 12 kg. fuelwood required per day per household and all the household fulfill it from their own harvesting. Above all the fuelwood income per trip is Tk. 248. Honey collectors earn on an average Tk. 13987 in a season (45 days) and also earn from selling wax Tk. 1500. Beside, Nypa leaf collector earns Tk. 92507 in a season (90 days) and Hental collector also Tk. 43600 in a season (60-70 days). This income helps them to meet the family necessities because they have limited alternative income opportunity. NTFPs contribution to household economy is highest (i.e. 94 percent in Mongla, 88 percent in Koyra and 86 percent in Shyamnagar) share of the total household cash income whereas very lower percentage of share of income come from business, wage, livestock and others income source in the study area.

Keywords: Sundarbans, Contribution, NTFPs, Livelihood

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Chapter One: Introduction

1.1 Background of the study

Non Timber Forest Products (NTFPs) constitute an important source of livelihood for the millions of people from forest fringe communities across the world and also serve as vital livelihood safety nets in term of hardships to the poor people (Thapa, 2008). A significant proportion of the population of rural people in Asia, Africa, South America and Southeast Asia are forest dependent (Miah, 2012). The contribution of NTFPs to the livelihoods and welfare of forest dependent people has become increasingly recognized (Arnold and Perez, 2001; Gram, 2001; Belcher, 2005). The importance of NTFPs in supporting livelihood of forest dependent communities has been widely promoted due to the recognition that NTFPs can contribute to improve the livelihoods of forest dependent communities (Belcher et al., 2005; Marshall et al., 2005; FAO, 2006); household food security and nutrition (Clark & Sunderland, 2004; Shackleton and Shackleton, 2004); generate additional employment and income (Peters, 1996) and offer opportunities for NTFP-based enterprises (Shackleton and Shackleton, 2004; Subedi, 2006). Moreover, NTFPs are more accessible to the poor (Saxena, 2003); contribute to foreign exchange earnings (Shiva and Verma, 2002); and support biodiversity and other conservation objectives (FAO, 1995; Marshall et al., 2005). Further, NTFPs are also used for cultural and recreational purposes and offer various opportunities, including cultural maintenance and revival, and rural economic development (Cocksedge, 2006). In many places, people consume NTFPs for subsistence more than they trade them (Kar and Jacobson, 2012). In such situations, NTFPs are considered a safety net to fill in the gaps when there is an agricultural shortfall or another kind of emergency (Shackleton and Shackleton, 2004; Paumgarten, 2005). During early 1990s NTFPs were considered as a potential alternative to deforestation and land conversion (Falconer, 1990; Plotkin and Famolare, 1992) and also a means of sustainable forest management and poverty alleviation (Peters et al., 1989; Ros-Tonen, 2000). NTFPs play a role in the household economy for not only the poor, but also the rich (Nguyen, 2006). Collection and processing of NTFPs provide major employment opportunities to the poorest rural populations worldwide (Riadh, 2007). In India, NTFPs contribute from 10 percent to 40 percent of income for 50 million indigenous households (Shiva, 1993, as cited in

Sekar et al., 1996); about 200 to 300 million villagers depend on NTFPs to varying degrees (Shiva, 1995b); and 1.6 million of employment are generated in the NTFPs sector (Gupta, 1994). In Indonesia, the rattan industry alone provides jobs for 2,00,000 people (Haury and Saragih, 1995). In Vietnam, more than 3,20,000 people are involved in NTFP production (Tien, 1994). In Bangladesh, this amounts to a contribution of about Tk. 1.3 billion annually to the economy (GOB, 1993), and employment for nearly 3,00,000 people (Basit, 1995). These figures are impressive and given the number of forest-dependent people involved, the implication is that forest management policies should properly address the dependence of local people on forests for their livelihood needs. Considering all, this paper attempts to assess the contribution of NTFPs to the livelihoods of the adjacent people in the Sundarbans Mangrove Forest of Bangladesh.

1.2 Study objective

- To study the contribution of NTFPs to the livelihoods of the adjacent people in the Sundarbans Mangrove forest

1.3 Rationale of the study

The Sundarbans, located in the south-western part of Bangladesh, is a unique as well as the largest single tract of mangrove forest in the world. The forest area comprises parts of Bagerhat, Khulna, and Satkhira districts of Bangladesh. The total mangrove forest area is around 4.2 percent of the total land area of the country, this being 51 percent of the total forest area (Canonizado and Hossain, 1998). It is the most diverse and the richest natural resource in Bangladesh. Human dependence on the Sundarbans forest resource has always been there. About one million people depend on Sundarbans for their living and livelihoods (Partha and Samad, 2013). Otherwise, Canonizado and Hossain (1998) reported that about 2,00,000 fishermen are dependent on this forest and supporting about a million household members. Another researcher Hoq (2003) accounted that over 3.5 million people are, from the surrounding areas, depending directly or indirectly on the Sundarbans for their livelihood. The people who live near Sundarbans are engaged in honey collections, cutting woods and Golpata, fishing, catching crabs and shrimps and collecting snails for their consumption and livelihood.

Five main economic activities and forest-dependent communities are Bawalis (wood cutters), Mawalis (honey collectors), Gollpata sangraha-kari (Nypa leaf collectors), Jele (fishermen) and Chunery (snail and oyster collectors) (Roy, et al., 2010). Though the forest resources of Bangladesh are declining rapidly but still the forest 'Sundarbans' is playing an important role in meeting the basic needs of the forest dependent people and their sustainable livelihoods (Reza et al., 2002). It is the single largest source of forest produce in the country (Rahman, 2000). The Sundarbans play an important role in the national economy. NTFPs from SRF contribute an estimated Tk. 717 million (US\$ 17.9 million) annually to the Bangladesh economy, directly or indirectly (Basit, 1995). Not only economic value, Sundarbans has a great contribution in saving ecology (Singh, 2010). Despite the importance of NTFPs for rural livelihoods of the country, policy-makers, forest managers and practitioners have not paid sufficient attention to these resources. There is no record of consumption of NTFPs except for some recent NTFP research and data collection in a few protected area sites of the Nishorgo Support Project, BFD (Fox et al., 2007) and in Chittagong Hill Tracts (Kar, 2012). In regard to exploring the contribution of NTFPs on rural livelihoods economy and food security, very little has been done on Bangladesh NTFP perspective. Mentionable NTFP-related studies in Bangladesh include several research initiatives by government and NGOs on exploring NTFP-livelihood relationship specific to a few protected areas of Bangladesh (Kar, 2010). A number of researches have taken place on various fields in Sundarbans of Bangladesh. However, no holistic studies have been conducted on the contribution of NTFPs in the livelihoods of the adjacent people. So, the present study aims at evaluating the contribution of NTFPs to the livelihoods of the adjacent people in the Sundarbans Mangrove Forest of Bangladesh.

1.4 Scope of the study

This study has conducted a detailed analysis of contribution of NTFPs to the livelihoods of the adjacent people in the Sundarbans Reserve Forest. It examines various contributions of NTFPs to the livelihoods of the adjacent people. Besides, this study finds out the remarkable differences between forest dependent people of three ranges of Sundarbans in terms of livelihood characteristics. These findings can help to improve socio-economic livelihoods in a great extent of the forest dependent people. Moreover, the research outcome will contribute to the NTFPs based livelihood

development and management on the utilization of NTFPs with the data from the current study. In South Asia, (India and Nepal), initiatives are taking to conserve and develop NTFPs with the goal of sustainability and have already incorporated some guidelines into their national policies. This research will help Bangladesh to investigate NTFPs initiatives in order to develop a standard guideline for the sustainable use of NTFPs in Sundarbans. NTFPs have not been accorded adequate attention in Sundarbans development planning in Bangladesh. So the study will also provide relevant information about NTFPs for policy makers and development actors in line with the current forest policy of the country.

1.5 Limitation of the study

The research has some difficulties in getting support by people during collection of the data. People usually collect NTFPs in a group rather than independent, hence quantifying the resource collected, consumed and income earned by individuals is difficult, as respondents give the information for the group. This challenge is overcome by changing the data collection approach. In addition individual efforts are made to collect extra information apart from the questionnaire. The data are collected with pre-tested questionnaires. Another problem is related with study area which is very large. So, it is not possible to conduct survey in all the area equally. Due to time and resource constraints, data has been neither cross checked nor triangulated at any significant level. As maximum information is collected through interview, the authenticity of the information may vary a little with the real fact. Besides, in case of field survey, respondents could not provide the real data in all cases because of memory bias. Hence, the study pertains to a particular location; it cannot be generalized and implied to other locations.

1.6 Organization of the research paper

The paper is organized in six main chapters which are further divided into sub chapters. In the first chapter, background and rationale of the study and objective of the study, scope and limitation of the study are discussed. The second chapter contains the review of literature, which reports the findings of past studies conducted by various researchers across the national and international levels. Chapter three describes the methods and procedures followed in the fields, sample data and

sampling procedure, determines the variables, source from which the relevant data were collected, the software used for analysis and the tools and techniques with which the data are analyzed. Chapter four describes the main features of the study area, climatic condition, geology and socio-economic conditions of the people. Chapter five is devoted to the presentation of detailed results and discussion in tabular form into which relevant details have been compressed. Finally, chapter six is outlined to general conclusions and major findings of the study.

Chapter Two: Literature Review

2.1 Introduction

This section presents a focused review of the current literature for identifying the problems and issues related to the NTFPs in Bangladesh as well as global perspective. This review also examines the methodological aspects of measuring the contribution of NTFPs in the livelihoods of the adjacent people in Sundarbans Reserve Forest. However, author's intention is to report the findings and understandings of past studies conducted by various research specialists as well as their views and opinions about different aspects related to the present study.

2.2 NTFPs definition

The term Non-Timber Forest Products (NTFPs) encompasses all biological materials other than timber, which are extracted from forests for human use (De Beer and McDermott, 1989). NTFPs embody all biological matter of wild plants and animals other than timber extracted from forests and woodlands, e.g. fruits, nuts, vegetables, medicinal plants, resins, bark, fibers, palms, grasses as well as small wood products and firewood, amongst others (CIFOR, 2011). NTFPs consist of goods of biological origin other than wood, derived from forests, other wooded land and trees outside the forest (FAO, 2006). Similarly, Subedi (1999) defined NTFPs as all goods of biological origin other than timber, fuel-wood and fodder, forest, grassland or any land under similar use. There is no unique definition of NTFPs. Some researchers defined it very broadly to include all forests products except timber, while others have been using the term narrowly to focus on certain groups of forest products. However, for the purpose of this paper NTFPs are identified as all plants and animal products of Sundarbans forests like Gollpata, fuelwood, honey, wax, fish, crab, shrimps, snails and various edible fruits except timber.

2.3 The sustainability of livelihood

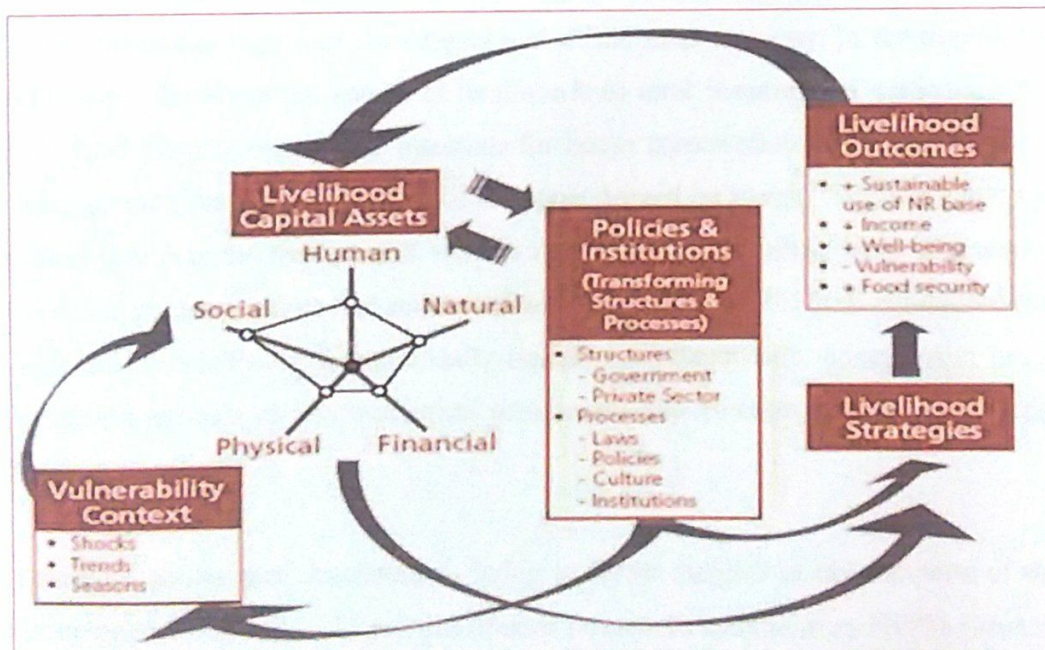
A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living (Chambers and Conway, 1992 as cited in Boateng, 2008). Livelihoods are sustainable when they:

- ✓ are resilient in the face of external shocks and stresses
- ✓ are not dependent upon external support (or if they are, this support itself should be economically and institutionally sustainable)
- ✓ maintain the long term productivity of natural resources
- ✓ do not undermine the livelihoods of/or compromise the livelihood options open to other (Chambers and Conway, 1992, as cited in Boateng, 2008).

2.4 Sustainable livelihood framework

The concept of 'sustainable livelihood' is increasingly central to the debate about rural development, poverty reduction and environmental management. A livelihood comprises the capabilities, assets (including material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resource base (Chambers and Conway, 1992, as cited in Scoones, 1998). A framework for sustainable livelihood is shown below.

Figure 2.2: Sustainable Livelihood Framework



Source: DFID (1999)

Chambers and Conway (1992) consider five indicators: human, natural, physical, social and financial for measuring livelihood. Income, health, education, access to assets, drinking water and sanitation are common livelihoods criteria. Many scholars have applied different forms of capital to describe livelihood. World Bank has more emphasis on social capital. Some scholars have argued that food security is a prime need for livelihood. So, analysis of health, education, and income, access to assets, clean water and sanitation is necessary for measuring livelihood.

2.5 Contribution of NTFPs in global perspective

There is growing evidence that Non Timber Forest Products (NTFPs) has contribution to maintain livelihoods in rural Africa, Asia and elsewhere in developing countries (Cavendish, 2000; Shackleton and Shackleton, 2004; Cocks et al., 2008). NTFPs provide material subsistence and cash income to millions of rural people, particularly in LDCs (Stanley et al., 2012). In developing countries, most of the rural households and a large proportion of urban households depend on NTFPs to meet some parts of their nutritional, health, and raw material needs and for income from selling (Shah and Sundriyal, 2011). In some cases, NTFPs are the only source of income for local communities and they form an integral part of the rural economy. In the tropics, the NTFPs are the important source of livelihoods to rural communities particularly for their food, medicines and raw materials for house construction as well as fuelwood consumption (Wollenberg, 2000). Rural people depend on a wide variety of plant and animal products for their use as well as marketing, a few others have commercial value and generate substantial revenue (Shah and Sundriyal, 2011). It is reported that at least 150 NTFPs are internationally traded, comprising nuts, honey, palm heart, plants and animals of pharmaceutical uses, rattan and bamboo, cork, essential oils, and gum (FAO, 1997).

Estimation shows that, smallholders living in forest margins in diverse parts of the world earn between 10 to 25 percent of their household income from NTFPs (Mukul, 2007). An assessment of the impact of the East Asian economic crisis of the late 1990s found that forest assets helped to mitigate poor communities by providing supplemental income through sales of forest products as well as a reserve of

cultivable land for food production (Pagiola, 2001). Asia is undoubtedly the world's largest producer and consumer of NTFPs (Mukul, 2007). According to de Beer and McDermott about 27 million people in Southeast Asia rely on the use of NTFPs (Mukul, 2007). Some estimates suggests that, part of Southeast Asia's tropical forest promote up to 50 US\$ per month per hectare to local people from exploiting forest resources, without considering timber values (Sedjo, 2002). NTFPs may account for as much as 16 percent of total income of households in India and 39 percent are involved in NTFPs collection as a subsidiary income source (Mallik, 2000). In parts of Nepal, up to a quarter of the total household income is derived from the sale of NTFPs. Kanel estimated the value of NTFPs worth of US\$ 18 million; legally or illegally is exported from Nepal to India. In southern Ghana, 10 percent of the population generated some cash income from forest product activities in the early 1990s (Mukul, 2007). Again, NTFPs play a crucial role as a source of cash income during periods of unemployment or crop failure. Hence, the potential contributions of NTFPs can be visualized in three distinct category in our life and living i.e., subsistence, supplement income or emergency supports.

2.6 NTFPs and rural livelihoods in Bangladesh

NTFPs play an important role in the daily life and economy of Bangladesh's rural population (Kar, 2012). According to a previous statistics the collection, processing and selling of NTFPs provide major employment opportunities to a rural people of about 3, 00,000 and contribute approximately Tk. 1.3 billion annually to the Bangladesh economy (GOB, 1993; Basit, 1995). Governments earn an estimated Tk. 717 million (US\$ 17.9) annually only from the Sundarbans and one third of the population living around this forest were assessed to be dependent on these forest for a substantial part of their income either directly or indirectly (Basit, 1995). It contributes to the food security of the rural people by supplementing agricultural crops (Kar, 2012). NTFP-based small-scale cottage industries provide off-farm employment and income generation in the rural communities (Alamgir, 2006). The Bangladesh Small and Cottage Industries Corporation (BSCIC) listed 157 types of small and cottage industries in Bangladesh and among them about 22 industries directly related to the NTFPs trade (Kar, 2010). In 1986, there were about 3.22 million households engaged in cottage industries in Bangladesh producing 160 different products and employing about 9.18 million people and many of these were

related to NTFPs trade (Kar, 2012). In addition, about 75,000 bamboo and cane units were recorded in Bangladesh in 1982 (Kar, 2012). Since now-a-days NTFPs hold both conservation and economic potentials and government should emphasize on the proper utilization of this opportunities particularly for sustainable forest resource management and conservation. Many scholars believed NTFPs can play important roles by contributing to people's livelihoods without placing major stress on forest resources. NTFPs have three main functions in the household economy of rural communities living in or adjacent to the forest of Bangladesh (Sohela, 2013). Firstly, they help to fulfill households' subsistence and consumption needs in terms of e.g. energy and nutrition as well as medical and construction purposes. Secondly, they serve as a safety-net in times of crises (e.g. income shortages from other income sources, e.g. crop failure) and thirdly, some NTFPs provide regular cash income.

2.7 NTFPs in Sundarbans

The Sundarbans, the largest single tract of mangrove ecosystem in the world, is located in the estuary of the river Ganges, spanning an area of about one million hectares in South-west Bangladesh and South-eastern part of the State of West Bengal in India. The Sundarbans mangrove forest was declared as "Reserve Forest" in 1875-76 under the first Forest Act of the then British India. In Bangladesh, SRF covers an area of 577,000 ha which is 4.07 percent of total land mass of the country and 40 percent of total forest land (Mehndiratta, 2002). Among which 401,600 ha is land and remaining 175,400 ha are under the water in the forms of river, canals and creeks of width varying from a few meters to several kilometers (Hossain and Acharya, 1994). The Sundarbans mangrove forest is valuable because of its rich biodiversity which are exploited particularly, the NTFPs, which is one of the epitomes for the livelihoods of many forest fringe dwellers (Bhattacharya, 2004). The NTFPs collected from mangrove forest of Sundarbans includes tannin bark (most Sundarbans species like *Ceriops decandra*, *Ceriops myrobalans*, *Phoenix paludosa* yield around 30-42 percent tannin); *Nypa fruticans* (Golpata), hogla (*Typha elephantia*), hantal (*Phoenix paludosa*) natural honey from *Apis dorsata* and bee wax; fuelwood and small poles and boles; fishes, prawn, crab, shrimps; and lime (manufactured from *jorgran*, *kastura* and *jhimuk*) (Singh et al., 2010). The two major fuel wood species in the Sundarbans are *Heritiera fomes* and *Ceriops decandra*. However, there are a number of other species, which also provide good quality fuelwood. These include *Amoora*

cucullata, *Aegiceras majus*, *Rhizophora mucronata*, *Hibiscus tiliaceus*, *Ceriops candellana* and *Cynometra ramiflora*. Leaves of *Nypa fruticans* is a major source of thatching material which is extensively used by the poorer section of rural population in south-west Bangladesh. The Sundarbans is the only source of Nipa leaves. In addition, *Saccharum cylindricum* or sungrass grows extensively in the sandy areas on the seaward side of the Bangladesh Sundarbans. The grass is harvested in the same fashion as are cereal crops in agricultural fields and is used for thatching.

In the Forest Department terminology, fishery resources in the Sundarbans are regarded as minor forest products and their harvest and management is regulated by the Forest Department. It is the most important non-forestry product of the forest. The shallow water, creeks, small and big rivers crossing mangrove forests supports many species of fish. Over 120 species of fish are caught routinely by commercial fishermen. Some species such as *Hilsha ilisha* are exclusively marine but travel through estuaries to the upstream areas for breeding and then return to the sea. Shrimps and prawns constitute the most important fishery of the zone. The most important crustaceans' species are *Penaeus mondon* and *Macrobrachium rosenbergi*. Mud crab (*Scylla serrata*) is the largest edible crab found in the forest area and has high economic value because of its very tasty meat and very high nutrient content. Although honey and bees-wax are universal non-forest products in the Sundarbans, these are included in the NTFPs. *Aegiceras corniculatum* and *Ceriops decandra*, these two species are favored by the honey-bee *Apis dorsata*. Honey made from *Aegiceras* is of high quality and has a distinctive flavor. An estimated 185 ton of honey and 45 ton of wax are extracted annually. The bark of various species is used in tannin production. *Ceriops decandra* is a major source of tannin while the barks of other species such as *Bruguiera gymnorrhiza* and *Xylocarpus granatum* also have high tannin content. *Xylocarpus granatum* fruits are also used as tannin. *Phoenix paludosa* is a thorny palm, the stems of which are used extensively in the construction of small huts as roof rafters and framework of the wall. *Phragmites karka*, a reed is collected from the forest and used for making matting for walls of houses, coverings for boats and as mats.

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2.8 Contribution of Sundarbans NTFPs on sustainable livelihoods

In Sundarbans, the local people are dependent on the forest and waterways for such necessities as firewood, timber for boats, poles for house-posts and rafters, Gollpata leaf for roofing, grass for matting, reeds for fencing and fish for their own consumption. Over 3.5 million people are directly or indirectly dependent on the Sundarbans for their livelihood (Hoq, 2003; Roy and Alam, 2012). It supports large group of fish, shrimp and edible crab and also supply food and cash to local coastal communities. Currently, around 500,000 families are dependent on the Sundarbans for their livelihood (Mehndiratta, 2002). About 200,000 fishermen are also dependent on this forest supporting about a million household members (Canonizado and Hossain, 1998). Various NTFPs and plantations help considerable employment and income generation opportunities for at least half a million poor coastal population (Wikipedia, 2014). The Sundarbans play an important role in the economy of the southwestern region of Bangladesh as well as in the national economy. In addition to traditional forest produce like timber, fuelwood, pulpwood etc., large scale harvest of NTFPs such as thatching materials, honey, bees-wax, fish, and crustacean and mollusk resources of the forest takes place regularly. In the 1980s the forest produced about 45 percent of the total timber and fuelwood output from the forests of the country (Rahman, 2000). Because of the extensive and diverse resources which are available from the Sundarbans, the forest generates large-scale employment opportunities. The number of people entering the forest in a given year can be as high as one million. However, the number of people involved in retailing, transportation and processing of products from the Sundarbans is much higher. Besides, the forest also provides natural protection against cyclone to coastal people.

2.9 Conclusion

From the above discussion it is clear that NTFPs are very important in Bangladesh. The Sundarbans, World Heritage Sites of the country, is a rich habitat for offshore fisheries and onshore shrimp cultivation and rich in forest-based resources. It is a major source of government revenue, at the same time meeting the livelihood needs of the local communities (Mehndiratta, 2002). The ecological significance of Sundarbans is a well established fact. However, the economic significance and the dependency are less addressed. NTFPs and various income generation opportunities provided by nature in these World Heritage Sites

need integrated planning for the livelihood of adjacent communities (Roy et al., 2010). The next chapter of the study describes the conceptual framework and analytical framework of the study that helps to analyze the data easily and facilitates to complete the research work.

Chapter Three: Materials and Method

3.1 Introduction

This chapter describes the methods and procedures followed in the fields, sample data and sampling procedure, determines the variables, source from which the relevant data were collected, the software used for analysis and the tools and techniques with which the data were analyzed.

3.2 Site selection

The Sundarbans is a unique as well as the largest single mangrove forest in the world. It is situated in the southern coastal region of Bangladesh. Geographically the forest area lies between 21°27'30" to 22°30'0" North latitude and 89°02'00" to 90°0'0" East longitude. Of the total land area of the Sundarbans, Bangladesh part of which is around 5800 km². The rest part lies in the West Bengal State of India. The Sundarbans is rich in floral as well as faunal biodiversity. A total 334 species representing 245 genera of plants thrive in the Sundarbans (Hoq, 2003). As many as 120 species of fish, 59 species of reptiles, over 300 species of birds, and 42 species of mammals have been recorded in the Sundarbans (FAO, 1995). The Sundarbans Reserve Forest and surrounding areas have a rich avifauna and the most recent list of species indicates that at least 315 species representing 48 percent of the birds known to occur in Bangladesh, have been recorded here (IUCN, 1994). Besides, Mangrove waters are very rich in fishery resources and act as nurseries and spawning grounds for a large number of fishes, crabs, shrimps and various kinds of mollusk. Sundarbans resources harvesters are playing a vital role for national economy of Bangladesh. The Sundarbans is bearing numerous values and holding importance from economic, social and ecological perspectives. It is the direct and indirect sources of the livelihood of 3.5 million people. In addition to traditional forest produce like timber, fuelwood, pulpwood etc., large scale harvest of NTFPs such as thatching materials, honey, bees-wax, fish, and crustacean and mollusk resources of the forest takes place regularly. So, author purposively selects SRF as the study site for its diversified ecological resources

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especially NTFPs and its contribution on sustainable livelihoods pattern of the forest dependent people.

3.3 Conceptualization and literature review

Conceptualization is an important task of a study. To develop a holistic concept about the study problem author's need to communicate with various GO's and NGO's personnel at district levels and Upazila levels who are involved in forestry extension program, forest department people and expertise and to study different books, journals, seminar papers, reports and magazines, research papers, review papers etc.

3.4 Study objective

- To study the contribution of NTFPs to the livelihoods of the adjacent people in the Sundarbans Mangrove Forest

3.5 Sample size and sampling design

The sampling design for the survey is purposive sampling. Firstly three Upazilas adjacent to the Sundarbans Reserve Forest under three coastal districts are selected. These three Upazilas are Mongla, Koyra and Shyamnagar under Bagerhat, Khulna and Satkhira districts respectively. A reconnaissance survey is carried out to select the study area and for secondary data from the respective forest station officer. In each Upazila two unions are selected for the study. These are Chila and Sundarban union under Mongla Upazila, Bagali and Maheswaripur union under Koyra Upazila, and Munshigonj and Burigoalini union under Shyamnagar Upazila. Again, one village under each union is selected. In this way 6 villages are selected from 6 unions purposively. In each village 15 households, which are adjacent to the forest and collect NTFPs, are selected purposively. Finally 90 households are selected for data collection (Table 3.1). So, at the end there are 90 sampling units for field survey.

Table 3.1: Distribution of sample of the respondents

	Name of districts	Name of upazilas	Name of unions	Name of villages	Sampled respondents
	Bagerhat	Mongla	Chilla	Chilla	15
			Sundarban	Sundarban	15
	Khulna	Koyra	Bagali	Boga	15
SRF			Maheswaripur	Gilabari	15
	Satkhira	Shyamnagar	Munshigonj	Harinagar	15
			Burigoalini	Kallbari	15
Total	3	3	6	6	90

Source: Field Survey

3.6 Questionnaire preparation

The purpose of the survey is to generate individual household level information and to improve the understanding of NTFPs and its contribution on household livelihoods. Therefore, the questionnaire is designed to collect information on households demographic and socio-economic characteristics (household size, age, sex, education, income and assets etc.), livelihood trends, and about the importance of different NTFPs to their livelihoods. To capture dimensions of NTFPs on household livelihoods security, both closed and open ended questions are combined in the questionnaire to collect both qualitative and quantitative data.

3.6.1 Draft questionnaire preparation

The questionnaire has been prepared on the basis of the information collected by the reconnaissance survey in the study area. Draft questionnaire has been prepared to collect the respondent's opinion. Questionnaires from secondary sources (for similar works) are collected and reviewed and useful points are considered for designing the questionnaires. The questionnaire has reasonable, clear understanding, less technical terms, no vague information and tries to follow the logical sequence.

3.6.2 Pre-testing and finalizing of the questionnaire

A pre-test of the questionnaire is done in one nearby study area (Mongla) and reviewed for clarity. The errors of draft questionnaire are corrected, fault and failures are also modified and vague questions are excluded to prepare a final questionnaire according to the study objectives. Final questionnaire is therefore ready for interview to the respondent in the whole study area (Annex-1).

3.7 Data collection

3.7.1 Primary data collection

The field data has been collected by visiting and surveying the target study area. A formal and informal discussion with the villagers of the study area is conducted. Finally, field survey is conducted on those 90 households with the help of a semi-structured questionnaire by face to face interviews during the period of November 2013 to January 2014. Data collection is intended to capture basic demographic data of the respondents (gender, age, literacy, family size), landholding pattern and household energy, level of income and expenditure, physical and livestock assets and types of NTFPs collected, no. of man collecting NTFPs, quantities of NTFPs collection, consume, or trade in etc. As majority of the peoples are illiterate, they can not give absolute distance they travel (km.) and actual time taken (hrs.) for extraction of NTFPs. Hence, distance travelled and times taken are carefully approximated. The total income generated in a season by the respondent during collecting trip is calculated from the quantity of NTFPs collected and the price received by the collectors. The timing of data collection is political turmoil in Bangladesh that restricted free movement for household survey. Field work is also constrained by limited transport and time.

3.7.2 Secondary data collection

The literature and information of the study are collected from the Forest Station Offices, Khulna university center library; seminar library of Forestry and Wood Technology Discipline, published and unpublished reports, journals, books and newspapers. Besides, important information is collected from the regional center of BBS, Department of Forestry (DoF) in Dhaka, Khulna Forest Office, relevant papers and

reports of International Organizations through internet search, and papers relevant to the study from NGO's.

3.8 Analytical framework

3.8.1 Variable determination

The variables are to be studied in this paper are categorized into four types. These are demographic factors, social factors, economic factors and NTFPs related factors. Table 3.2 describes variable categories, name of the variable and unit of measuring the variables.

Table 3.2: Description of the variables

Variables name	Category of the variable	Measurement unit
Age	Demographic factors	Years
Sex		Male=1, Female=0
Household size		Number of members
Marital status		Married=1, 0=Unmarried/Widow/Divorced
Family structure		1=Joint, 0=Nuclear
Housing pattern	Social factors	0=Kacha, 1=Semi-Pacca, 2=Pacca
Religion		1=Muslim, 2=Hindu, 3=Christian, 4=Buddhist
Ownership of land		1=Own, 0=Landless
Drinking water source		1=Yes, 0=No
Sanitary Latrine		0=Kacha, 1=Semi-Pacca, 2=Pacca
Household Food Consumption		1=Usually Food Deficit, 2=Occasionally Food Deficit, 3=Break even, 4=Enough
Education		Years of schooling
Household income	Economic factors	BDT
Household expenditure		BDT
Land assets		Decimal
Physical assets		Number
Livestock assets		Number
Earning members		Number
Literate members		Number
Cost of collection		BDT
NTFPs income		BDT
NTFPs types	NTFPs related factors	-
Collection time		Day
Qty. collected		Kg.
Distance travelled/trip		Km.
Method of collection		-
Household consumption		Kg.
Collection permit		1=Yes, 0=No
Collecting members		Number
Period of availability		Month
Experiencing		Years
Distance to forest		Km.
Distance to local market		Km.

Source: Field Survey

3.8.2 Data sorting and analysis

The collected literature and information are vigilantly reviewed and sorted according to the sequence and requirements. The unwanted part of the collected information and data has been discarded from the final paper to avoid the bulky size of the paper.

3.8.3 Data processing and analysis tools

Study data obtained from different methods are initially entered in computer using Microsoft Excel. The qualitative data are carefully coded and the code numbers are entered and exported to Statistical Software Package for Social Sciences (SPSS-version 20). Exported data is checked randomly against original completed questionnaires. Errors are detected and corrected satisfactorily for analysis. Then all the analysis is carried out in SPSS (version 20). Hence, all necessary tables, graphs and figures are created in Excel.

3.8.4 Data analysis techniques

The responses to the questionnaire for the household survey are analyzed both qualitatively and quantitatively. Descriptive statistical analysis including frequency distribution, percentage, cross tabulation of data, and simple ranking procedures are used for the data analysis to summarize households' socio-economic characteristics and to assess the contribution of NTFPs on livelihoods security of forest dependent people. Commonly used techniques for valuing the annual value of NTFPs are the income approach or products and services approach, whereby the physical production of goods and services is valued using actual or surrogate market prices of the resource (Shylajan and Mythili, 2007). Information is collected on each source of income of the households and each respondent was required to give an estimate of how much NTFPs is collected, consumed and sold from each source of income in the last year. This basically depends on household's estimation of the amounts harvested, consumed and sold rather than actually measured by researchers. In this study, total income includes both cash and subsistence income of households. Both opportunity cost of labor and transportation cost of products that go to market are not considered for calculating cost and returns of the NTFPs. Cash income of the respondents is calculated according to current market price of the study area (Annex-2).

However, data analysis techniques are:

3.8.4.1 Quantitative data analysis

Preliminary quantitative data analyses included descriptive statistics such as mean and standard deviation (SD) and frequency distribution, percentage, cross tabulation etc. are used to construct tables and graphs presented in results. In some cases, sample means are compared by performing independent T-test.

3.8.4.2 Qualitative data analysis

The qualitative data collected in the study are coded before entering to the computer and imported to SPSS for analysis. Preliminary analysis of qualitative data included calculating frequencies, percentages of different variables and cross tables. In most cases the opinions of respondents are grouped in broader categories.

3.9 Preparation of draft and final report

Finally, after completing the analysis phase a draft report was prepared containing the entire study findings. After all necessary correction, rectification and modification suggested by supervisor, a final report has been prepared for final submission.

3.10 Conclusion

This Chapter has presented the methodology used for the study. In this chapter purposive sampling is used to collect data from 90 respondents. Author also determined the variables and measurement unit to evaluate the contribution of NTFPs to the livelihood of forest dependent people. The steps followed for the analysis can be summarized as first descriptive statistics which led to frequency distribution, percentage, cross tabulation, mean and standard deviation. The independent t test is used for estimating the significance differences between variables. The next chapter discusses about the study area in details.

Chapter Four: Profile of the Study Area

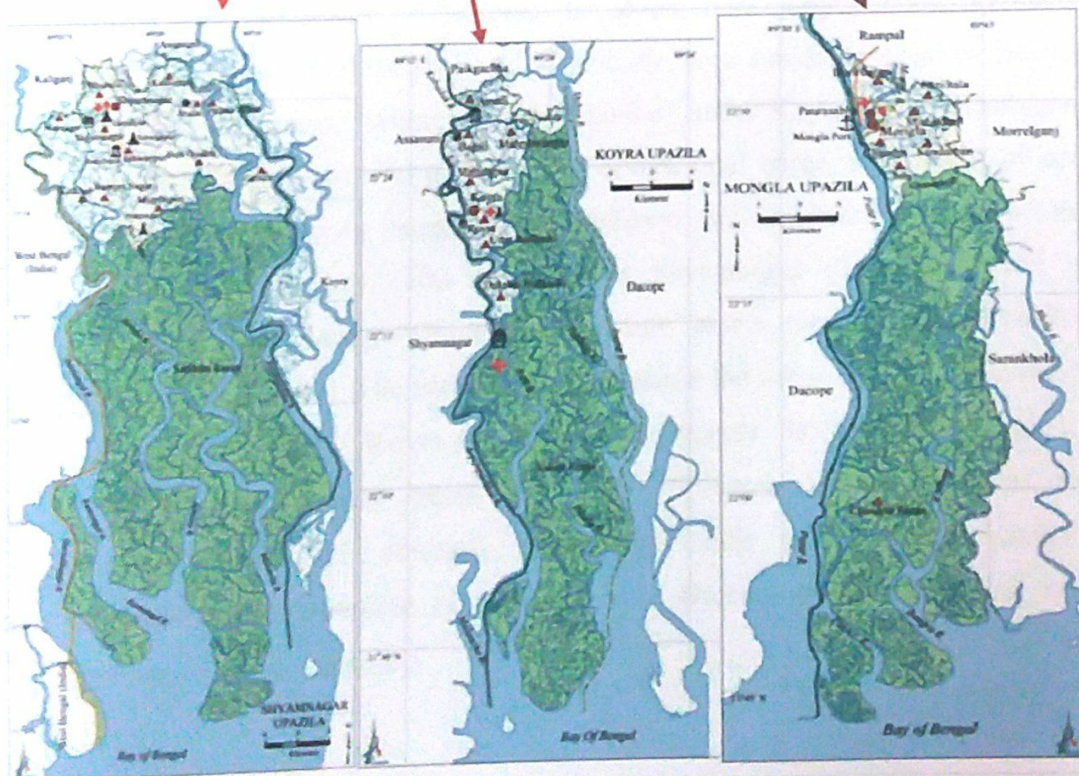
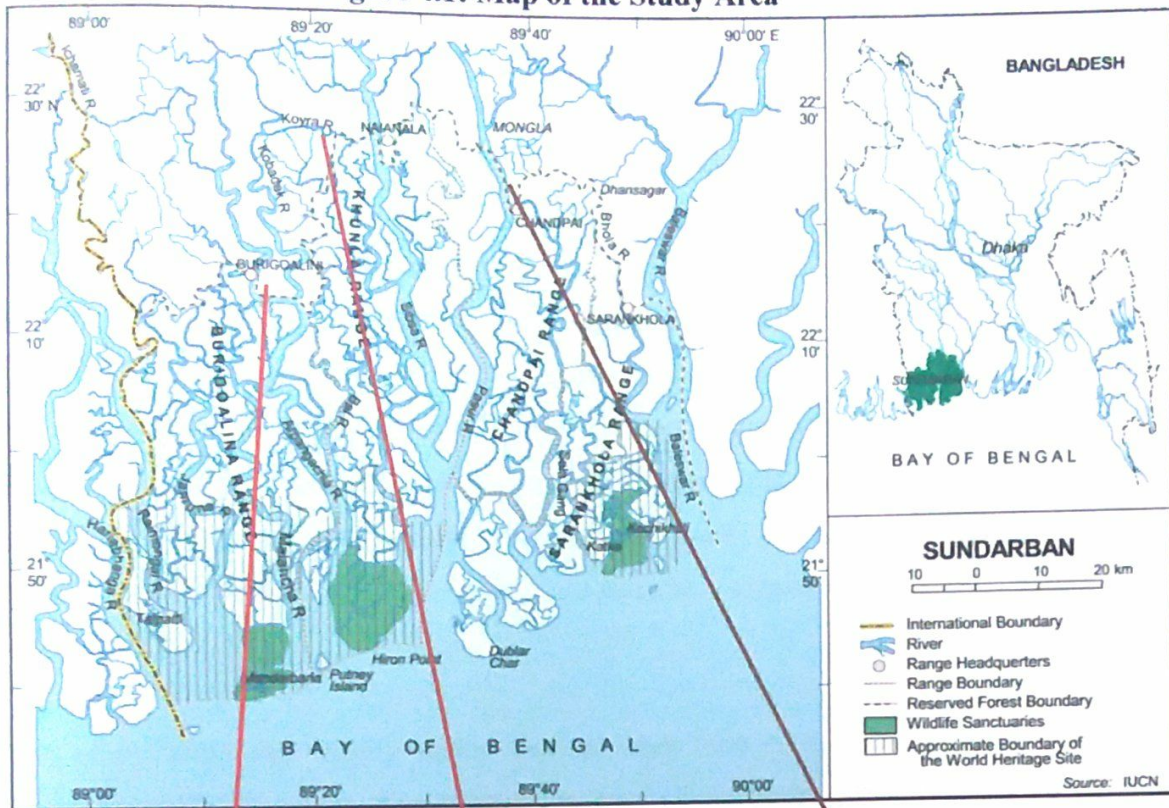
4.1 Introduction

In this chapter a short description regarding different aspects of the study area is given to get an overall picture and profile of the study area. The study is conducted in three Upazilas adjacent to Sundarbans Reserve Forest (SRF) to know the rural livelihoods of NTFPs collectors and contribution of it to the rural livelihoods. It involves much more time and labor to carry out detail studies for this area through household's interview and field inventory at different villages and it seemed to be difficult to carry out the whole studies within the short period of time.

4.2 Location

Geographically the SRF lies between 21°27'30" to 22°30'0" North latitude and 89°02'0" to 90°0'0" East longitude. Bangladesh part of Sundarbans is around 5800 km². Three Upazilas adjacent to the SRF under three coastal districts are selected. These Upazilas are Mongla under Bagerhat District, Koyra under Khulna District, and Shyamnagar under Satkhira District (Fig.4.1). From these three Upazilas, a total of 6 villages are selected purposively. It might be mentioned that the study villages are located within the buffer zone of the SRF (0-10 km), more specifically, within 0-5 km of the SRF. The study locations lie under Ganges Tidal Floodplain. This region occupies an extensive area of tidal floodplain land in the south-western part of the country. Almost all parts of Khulna, Bagerhat, Satkhira along with the Sundarbans Reserved Forest are included under this region. Besides, the study area Joymonirgol village is situated in south-west and Golbunia in south-east position of Mongla town and around 17 Km. far from it. Otherwise, Bagali and Maheshwaripur Union is situated around 15 Km. far from the Koyra town; Munshiganj and Burigoalini Union is situated around 17 Km. far from the Shyamnagar town. There is pacca, semi-pacca and mud road network, bridge, kulvert and good waterways to communicate the Upazila and Zilla town in the study area.

Figure 4.1: Map of the Study Area



Source: Banglapedia (2014)

4.3 Soil condition

General soil types of the study areas are Non-calcareous Grey Floodplain Soils, Calcareous Dark Grey Floodplain Soils and Acid Sulfate Soils (Islam and Saha, 1998). The soils of Mongla are entirely Non-calcareous Grey Floodplain Soils, whereas most soils under Koyra are also the same except Calcareous Dark Grey Floodplain Soils at northern parts of the Upazila. A considerable portion of the Shyamnagar Upazila represents Acid Sulfate Soils, although the survey area falls under Non-calcareous Grey Floodplain Soils. Extreme acidity (pH 2.9-4.0) developed under dry conditions in these three regions. Soils of the study area under Mongla are mostly moderate acid to neutral having a pH range between 5.5-7.3. Although Koyra represents soils having the same pH range, however, a considerable portion falls under moderately alkaline group (7.3-8.4) (Mehndiratta, 2002).

The study areas fall mainly under medium high land category. However, in Munshigonj Union under Shyamnagar patches of medium high lands are also available. Among the agro-ecological constraints the major one is however, the susceptibility of the region to moderate to severe tidal surges. Major portion of the three Upazilas are tidal surge-prone. The study area under Mongla is entirely tidal surge-prone areas, whereas Bagali Union under Koyra and Munshigonj Union under Shyamnagar are partly under severe tidal surge area. Status of soil moisture holding capacity suggest four different soil moisture regimes in the region, ranging from low (100-200 mm) in Shyamnagar (Satkhira), while in Koyra (Khulna) and Mongla (Bagerhat) moisture levels are moderate (200-300 mm) (Mehndiratta, 2002). The entire region represents the saline zone of Bangladesh. Among the study areas, Koyra and Mongla represents the areas where salinity is in S₂ category, which meant that over 70 percent of the Upazilas are affected by salinity. In contrast, Shyamnagar falls under S₂+S₃ category meaning that over 60 percent of the Upazila is affected by salinity along with the dominance of S₂ category.

4.4 Climatic condition

The study area (Sundarbans) is located south of the tropic of cancer and at the northern limits of the Bay of Bengal, which may be classified as tropical moist forest.

Annual average rainfall varies from 1600-2000 mm. Most rainfall occurs during the monsoon from May to October. Frequent and heavy showers occur from mid-June to mid-September. Temperature ranges from 7.7 °C to 38.8 °C round the year (Information Sheet on Ramsar Wetlands, 2001). The mean annual relative humidity varies from 70 percent to 80 percent at the study area. Humidity is highest in June-October and lowest in February.

4.5 Vegetation cover and biodiversity

All the study villages under three Upazilas are within 5 km of the Sundarbans forest even adjacent to SRF. So the vegetation cover of the study area is rich in floral as well as faunal biodiversity. The more prominent and important tree species found include the Sundri (*Heritiera fomes*), Gewa (*Excoecaria agallocha*), Keora (*Sonneratia apetala*), Goran (*Ceriops decandra*), Singra (*Cynometra ramiflora*), Dhundul (*Xylocarpus granatum*), Amur (*Amoora walichii*), Passur (*Xylocarpus mekongensis*), Dakur (*Cerbera odollum*) and Kankra (*Bruguiera gymnorhiza*) and Gollpata (*Nypa fruticans*). As many as 120 species of fish, 59 species of reptiles, over 300 species of birds, and 42 species of mammals have been recorded in the Sundarbans (FAO, 1995). The Sundarbans Reserve Forest and surrounding areas have a rich avifauna and the most recent list of species indicates that at least 315 species representing 48 percent of the birds known to occur in Bangladesh, have been recorded here (IUCN, 1994).

4.6 Land use pattern

Historically the region was dominated by single crop i.e. local Aman rice in the predominant cropping pattern: 'Fallow-T. Aman-Fallow' (BARC, 1998). During the early 1960s, the only cropping pattern in the southern parts of Khulna, Bagerhat and Satkhira is Fallow-Fallow-T. Aman Rice. Cropping patterns remained the same for years except during the early 1980s when introduction of modern rice cultivation, and more importantly, brackish water shrimp cultivation changed the scenario, and three dominant cropping patterns emerged containing shrimp as a major component in the land use pattern. Since mid 1980s, brackish water shrimp cultivation has emerged as a vital land-use with the emergence of new cropping patterns, e.g. Fallow-Shrimp T.Aman Traditional variety is being gradually replaced by modern rice cultivar(s), since mid-1980s. With

brackish water shrimp cultivation emerging as another major activity the land use pattern appeared as Shrimp- Rice-Shrimp cultivation where shrimp was cultured during January to July-August, followed by rice cultivation. Now diversified land use practice are seen in this region to cope the climate change. In Shyamnagar, total cultivable land 38552 hectares; fallow land 6257.79 hectares; single crop 23.8 percent; double crop 55.06 percent and treble crop land 21.14 percent (BBS, 2011). Among the peasants, 19 percent are landless, 30 percent small, 28 percent marginal, 16.5 percent intermediate and 6.5 percent rich; cultivable land per head 0.13 hectare (BBS, 2011). In Mongla, cultivable land 12565.76 hectares; fallow land 611.79 hectares; single crop 99.03 percent; double crop 0.86 percent and treble crop land 0.11 percent (BBS, 2011).

4.7 Socio-economic characteristics of the study area

Around 9,57,000 people live within 10 km buffer zone of the Sundarbans and 1,157,000 within a 20 km impact zone who depend directly or indirectly upon its resources for livelihood (Canonizado and Hossain, 1998). The socio-economic conditions of the study areas have given in Table 4.1. All the villages under the study are within 5 km of the Sundarbans forest. The average family size in Mongla, Koyra and Shyamnagar are 4.02, 4.08 and 5.17, respectively (BBS, 2011), with varied levels of literacy. Agriculture is the principal occupation of the people at all the survey areas. In Mongla, landless category is dominating; small farm category was the major group in Koyra and Shyamnagar. Agriculture is followed by fishing and forest related activities. Very few respondents in Mongla and Shyamnagar are engaged in trading or business. Some of the secondary occupations are shrimp cultivation, fishing, shrimp fry collection, fuel wood collection, honey collection, golpata collection, work as laborer, and business/trading. In Mongla, fuelwood collection is found to be the dominant secondary occupation, whereas, in Koyra and Shyamnagar, fishing appeared as the dominant secondary occupation. At all the locations, shrimp cultivation appeared to be the second important secondary occupation. It may be noted that shrimp is cultured on the same land where rice is cultivated. Besides, all the survey villages most of people are forest dependent. Author finds that around 90 percent people are directly depending on Sundarbans NTFPs to survive in

the study 6 villages. Among them around 60 to 70 percent people are fisheries and around 30 to 40 percent people collects others NTFPs from SRF.

Table 4.1: Socio-economic conditions of the study area

Parameter	Upazila name		
	Koyra	Mongla	Shyamnagar
A. Population			
Total population	1,93,931	1,36,588	3,18,254
Male	95,393	71,492	1,53,441
Female	98,538	65,096	1,64,813
Total household (HH)	45,750	32,383	72,279
Average household size	4.08	4.02	5.17
Population density (Km ²)	109	93	162
Literacy rate (%)	50.40	57.2	48.6
B. Occupational pattern			
Agriculture (%)	43.39	21.41	32.93
Fisheries (%)	4.98	6.23	5.50
Business (%)	9.46	15.09	10.11
Day labor (%)	25.01	25.80	32.01
Forestry (%)	3.21	-	2.34
Service (%)	2.90	16.27	3.38
Others (%)	11.05	13.26	13.73

Source: BBS (2011)

4.8 Conclusion

From this chapter all sorts of variability in the study area like soil, land pattern, climate, vegetation cover and socio-economic conditions of forest dependent people etc. are known properly. It is very much helpful to analyze the problems of the study. Author finds that most of the people are directly involved with Sundarbans as well as for NTFPs to survive. Adjacent people largely depend on NTFPs and they collect it from Sundarbans for subsistence and cash income. Besides, it is hardly needed to explore that how NTFPs contribute to the livelihoods of forest dependent people that are properly analyzed in the next chapters.

Chapter Five

Results and Discussion

5.1 Socio-economic and demographic profile of the NTFPs collectors

Socio-economic and demographic conditions determine the dependency on NTFPs. Family is the one and only source of labor supply because of being the primary productive unit. All the family members contribute to subsistence and commercial side but the age of the respondents is sorted out in three age groups in the study area (Table 5.1) because age of the respondent covered a wide range. The most important economically active population is considered the members of age 30 to 55 years. Despite of having the supportive role of the members with age below 30 and above 55 years in the economic activities of the family, they are not considered as economically active members. Out of the 90 sampled households, the study reveals that about 67 percent of the respondent is of economically active age (Table 5.1). In Shyamnagar, a greater part of the respondent is of economically active age than other two areas of Koyra and Mongla. A large number of the respondent of the sampled area is male (95.67 percent). But only 13 percent of the respondent of the sampled area of Shyamnagar is female. The study, therefore, exposed male is superior in all age group.

Overall, average household size is 4.81, which was higher than the national average 4.44. The average household size is found higher in Mongla with 5.03 followed by Shyamnagar with 5.0, and Koyra with 4.40 (Table 5.1). Only one-fourth of the respondents have extended family. It reveals that majority of the respondent (76.67 percent) has nuclear family. The study also reveals that majority of the respondent (94.67 percent) is married. About two-third (71.67 percent) of the respondents in the study area is Muslim. Higher number of Muslim respondents is found in Mongla and Shyamnagar than Koyra.

Land ownership within the agrarian economy of the study area provides a major source of income. The mean landholding size per household is 27.90 decimal ranging from 0 decimal to 173 decimal in which mean landholding size per household of

Koyra was (59.33 percent) that is higher than that of Mongla and Shyamnagar (Table 5.1).

Table 5.1: Socio-economic and demographic profile

Variables	Koyra (N=30)			Mongla (N=30)			Shyamnagar (N=30)		
	Mean	S.D.	%	Mean	S.D.	%	Mean	S.D.	%
Age (Years)	38.23	11.51		40.96	12.31		45.63	12.71	
Young Age (<30)			27			26			10
Middle Age (30-55)			65			67			70
Old Age (>55)			08			06			20
Sex									
Male			100			100			87
Female			00			00			13
Household size (Number)	4.40	1.13		5.03	1.18		5.00	1.59	
1-3			23			10			13
4-6			70			77			70
>6			07			13			17
Family structure									
Joint			33			10			17
Nuclear			67			90			73
Marital status									
Unmarried			13			03			00
Married			87			97			100
Religion									
Muslim			43			92			80
Hindu			57			08			20
Landholding size (Decimal)	59.33	48.63		11.73	7.88		11.12	12.66	
Land ownership									
Own			93			40			60
Landless			07			60			40
Education (Years of schooling)									
Illiterate (0)			53			57			63
Primary (1-5)			35			37			17
Secondary (6-10)			08			03			20
Tertiary (>10)			04			03			00
Total learning members	2.36	1.21		1.70	1.05		1.80	1.73	
Total earning members	1.47	0.57		1.53	0.62		1.53	0.57	
Household annual income (BDT)	127000			121000			128300		

Source: Field Survey (2013)

The study also reveals that one-third of the respondent (35.67 percent) is landless. Most of the respondent of Koyra has own land (93 percent) but land ownership pattern in Mongla and Shyamnagar are vice-versa (Table 5.1).

As a human capital and the most important factor for socio-cultural and economic change, education plays an important role in shaping household status in the society. Advancement means development and development is not possible without education. People' attitude and knowledge cannot be developed without education and so with

the society. In the study area, majority of the respondents are found with illiterate (57.67 percent) followed by primary education (29.97 percent) and only very few has secondary and higher secondary level education (Table 5.1). Illiteracy rate is found higher in Shyamnagar (63 percent) than Mongla and Koyra. The number and spread of schools in the study area are low and the quality of facilities in the existing schools is not adequate. Distant locations of the schools, poor road access, low income, lack of labor force for farming and food insecurity are the key hurdles depriving children from going to schools. Each household has a mean of 1.95 literate and 1.51 earning members where average household size is 4.81. Higher number of literate member is found in Koyra than Mongla and Shyamnagar but about equal earning members in these areas (Table 5.1).

5.2 Livelihood condition of the households

5.2.1 Living condition

Livelihood Condition of the NTFPs Collectors' indicate the economic status of that respondent which reveals whether they collect NTFPs or not and also reveals how much they benefitted from NTFPs and how much they depend upon it. The study shows that most of the households made earthen material that means Kacha Bari, called Bangla. No respondent has been found household made with cement-concrete material. This condition is true for sanitary latrine facilities (Table 5.2). Therefore study indicates that most of the respondent depends upon NTFPs.

Water is called life. But in the study area availability of drinking water source is very scarce. It is more factual in Shyamnagar than Koyra and Mongla (Table 5.2). Pond Sand Filter water (84 percent) is the main source of drinking water in all three regions. Rain water as the source of drinking water is about 10 percent of the households. Rest of the household depends upon other sources of drinking water.

Boat access pattern is an important factor influencing the contribution of NTFPs in household economy. The general hypothesis is the higher access of boat, the greater opportunity of using boat to collect NTFPs, so the higher contribution of NTFPs in household economy.

Table 5.2: Living condition of the NTFPs collectors

Living conditions	Households in percentage		
	Koyra(N=30)	Mongla(N=30)	Shyamnagar(N=30)
Housing materials			
Kacha	87	90	70
Semi-pacca	13	10	30
Pacca	0	0	0
Sanitary latrine facilities			
Yes	50	40	90
No	50	60	10
Sanitary latrine conditions			
Kacha	90	96	84
Semi-pacca	10	4	16
Pacca	0	0	0
Availability of drinking water source			
Yes	23	23	53
No	77	77	47
Sources of drinking water			
PSF	86	82	84
Rainwater	12	6	12
Others	2	12	4
Access to boat			
Own	73	70	67
Moneylender	12	14	15
Shared	15	16	18

Source: Field Survey (2013)

In study area about two-third of the respondent has own boat and about 16 percent of the respondent had boat that is shared. Therefore the study indicate that the respondent has the greater opportunity of using boat to collect NTFPs, so the higher contribution of NTFPs in household economy.

5.2.2 Households food consumption status

NTFPs provide a safety net for the poor households of the forest adjacent people. Data reveals that 62 percent households get enough food all the year round otherwise 15 percent households food consumption is break even due to short term shocks. Occasionally food deficit household is 14 percent and usually food deficit household is only 9 percent in the study area (Table 5.3).

Table 5.3: Households food consumption status

Food consumption status	Households in percentage			
	Koyra(N=30)	Mongla(N=30)	Shyamnagar (N=30)	Total
Enough	62	58	67	62
Break even	18	14	12	15
Occasionally food deficit	12	16	15	14
Usually food deficit	08	12	06	09

Source: Field Survey (2013)

5.2.3 Households food sufficiency status

Table 5.4 shows the food sufficiency status of the households. Data reveals that average 59 percent household of the study area were hardly able to meet their food demand for 8 months. About 25 percent of the households had food sufficiency for 8-10 months and only 16 percent households had food sufficiency more than 10 months. Most of the households reveal that food deficit season is from October to November because the scarcity of NTFPs in Sundarbans. Otherwise, some people opinion about food deficit season is from April to May due to natural hazards by this time. Food sufficiency status in the study area is affected by water hijacker, moneylender and suffering from natural calamities like cyclone, flood, risk for tiger attack, scarcity of drinking water, lack of land property, salinity, low scope of alternative income, and lack of government support. All these make their livelihoods vulnerable.

Table 5.4 Distribution of households by food sufficiency

Food sufficiency in months	Households in percentage			Total
	Koyra(N=30)	Mongla(N=30)	Shyamnagar(N=30)	
<8 months	56	68	54	59
8 -10 months	25	23	28	25
>10 months	19	09	18	16

Source: Field Survey (2013)

5.2.4 Households livestock status

Livestock population is poor in the study area due to increasing scarcity of fodder and grasses, scarcity of grazing lands, of drinking water, and widespread incidence of intestinal diseases, particularly for cattle and ducks. In the study area the main animals rearing are goat, cow, buffalo and poultry. The average of livestock ownership was calculated in Livestock Standard Unit (LSU) to aggregate different types of livestock owned by respondents per household.

Aggregate LSU is calculated as, (Adhikari, 2006b)

$$\text{LSU} = 1 \text{ (cow/bull)} + 1.5 \text{ (buffalo)} + 0.4 \text{ (goat/sheep)} + 0.6 \text{ (swine/pig)} + 0.2 \text{ (poultry)}$$

As indicated by Table 5.5, the average livestock holding size is 1.72 LSU. It is found higher in Koyra 2.74 followed by 1.24 in Mongla and 1.17 in Shyamnagar respectively. There is significant differences ($p < 0.10$) in cases of LSU at 10 percent level of significance between the survey areas.

Table 5.5: Size of livestock holding by household

Area	Livestock Standard Unit (LSU)				t	*p
	Minimum	Maximum	Mean	S.D.		
Koyra	0	8.8	2.74	2.21	0.07	P<0.10
Mongla	0	8.8	1.24	1.85		
Shyamnagar	0	8	1.17	2.03		

Source: Field Survey (2013)

5.3 Scenario of NTFPs in the study area

NTFPs are an important source of income to the Sundarbans forest adjacent people. The study area is full of varieties of NTFPs which are used for household consumption as food, fodder, thatching materials, housing materials and fuelwood as well as generating cash income for sustaining livelihood. Among different NTFPs crabs, white fish, crustaceans, crustaceans' fries, Nypa leaf, Hental, fuelwood, wax and honey are the major traded NTFPs (Table 5.6). Crabs are collected by crab catcher instruments (locally called Doan, Autla or Laied). Author finds that crabs are used only for cash income not for consumption because of religion restrictions. White fish and crustaceans are collected by fishing nets and used for both household consumption and cash income. However, crustacean fries are collected by fine fishing nets though it is banned and used only for cash income.

Table 5.6: Scenario of major NTFPs

Local name	English name	Method of collection	**Purpose
Kakra	Crab	Crab catcher instruments (Doan, Autla or Laied)	1,2
Cingri	*Crustaceans	Fishing Net	1,2
Golda Renu	Shrimp fries	Fine mesh nets	2
Bagda Renu	Prawn fries	Fine mesh nets	2
Mas	White fish	Fishing Net	1,2
Kat	Fuelwood	Axe/Cutter	1,2
Modhu	Honey	Bee hive and Smoker	1,2
Mom	Wax	Collected from Honey Comb	2
Gollpata	Nypa leaf	Cutter	1,2
Hental	Hental	Cutter	1,2

Source: Field Survey (2013)

[For Table, * Crustaceans means shrimp, prawn, Chaka Cingri and Goda Cingri, **]=Household consumption, 2=Cash income]

Honey is collected from bee hive with smoke and used for both household consumption and cash income and wax is also collected from honey comb. Honey collectors collect honey from various tree species in sundarbans forest (*Aegiceras corniculatum*, *Cerriops decandra*, *Sonneratia apetala*, *Xylocarpus mekongensis*, *Excoecaria agallocha*, *Avicennia*). Fuelwood, Nypa leaf and Hental are collected by cutter and used for both household consumption and cash income. Besides, seed coat of fruits of some trees is also used as fuel purposes in the study area. Women often collected Keora fruits that are used as an additive in lentil soups and other food items. Besides Nypa fruits, Hental fruits and Baglo fruits are also collected for household consumption.

5.4 Details of NTFPs collectors

Table 5.7 depicts details on various NTFPs collectors e.g. number of NTFPs collectors per household, time spent for collection, distance travelled per trip, distance to nearest forest and market, collection permit and years of experience. Exploring the amount of time spent by the household members to collect different NTFPs is important for future initiatives. Results show that each household spends an average of about 7.87 hours per day for collecting NTFPs. This suggests that each household spend most of the time for collecting some sort of NTFPs either for subsistence or cash income. According to the survey respondents, the average harvesting distance per trip is 21.08 km. Collection of NTFPs in the study area is dominant by men. Though women are involved mainly in household activities, they also collect NTFPs a

little amount from Sundarbans like fish, crasteceans fries, fuelwood and fruits in daily basis. The average number of NTFPs collectors per household is 1.51 and experience of collecting NTFPs is 16 years. For harvesting NTFPs the collectors need permission from forest department and pay revenue. People usually take permission when they go inside the forest for harvesting of the NTFPs during Goan. Whatever, someone says that they do not require any permission when they catch fish, crab and crustacean fries for short distance in daily basis. Data reveals that 80 percent of the collectors in the study area take permission for harvesting NTFPs in contrast 20 percent collectors (especially fisheries) do not take any permission.

Table 5.7: Details of NTFPs collectors in the study area

Variables	Koyra (N=30)			Mongla (N=30)			Shyamnagar (N=30)		
	Mean	S.D.	%	Mean	S.D.	%	Mean	S.D.	%
NTFPs collectors (Number)	1.47	0.57		1.53	0.62		1.53	0.57	
Time spent for collection (hr./day)	7.83	1.82		8.06	1.43		7.73	2.37	
Distance travelled /trip (km.)	25.32	21.79		21.03	18.08		16.90	12.85	
Distance to nearest forest (km.)	1.77	1.09		1.24	1.03		1.34	0.90	
Distance to nearest market (km.)	1.53	1.03		1.18	0.90		1.34	1.06	
Collection permit									
Yes			84			77			80
No			16			23			20
Years of experiencing	8.80	5.55		19.26	9.49		20.86	10.60	

Source: Field Survey (2013)

5.5 Households involvement in major NTFPs collection

Collection of NTFPs from the Sundarbans Mangrove forests is one of the major economic activities of the forest adjacent people to sustain their livelihoods. Almost all households are involved in NTFPs collection directly for subsistence and cash income. Table 5.8 presents percentage of household involvement in NTFPs collection in the three study area. Average involvement of households in collection of Crab is 70 percent followed by involvement in white fish (72 percent), crustaceans' collection (72 percent), crustacean fries collection (58 percent), fuelwood collection (84 percent), honey collection (32 percent), Nypa leaf collection (23 percent) and wax collection (32 percent). Very few households (less than 3 percent) report that they participated in hental collection. Besides a significant number of households (especially women) also involved in various fruits collection for household consumption all the year round that is not considered in this paper.

Table 5.8: Households involvement in major NTFPs collection

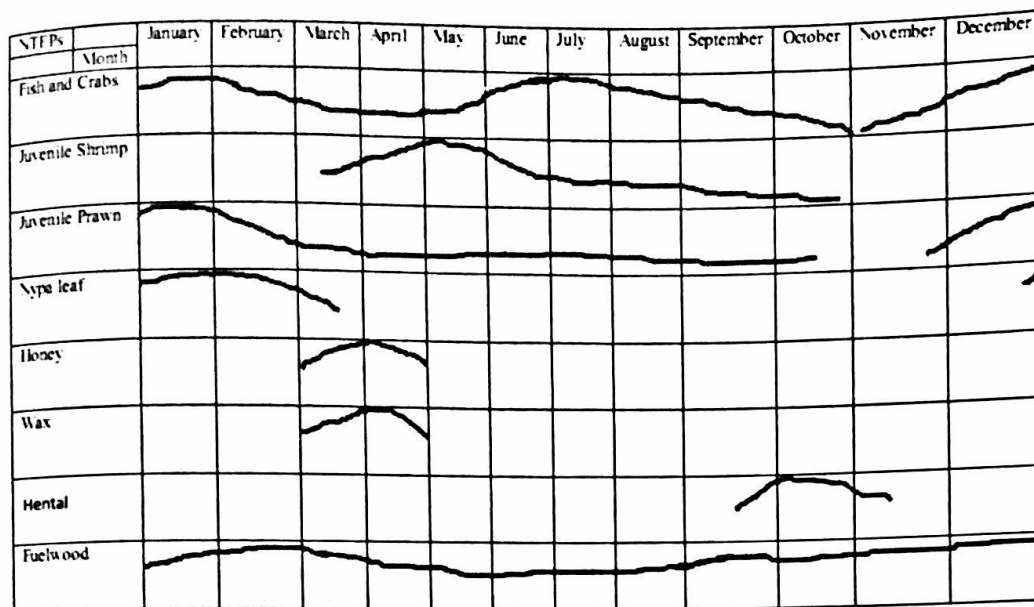
Major NTFPs	Households involved in collection (Percentage)			Total
	Koyra (N=30)	Mongla (N=30)	Shyamnagar (N=30)	
Crab	73	68	70	70
White fish	60	73	83	72
Crustaceans	60	73	83	72
Crustacean fries	50	68	57	58
Fuelwood	80	93	80	84
Honey	30	33	33	32
Nypa leaf	23	30	17	23
Wax	30	33	33	32
Hental	n.a.	03	n.a.	01

Source: Field Survey (2013)

5.6 Period of availability (season) of major NTFPs

Figure 5.1 depicts details on the period of availability of the major NTFPs in the study area. NTFPs are collected all year round. However, most of them are seasonal in nature. Crabs and fish are abundantly collected from December to February (peak season) from the rivers and June to September from the forest. They go to forest two times per month during Goan for harvesting and can stay inside the forest 168 days (24 Goans) in a year. The late winter and summer season (February to May) is considered as the peak season for shrimp fries collection. Otherwise the early winter to rainy season (December to June) is considered as the peak season for prawn fries collection. The late December to March is considered as the season for Nypa leaf collection. Nypa leaf collectors get permission for three months inside the forest in a year. However, March to April is considered as the peak season for honey collection. Honey collector stay inside the forest 45 days in a year. Hental is collected from mid-September to mid-November. Otherwise, NTFPs collectors get fuelwood and different fruits all the year round for their household consumption from the Sundarbans.

Figure 5.1: Period of availability (season) of major NTFPs



Source: Field Survey (2013)

5.7 Contribution of different NTFPs to household consumption

Table 5.9 shows total amount of annual harvesting of each harvester from the Sundarbans Reserve Forest and annual amount of consumption from their harvesting products. Each NTFPs collector annually harvest average 560 kg of crabs and consume 45 kg for own household. However, average household consumption of white fish is 180 kg followed by crustaceans 32 kg, honey 12 kg, Nypa leaf 2 *Kaon*, fuelwood 3392 kg and fruits 25 to 30 kg. Subsistence income is also calculated to know the total cash income of the forest dependent people.

Table 5.9: Households annual consumption of NTFPs

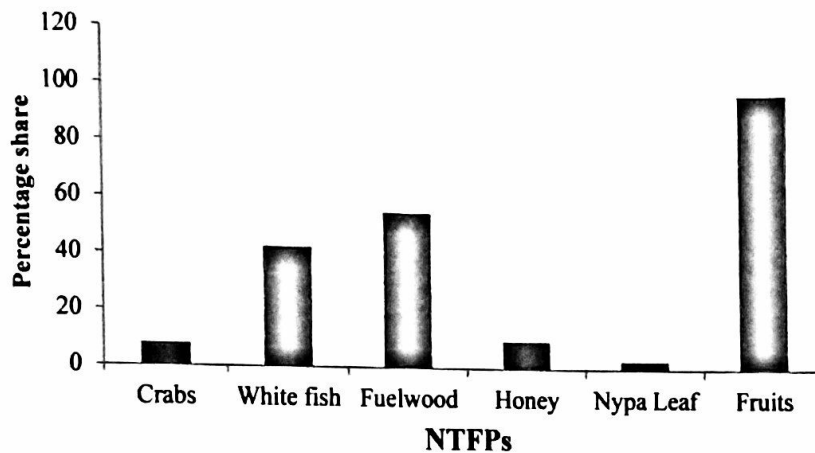
NTFPs	Average collection / Yr.	Household consumption/Yr.	Subsistence income (BDT/Yr.)
Crabs (kg.)	560	45	9000
White fish (kg.)	420	180	27000
Crustaceans	380	32	8000
Fuelwood (kg.)	6054	3392	8480
Honey (kg.)	95	12	2400
Nypa leaf (<i>Kaon</i>)	54	2	3600
Fruits (kg.)	25-30	25	300
Total			

Source: Field Survey (2013)

5.8 Households NTFPs Consumption

Figure 5.2 shows that fruits consumption share is the highest percentage (100 percent) of the total harvesting otherwise fuelwood consumption share is 56 percent and fish is 46 percent. Very lower portion of harvesting product is consumed by honey (10 percent), Nypa (3 percent) and crab (8 percent) of the total collection. Rest share of harvesting is sold to local market for getting cash.

Figure 5.2: Households NTFPs consumption



Source: Field Survey (2013)

5.9 Amount of NTFPs collection

The study villagers have an intimate relationship with the forest since time immemorial and for who forest provide substantial source of livelihood. NTFPs collection and trading is an important income generating source of the forest adjacent people in the study area. Table 5.10 depicts the economics of NTFPs collectors in Goan (a single trip for 7 days inside the forest) basis. Fishermen and Crab catchers can harvest every month in a year during season of these, whereas Hental and honey collectors get permission 1 to 1.5 months in a year and Nypa leaf collectors get permission 3 months in a year. Every harvesters use boat for harvesting of the sundarbans resources. In the table, all NTFPs income is shown for a single trip (Goan) except honey, wax, Nypa and Hental because these are calculated in season basis.

Data reveals that NTFPs collectors harvest average 46 kg crabs per trip and net average income (deduct collection cost) is Tk. 7838 whereas crustaceans income Tk. 4238 and white fish income is 3602 Tk. One collector harvest both crustaceans and white fish during Goan, so no extra collection cost required for crustaceans collection or vice versa. Otherwise, shrimp fries and prawn fries are collected at a time and income per trip is Tk. 8860 and 2742 respectively. When people go inside the forest in most cases they collect fuelwood all the year round. In the study area all households dependent on fuel wood for their daily cooking. Different amount of fuel wood is needed in different household i.e. depends on the size of the family. Author finds that on an average 7 to 12 kg. fuelwood is required per day per household and lion share of demand is fulfill from their own harvesting. Sometime they buy from market, also use fuelwood from village forest. Above all the fuelwood income per trip is Tk. 248.

Table 5.11 depicts the economics of NTFPs collectors in season basis. Honey collectors earn on an average Tk. 13987 in a season (45 days) and also earn from selling wax Tk. 1500. Beside, Nypa leaf collector earns Tk. 92507 in a season (90 days) and Hental collector Tk. 43600 in a season (60-70 days) also (Table 5.11). This income helps them to meet the family necessities because they have limited alternative income opportunity in the study villages. So, NTFPs dependency is high in this village and it has potential contribution to their livelihoods.

Table 5.10: Amount of NTFPs collection (household/goan) (N=90)

NTFPs	Quantity collected				Collection cost (BDT)				NTFPs income (BDT)			
	Min.	Max.	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.	Mean	S.D.
Crab (kg)	30	70	46.24	13.65	800	1700	1410	194.97	4300	12800	7838	2754.40
Crustaceans (kg)	13	35	25.87	5.68	800	1700	1410	194.97	2160	8310	4281	1293.24
White fish (kg)	16	52	33.41	8.70	800	1700	1410	194.97	900	6300	3602	1324.12
Shrimp fries (thousands)	3	15	6.07	2.87	800	1700	1410	194.97	3500	24300	8860	4912.55
Prawn fries (thousands)	03	12	5.48	2.03	800	1700	1410	194.97	1500	6000	2742	1017.81
Fuelwood (kg)	60	150	99	24.31	-	-	-	-	150	375	248	60.77

Source: Field Survey (2013)

[For Table 5.10, *Goan means a single trip for 7 days inside the forest, 2 Goans per month and 24 Goans in a year]

Table 5.11: Amount of NTFPs collection (household/*season) (N=90)

NTFPs	Quantity collected				Collection cost (BDT)				NTFPs income (BDT)			
	Min.	Max.	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.	Mean	S.D.
Honey (kg)	40	160	95	37.73	3000	8000	5000	2154.23	3000	27000	13987	7546.96
Wax (kg)	08	20	10	6.05	-	-	-	-	1360	3000	1500	652.23
Nypa Leaf (*Kaon)	25	80	54	17.84	-	-	4400	-	40600	139600	92507	32112
Hental (thousands)	2	8	5	4.25	-	-	4400	-	16000	72000	43600	26542

[*Kaon a local unit, 1 Kaon = 4 maund]

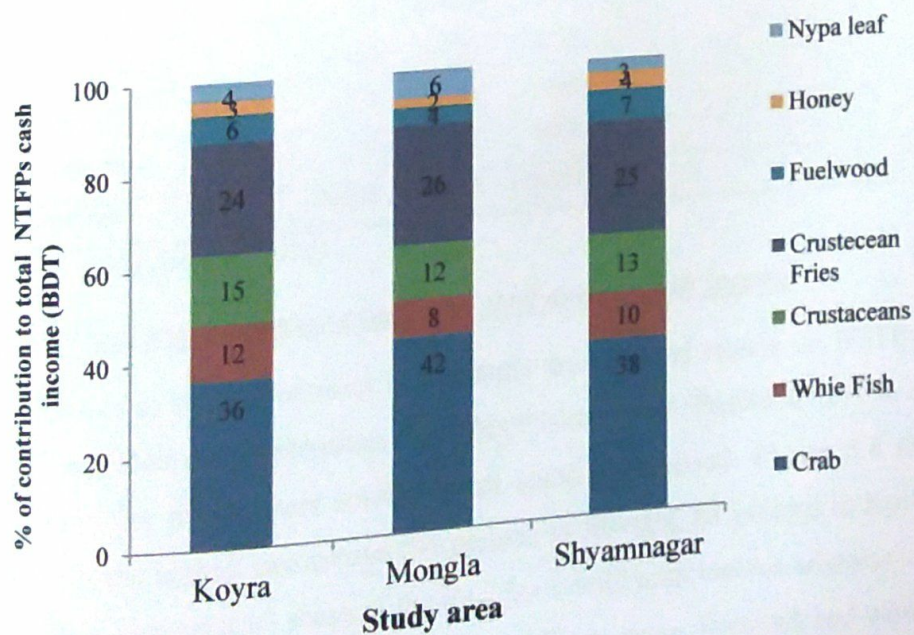
*Season:

- ✓ March to April (45 days) is considered as the season for honey
- ✓ Hental is collected from mid-September to mid-November (60-70 days)
- ✓ December to March is considered as the season for Nypa leaf collection (90 days)

5.10 Percent contribution of NTFPs to total cash income

Figure 5.3 shows that crab share is the highest percentage (42 percent in Mongla, 36 percent in Koyra and 38 percent in Shyamnagar) of the total NTFPs income otherwise crustaceans fries share is the second highest of total NTFPs cash income (26 percent in Mongla, 25 percent in Shyamnagar and 24 percent in Koyra).

Figure 5.3: Percent contribution of NTFPs to total cash income (household/yr.)



Source: Field Survey (2013)

White fish and crustaceans also have a significant contribution to total NTFPs cash income. Whereas very lower percentage of NTFPs share of income is from fuelwood, honey and Nypa leaf in the study area (Figure 5.3).

5.11 Contribution of different income sectors to household economy

Household level income information from different sources of income is important for policy analysis and improvement of people's livelihood. Although NTFPs is the mainstay of the village economy in the study area, people are bound to depend upon wage laboring, livestock income and small scale business for income generation to maintain their livelihood in off-seasons. Table 5.11 shows the mean annual income earned from NTFPs is the highest, i.e. Tk. 109893. While the mean income earned from wage labor is found Tk. 6909 and business activities is found Tk. 3235 per annum. While the income earned from livestock is Tk. 406 per annum and others income is Tk. 4901 per year.

Table 5.12: Annual household income from different sectors

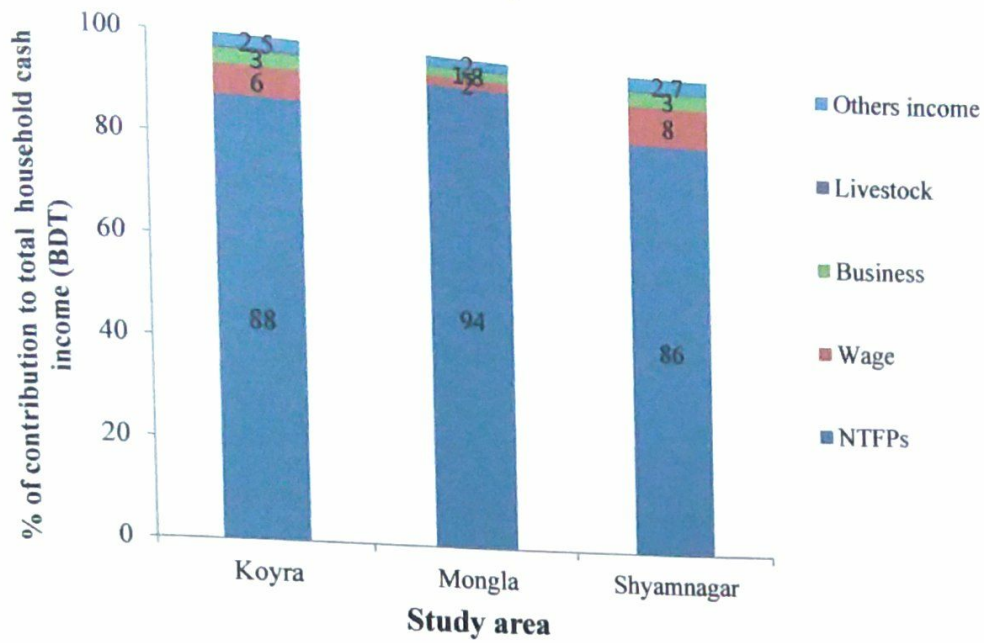
Household income sector	Household responded (N=90)			
	Min.	Max.	Mean	S.D.
NTFPs	20000	300000	109893	58945
Wage	0	40000	6909	10502
Business	0	54750	3235	10258
Livestock	0	1500	406	339
Others income	0	50000	4901	9060
Total income	40600	300600	125345	60656

Source: Field Survey (2013)

5.12 Percent share of income sectors to total annual cash income

Livelihoods of the respondents in the study area depend mostly on NTFPs income. They meet their daily necessities from this income share. People involve in collection of NTFPs for all the year round except some lean period. Figure 5.4 shows that NTFPs is the highest percentage (94 percent in Mongla, 88 percent in Koyra and 86 percent in Shyamnagar) share of the total household cash income whereas very lower percentage of share of income come from business, wage, livestock and others income source in the study area.

Figure 5.4: Percent contribution of income sectors to total cash income (household/yr.)



Source: Field Survey (2013)

This study finds that NTFPs income is the major income source in the study area. Almost all people directly or indirectly depend on Sundarbans NTFPs and NTFPs related business. The limitation of alternative income generating activities makes them more forest dependent. So the contribution of NTFPs to the adjacent of forest depend people are significant in the study area.

Chapter Six: Concluding Remarks

6.1 Findings

NTFPs play an important role in the livelihoods of forest adjacent people of Sundarbans region. This study finds that NTFPs are providing food, fuelwood and direct cash income for the households. Most of the people mentioned they can also purchase more food from market with their increased income that come from NTFPs income of Sundarbans.

NTFPs play a significant role in the livelihoods of rural household economy. Trading of NTFPs both unprocessed and semi-processed products represent a significant source of revenue for individual's households and national economy as well. Out of the 90 sampled households, the study reveals that about 67 percent of the respondent is of economically active age and majority of the respondents are found with illiterate (57.67 percent) and one-third of the respondent (35.67 percent) is landless and 1.51 earning members where average household size is 4.81. The study shows that most of the households are made earthen material that means Kacha Bari, called Bangla. No respondent has been found household made with cement-concrete material. This condition is true for sanitary latrine conditions as well as sanitary latrine facilities. In study area about two-third of the respondent has own boat and about 16 percent of the respondent has boat that is shared. Therefore the study indicate that the respondent has the greater opportunity of using boat to collect NTFPs, so the higher contribution of NTFPs in household economy. Data reveals that 62 percent households get enough food all the year round otherwise 15 percent households food consumption is break even due to short term shocks. Occasionally food deficit household is 14 percent and usually food deficit household is only 9 percent in the study area. Livestock population is poor in the study.

The major NTFP that are being collected includes firewood, prawn, fishes, crab, honey, Nypa leaf and wax. The average involvement of households in collection of Crab is 70 percent followed by involvement in white fish (72 percent), crustaceans' collection (72 percent), Crustacean fries collection (58 percent), fuelwood collection (84 percent), Honey collection (32 percent), Nypa leaf collection (23 percent) and wax

collection (32 percent). Very few households (less than 3 percent) reports that they participated in hental collection.

Another important finding is that each NTFPs collector annually average harvest 560 kg of crabs and consume 45 kg for own household. However, average household consumption of white fish is 180 kg followed by crustaceans 32 kg, honey 12 kg, Nypa leaf 2 *Kaon*, fuelwood 3392 kg and fruits 25 to 30 kg. Data reveals that NTFPs collectors harvest average 46 kg crabs per trip and net average income (deduct collection cost) is Tk. 7838 whereas crustaceans income Tk. 4238 and white fish income is 3602 Tk. Otherwise, shrimp fries and prawn fries are collected at a time and income per trip is Tk. 8860 and 2742 respectively. Author finds that on an average 7 to 12 kg. fuelwood required per day per household and lion share of the demand fulfill from their own harvesting some time buy from market also use fuel of village forest. Above all the fuelwood income per trip is Tk. 248. Honey collectors earn on an average Tk. 13987 in a season (45 days) and also earn from selling wax Tk. 1500. Beside, Nypa leaf collector earns Tk. 92507 in a season (90 days) and Hental collector also Tk. 43600 in a season (60-70 days). This income helps them to meet the family necessities because they have limited alternative income opportunity. The mean annual income earned from NTFPs is the highest, i.e. Tk. 109893. While the mean income earned from wage labor is found Tk. 6909 and business activities is found Tk. 3235 per annum. While the income earned from livestock is Tk. 406 per annum and others income is Tk. 4901 per year. NTFPs is the highest percentage (94 percent in Mongla, 88 percent in Koyra and 86 percent in Shyamnagar) share of the total household cash income whereas very lower percentage of share of income come from business, wage, livestock and others income source in the study area.

6.2 Conclusion

Population is increasing at an alarming rate in our country. With the increasing population pressure, the forest and forest related resources are depleting at an alarming rate. The study leads to conclude that the livelihoods of forest adjacent people in the study area have traditionally been dominated by NTFPs. Sundarbans is one of the essential components of the livelihood of the forest dependant population of the area. Therefore, the livelihoods promotion among the people needs a shift of paradigm focusing on forest resources to keep pace with current development and

future challenges in the area. There is enormous scope in improvement of NTFPs based livelihoods for forest dependent population through proper storage and value addition to NTFPs, domestication and commercialization of NTFPs, organized marketing system, proper refinement and dissemination of indigenous technologies, institutional support in training and skill development, appropriate extension and communication networks and exploring new forest resources based livelihood revenues through wood and NTFPs based secondary employments in the area. The interventions visualized needs to be implemented efficiently for all-round development of the forest people and ecological stability in the study area.

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**Annex-I
Questionnaire
On**

**Contribution of NonTimber Forest Products to the Livelihood of the
Adjacent People in the Sundarbans Mangrove Forest**

(The information collected through this study will be used solely for study purpose)

Village		Union		Upazila		Zila

Day		Month		Year			

Sample No.:

A. Socio-economic characteristics of the respondent's family:
A1. General information of the respondent

A1.1 Name of the respondent	A1.2 Age	*A1.3 Sex	**A1.4 Religion	A1.5 Education (Years of schooling)	***A1.6 Marital Status	A1.7 Present occupation

*1=Male, 2=Female. ** 1=Muslim, 2=Hindu, 3=Christian, 4=Buddhist, *** 1=Married, 0=Unmarried/Widowed/Divorced

- A2. Family structure (put tick): Joint Nuclear
- A3. Household size (number): Total No..... Male..... Female.....
- A4. Total landholding (Satak):
- A5. Landholding pattern: Own land Landless
- A6. Household income pattern:

Household income sectors	Annual household income (Taka)	Duration (month)
NTFPs income		
Timber and pole		
Wage income		
Processed forest products income		
Total raw forest income		
Business income		
Agricultural income		
Livestock income		
Others income		
Total household income		

- A7. Sex of the household head: Male Female
- A8. Education of the household head (years of schooling):
- A9. Age of the household head (years)
- A10. No. of literate members: Male..... Female.....
- A11. Housing material: Kacha Semi- pacca Pacca
- A12. Sanitary latrine facility: Yes No
- A13. Availability of drinking water source: Yes No
- A14. Distance of drinking water source (km): Yes No
- A15. Access to boat: Yes No, if yes then
- A16. Ownership of boat: Own Hired
- A17. No. of earning members: Male..... Female.....
- A18. How do you consider your household food consumption (put tick)
 Enough Break even Occasionally food deficit Usually food deficit
- A19. Household food consumption scenario (meal/day):

meal/day	Duration
3 meals	
3 meals but reduce amount	
2 meals	

A20. Livestock assets and other physical assets:

Type	No.
Cattle	
Goat	
Duck	
Chicken	
Mobile	
Van	
Others (specify):	

B. Information on product gathered (NTFP'S-plants/animal products)

Particulars	1	2	3	4	5	6
Name of the NTFPs						
Most important 3 NTFPs for household use (rank 1-3)						
Plant parts (edible /non edible)						
Animal products (edible/non edible)						
Used for what						

purposes of						
Period of availability						
Peak season						
Lean season						
No. of hours of collection/day						
No. of household members collecting NTFPs						
a. Male						
b. Female						
Qty. collected /season (Kg.)						
June-Sept.-						
Oct- jan.-						
Feb-may-						
Distance travelled/trip (km.)						
Distance to nearest forest (km.)						
Boat permit (months)						
Collection permit						
Method of collection						
Cost of collection (Tk.)						
Cost of processing (Tk.)						
Household consumption (Kg.)						
NTFPs sales (Tk.)						
Cost of transportation (Tk./trip)						
Distance to local market (km.)						
Marketing channel						
Price received (Tk./kg.)						
Total income from sales(Tk.)						

Consumer price of NTFPs (Tk.)						
End use of this product						
Years of experience in harvesting NTFPs						
Remarks						

C. Information about NTFP enterprises and trading

C1. Is there any organization that provides technical support and extension services to encourage NTFPs domestication and commercialization? Yes.....No..... If yes,

(a) Name of organization:

(b) How they are supporting your household for NTFPs domestication/ commercialization?

C2. Is there any NTFP based enterprise (kutir shilpa, samity, small NTFP farm, cooperative etc.) in your village? Yes.....No.....

C3. Is there any govt./ non-government organizational activities for organizing and managing NTFP based enterprises? Yes..... No.....

If yes, what are they?

.....

C4. What kind of initiatives/ organizational effort would encourage people concerned for NTFPs development activities? (please rank 1 to 3) ¹

.....

.....

¹Codes: 1= financial support/ loan, 2= training and awareness development, 3= access to market information system, 4= improved communication system (infrastructure/ phone), 5= personal linkage, 6= domesticating more plants for raw materials, 7= other, specify.....

Signature of the surveyor

Signature of respondent

Annex-II

Current market price of the major NTFPs in the study area

NTFPs	Measuring unit	Average market price (BDT)
Crab	Kg	200-250
White fish	Kg	150-200
Crusteceans	Kg	150-300
Prawn fries	Number (per thousands)	500-600
Shrimp fries	Number (per thousands)	1700-2000
Honey	Kg	200
Wax	Kg	150-170
Nypa leaf	Number (per Kaon)	2500-3000
Hental	Number(per piece)	10
Fuelwood	Kg	2 5-3

Source: Field Survey (2013)