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Thesis Work
on
Livelihood Assessment of Sundarban Forest
Dependents at Shyamnagar Upazila under
Satkhira District in Bangladesh

This Thesis Paper has been prepared for the fulfillment of Master of Science in Forestry offered by the Forestry and Wood Technology Discipline under Khulna University in Bangladesh

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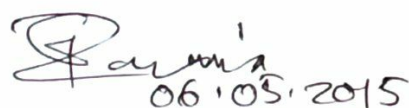
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DECLARATION OF HONOURED

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DEDICATION
TO MY
BELOVED PARENTS

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AUTHOR

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ABBREVIATIONS

AIGA	Alternative Income Generating Activities
BFD	Bangladesh Forest Department
CCA	Climate Change Adaptation
DRR	Disaster Risk Reduction
DoF	Department of Forestry
FD	Forest Department
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
GIS	Geographical Information System
IUCN	International Union for the Conservation of Natural Resources
IPAC	Integrated Protected Area Co-management
ICDP	Integrated Conservation and Development Project
MDG	Millennium Development Goal
MoF	Ministry of Forest
NTFP	Non Timber Forest Products
PRA	Participatory Rural Appraisal
SIZ	Sundarbans Impact Zone
SBCP	Sundarbans Biodiversity Conservation Project
USF	Unclassed State Forests
VGD	Vulnerable Group Development
VGF	Vulnerable Group Feeding
SRF	Sundarbans Reserve Forest
UNESCO	United Nations Educational, Scientific and Cultural Organization
WRI	World Research Institute
WWF	World Wildlife Fund

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Executive Summary

The Sundarbans Reserved Forest and its surrounding buffer zone are one of the most diverse and richest natural resource areas in the People's Republic of Bangladesh. It holds one of the largest mangrove forests in the world and has been recognized as an World Heritage and Ramsar site. It is considered as highly productive ecosystem that provides a wide range of valuable forest products. Sundarbans plays a significant role for supporting wide range of floral and faunal diversity and ecosystem services that supports livelihoods of local communities. Most of the communities in buffer zone of Sundarbans forest resources for their livelihoods. This study explores different resource users of Sundarbans forest dependent livelihoods and compares their socio-economic condition.

This research found the actual scenario of livelihoods of Sundarbans dependents in Shyamnagar Upazila under Satkhira District. This work reports, how biodiversity of Sundarbans forest is declining due to climate change, deforestation, illegal hunting and disregarding/ breaching the role of regeneration day by day. At the same time this research explores how the poor forest dependent community can overcome the chronic poverty. The study found that harvesters are getting actual benefit from the resources of the Sundarbans for the factors of Pyrates, corrupted Forest Department staffs and that led the lower income of forest dependents. Due to lower income they used to get huge loans for initial harvesting costs. Forest dependents also lose significant amount of money from their income for repaying high loan interest. This research also found that the users are highly dependent on Sundarbans forest resources for their livelihood. Most of the households are dependent on Sundarbans specially for fuel wood for mitigating their fuel consumption. The research shows that if the forest dependents can be relieved from the pyrates, corrupted Forest Department staffs and huge burden of loan together with the interest. Their income well be increased and Alternative Income Generating Activities (AIGA) can be a way to reduce the pressure on forest resources and to ensure sustainable development.

The paper recommends how the pressure by harvester on Sundarbans forest resources can be reduced and how they can protect the biodiversity of forests by creating AIGA. The work suggests how the vulnerable forest dependent groups can recover from their exposure and suggests to establish good governance specially considering human rights, strong law enforcement and effective management system for improving their livelihood status.

CHAPTER – ONE

1. INTRODUCTION

1.1 Preface

Natural forests in Bangladesh have been severely damaged due to over exploitation, changes in land use, encroachment on forest lands, fire, uncontrolled and wasteful commercial logging, illegal felling, grazing, and the collection of fuel wood to support the energy needs of a large population. The total forest area affected by encroachment in Bangladesh is estimated to be about 36,000 hectares (Haque 2007). Well managed protected areas tend to be particularly important in terms of providing vital ecosystem services, such as water purification and retention, erosion control and reduced flooding and unnatural wild fires. They buffer human communities against different environmental risks and support food and health security by maintaining crop diversity and species with economic and/or subsistence value (Dudley & Stolton 2003, Stolton et al. 2006, Stolton et al. 2008). Many rural communities depend on protected areas for subsistence and livelihoods, protected areas contribute directly to global sustainable development and poverty reduction targets (Dudley et al. 2010, Mulongoy & Gidda 2008). As for protected areas, it has been estimated that worldwide nearly 1.1 billion people – one sixth of the world's population – depend on protected areas for a significant percentage of their livelihoods (UN Millennium Project 2005). Ecosystems within protected areas provide benefits of various natures at all levels: locally, nationally and globally. Bangladesh is a developing country and most of the people livelihood depends on natural resources. Bangladesh is very high flood affected and one of the most vulnerable countries to climate change in the world. Natural Resources dependents people are facing difficulties for unsustainable management, unequal distribution of resources, corruption, natural calamities that makes vulnerable livelihoods. Sundarbans is the world largest mangrove forest and international recognized protected areas. Most of the people in the sundarbans buffer zone livelihoods dependent on sundarbans. Sundarbans plays a significant role for local, regional and national economy as well as biodiversity conservation. Sundarbans provide varieties and abounded resources specially fisheries resources and various non-timber forest products. Fishes resources of sundarbans export around the globe. Sundarbans resources harvesters are playing a vital role for national economy of Bangladesh. Biodiversity and livelihoods study in sundarbans Protected area is very important for measuring the role of protected area for

sustainable livelihoods and develop innovative idea that useful for protected areas management.

1.2 Objective of the study

- ❖ To assess socio-economic status of Sundarbans forest resource dependent community.

1.3 Limitations of the Study

The duration of research period was very short. Due to this number of samples was limited. Sampling of villagers was not rigorous. In the case of the control village, the sample was selected from those available within the community. This probably could be resulted in a bias towards sampling the poorest or people with non-agricultural livelihoods as they were people who were not in home as they would be out of home for working in the field.

CHAPTER – TWO

2. LITERATURE REVIEW

2.1 Poverty Situation of Bangladesh

Bangladesh, the world largest deltaic region lies in the northeastern part of South Asia between 22° 34' and 26° 34' North latitude and 88° 1' and 92° 41' East longitude (Hossain, 2001). The majority of country's land is formed by river alluvium from the Ganges and the Brahmaputra and their tributaries which, consists mostly of flood plains (80%) with some hilly areas (12%), with a sub-tropical monsoon climate (Islam, 2003). Geographically, Bangladesh falls near the Indo-Burma region which is one of the ten global prime spot areas and supposed to have 7000 endemic plant species (Mittermeier *et. al.* 1998). Due to its unique geo-physical location Bangladesh is exceptionally characterized by a rich biological diversity (Nishat *et. al.* 2002; Hossain, 2001; Barua *et. al.* 2001; Chowdhury, 2001).

The major food security problem is that around half of the Bangladeshis remain below the established food based poverty line and as many as one third are in extreme poverty and severely undernourished despite the impressive increases in aggregate national food grain availability. Success in making staple foods available coexists with very high prevalence of undernourishment (insufficient caloric intake) and malnutrition. According to the Bangladesh Bureau of Statistics in 2000 the malnutrition problem was desperately serious for the poorest 14% of the rural population who were consuming fewer than 1600 kcal per day. Another 10% consumed between 1600 and 1800 kcal per day and around 23% consumed between 1800 and 2122 kcal, the minimum caloric requirement to be food secure, 45% of women had low (<18.5) body mass indices and 52% of children were underweight (Source: P/EGFEPUB/EGFEFADPUB/ Webpage Food Security Strategy DAP 2006.2).

Poverty alleviation is a core challenge for Bangladesh. Because of poverty, malnutrition is a fundamental problem. To reduce poverty in Bangladesh, it is crucial to develop and improve the capacities of its most vulnerable populations and regions. For this, Bangladesh needs to accelerate the growth and productivity of its agriculture and nonfarm sectors, improve the quality of social services, ensure proper functioning of its community and rural institutions and expand

the rural support infrastructures. Over the last three decades food grain production in Bangladesh has more than doubled - rice and wheat production has increased from around 10 million metric tons in the early 1970s to 25 million metric tons by the early 2000s. However, nearly half of the population still cannot afford an adequate diet. Also, as much of the countryside lies in disaster-prone, largely flood plain areas, annual flooding and occasional flash flooding together with other periodic natural disasters, often cause crop damage and food shortages for the vulnerable population. These risks and uncertainties lead to transitory food insecurity (Source: Bangladesh Mission Food Security Strategy, P/EGFEPUB/ EGFEPAD PUB/ Webpage Food Security Strategy DAP 2006.2).

Chronic poverty and underdevelopment are at the basis of the high vulnerabilities being noted in the marginal areas. This is compounded by unsustainably high population growth rates.. Where national fertility rates average around 4.9 children per female in 2000-2002, the figure in disaster-prone northeastern province stands at 11.1 children per female. The population of pastoralist districts in Kenya increased four fold from 1964 to 2004 to a staggering 2.5 million. The carrying capacity of the land has long been exceeded and if livestock population growth is factored in, this pressure on the land and resources cannot be sustained.

The deficiency of income to satisfy basic needs is by far the most widely used definition of poverty status. Income poverty is determined by comparison of household income to a poverty line estimated using a normative food basket and price attached to each unit of food items. The absolute poverty line is set at the level of the expenditure needed to provide a balanced minimum diet of 2,110 calories with a 30 percent (of poverty level income) allowance for non-food basic needs.

Bangladesh made considerable progress in alleviating poverty in the 1980s and 1990s (Khan 1990; Osmani 1990; Hossain and Sen 1992; Rahman and Hossain 1995; Sen, 2003; World Bank, 2007). What mechanism worked behind such an improvement in the incidence of poverty? What are the patterns and determinants of transitions in and out of poverty? Are these movements transitory or persistent? The existing poverty literature for Bangladesh is prolific in descriptive studies based on household income and expenditure surveys at different points of time. But studies on movements in and out of poverty based on panel data are scanty (Sen 2003). A multivariate structural analysis for a deeper understanding of the underlying process of poverty dynamics is also lacking. This paper aims to fill in this gap with a unique household level

panel data generated through repeat surveys of the same households for a number of times over the last twenty years.

Analyzing dynamics of poverty is important both for uncovering the nature of the problem and for formulating effective poverty alleviation strategy (Lanjouw and Stern, 1993; Baulch and Hoddinot, 2000; Krishna a, 2004). If there is high mobility in and out of poverty, it would imply that a much greater proportion of the population experience poverty over the period of observation than the cross-sectional statistics indicates. It would also imply that a much smaller share of population experience persistent poverty relative to those enumerated as poor in a particular year. Analyzing factors behind such chronic poverty provides additional insights for developing anti-poverty programs (Hume and shepherd, 2004).

The lack of a policy framework to adequately address disasters contributes to a focus on the emergency response to the neglect of the other stages of the disaster management cycle: prevention/mitigation, preparedness and recovery. Response is however the most expensive part of the cycle in economic terms, in terms of human life and quality of life. Effective disaster management with a focus on prevention and mitigation as well as recovery from previous disasters is not yet in place in Kenya. Similarly, the management of the environment is poorly understood resulting in unsustainable natural resource management, continuous environmental degradation and eventually to increased vulnerability and poverty (Source: DMB, Causal Analysis Draft).

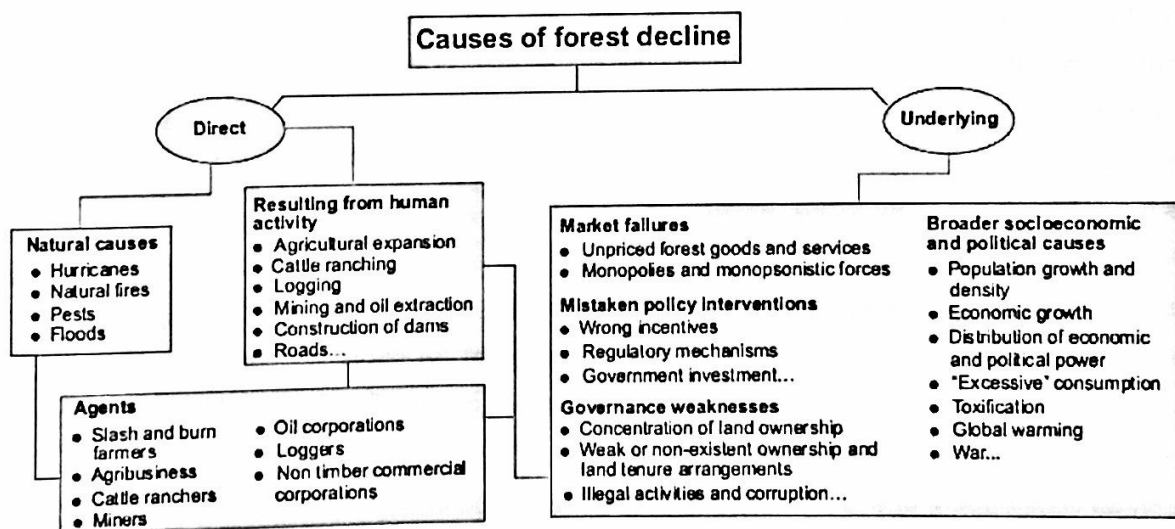
2.2 Biodiversity of Bangladesh

An estimated 5,700 species of angiosperms alone, including 68 woody legumes, 130 fiber yielding plants, 500 medicinal plants, 29 orchids, three species of gymnosperms and 1700 pteridophytes. (Firozet. *al.* 2004; Khan, 1977; Troup, 1975). Again, in Bangladesh, some 2,260 species alone have been reported from the hilly regions of the country (i.e., Chittagong and CHT), which falls between two major floristic regions of Asia. Subsequently, Bangladesh possesses a rich faunal diversity. The country has approximately 113 species of mammals, more than 628 species of birds (both passerine and non passerine), 126 species of reptiles, 22 species of amphibians, 708 species of marine and freshwater fish, 2,493 species of insects, 19 species of mites, 164 species of algae (or seaweed) and 4 species of echinoderms (IUCN, 2000; Islam *et. al.* 2003).

2.3 Deforestation and deterioration of Global Biodiversity

According to the World Resources Institute (WRI), the world has lost about half of its forest cover from 62 million km² to 33 million km² (Sundrinet. *al.* 2005; Kaimowitz and Angelson, 1998). The magnitude of global biodiversity situation is undoubtedly threatened million times higher than any time of its history. Over 15 million ha of natural forest are lost in the tropic every year which is more than the area of Nepal or Arkansas in the United States (FAO, 2006), again the present rate of species extinction is estimated to be between 1000 and 10,000 times the historical (pre 10,000 years BP) rate (Wilson, 1988). According to '2004 IUCN Red List' currently 15,589 species are threatened with extinction; 12% of world's known birds, 23% of mammals, and 32% of amphibians are also threatened (Baillie *et. al.* 2004). Most recent form of deforestation takes place in developing countries, particularly in tropical areas. Deforestation and forest degradation directly threatens the life and living of 400 million people out of which 50 million are forest indigenous people- who depend on forests for subsistence. The underlying causes of forest decline are diverse and include a variety of reasons.

Figure 2.3.1: The underlying causes of deforestation



(Source: Center for International Forestry Research, 2000)

Interestingly, most of the world's biodiversity have been hold by majority of the economically poorest countries (Koziell, 2001; Blockhus *et. al.* 1992) where the people depend most immediately upon local ecosystems for their livelihoods are somehow responsible for the

degradation of biodiversity and will mostly affected by the consequence of this biodiversity loss (CBD, 2006 and 2007). Biodiversity conservation is however essential to improve and alter this crisis. Biodiversity conservation through environmental sustainability (Goal 7) is one of the prime objectives of Millennium Development Goals (Box 2.1) which strongly linked with its first objective, i.e., eradication of poverty and hunger. To date, various international treaties and conventions with intergovernmental bodies have been formed to work on biodiversity issues in national, regional and international level.

2.4 Biodiversity and Livelihoods in Bangladesh

Ecosystem services form the basis of human survival. They help to meet the livelihood needs of the farmers, fisher folk, forest dwellers, craft persons and others. So, ecological security and livelihood security in Bangladesh are critically dependent on biodiversity and its components.

Biodiversity in Bangladesh contributes significantly to the country's economy. The people of Bangladesh depend on biodiversity for their day-to-day sustenance as well as overall livelihood security. For example, over 60 million people are dependent on aquatic resources everyday. One million people are full-time fisher folk and another 11 million have taken to part-time fishing in the country. Fifty to sixty-five per cent of the country's protein requirement is met by the consumption of fish. The fisheries sector contributes about 3.3% of the GDP of Bangladesh, earning more than 11% or more of the total export revenue, and employs 5% of the country's total work force (Parveen and Faisal 2001). The agriculture sector provides 63.5% of the country's employment, contributing a considerable 24% to the GDP. Of the sector's contribution to the GDP, approximately 7.1% is covered by the forestry. The various forestry-related projects in the country together generate 90 million person-days of job opportunities every year. The Sundarbans provides livelihood and employment to an estimated 112,000 people (Khan 2001).

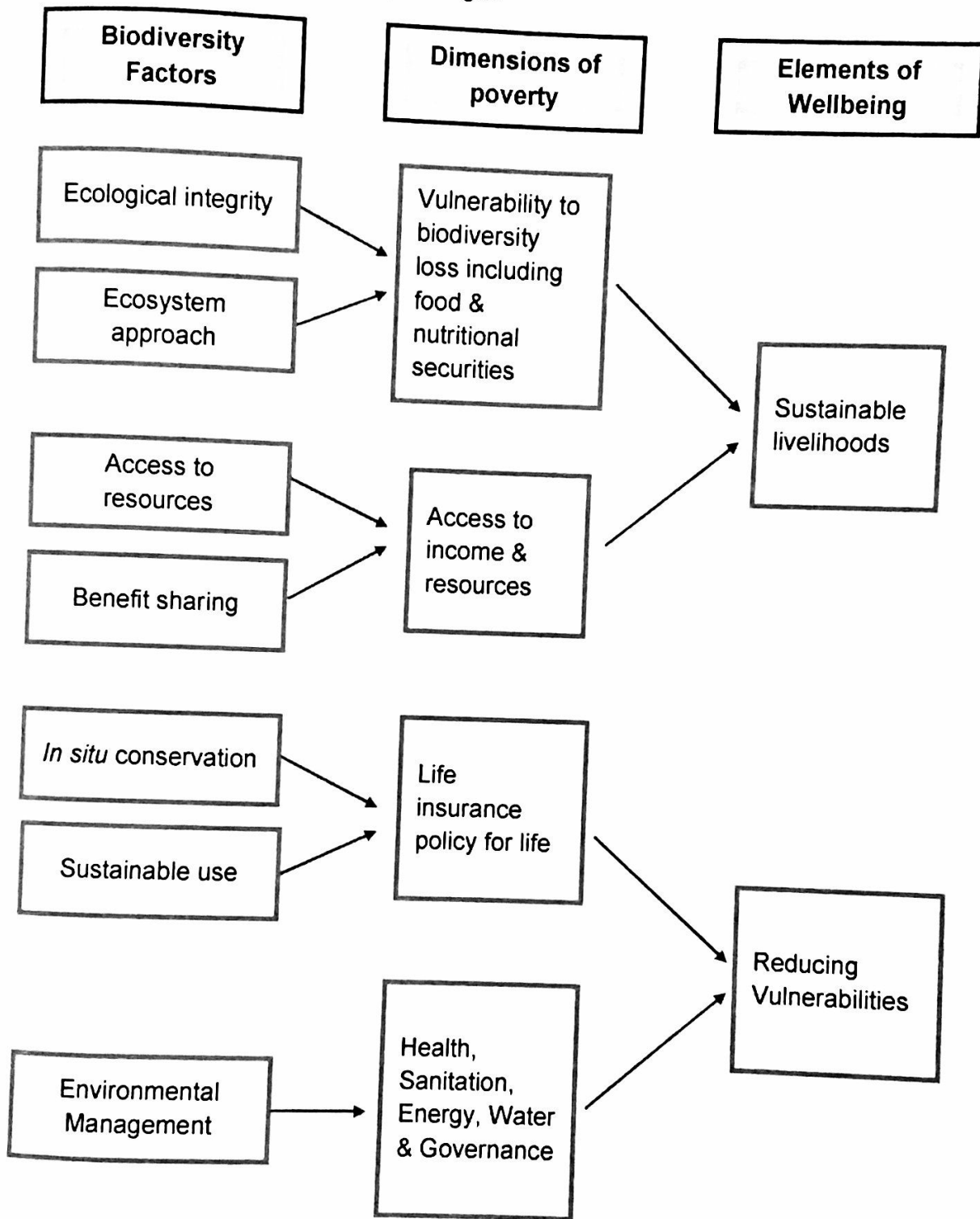
With more than 130 million people, a population growth rate of 1.48%, and a population density of 834 people per square kilometre, the pressure on the nation's natural resources is tremendous. Box:1 provides more information on the future trends of Bangladesh's populations and the natural resources on which it depends.

Box: 1**The Future Scenario**

In the year 2020, the estimated population of Bangladesh will be 170 million and population density, 1118 per sq km. Seventy per cent of the country's land is currently under cultivation. Land resources for agriculture consists approximately of nine million hectares which renders a per capita figure of 13 persons per ha. With the population reaching 170 million by 2020, this figure will increase to 20 persons per hectare counting the possible loss of cultivable land to alternative uses like housing, urbanization, etc. The pressure of the rising number of people on finite amounts of land, water and other natural resources has already resulted in mounting deforestation (a reduction from 10 to 6 percent in forest cover) that may become irreversible within the next 20 years, rising salinity and water logging of cultivated land, declining water tables and soil fertility and high levels of erosion in the hills. The riches of floodplain fisheries and wetlands have all been depleting precariously, caused by both natural forces and human interventions. If the negative trends cannot be reversed, they could reduce the current levels of fish production by 12 – 14 per cent. If the current two per cent per year deforestation rate is not reversed at all, the country's forests will probably disappear totally by 2020, and with them vanish the centuries old heritage of biodiversity.

(Source: World Bank and Bangladesh Centre for Advance Studies, 1998).

Figure 2.4.1: Biodiversity and Poverty Linkages



(Source: World Bank, 2002)

The contribution of biodiversity in the primary sector is immense, because a lion's share of the employment and rural livelihoods lie within formal and informal industries. The over-extraction of resources for livelihood sustenance is a major reason for the depletion of biodiversity in Bangladesh. Along with that, development initiatives that do not consider biodiversity can also be held responsible for this loss. At the same time, ecological threats from climate change, water and air pollution, and build-up of solid wastes will degrade the ecosystems, which will ultimately exacerbate the social costs of poverty. Hence there exists a direct link between poverty and biodiversity in Bangladesh. Conserving biodiversity poses a formidable challenge without considering alleviation of poverty simultaneously. Figure 2.2 highlights the linkages between biodiversity and dimensions of poverty. While these linkages apply to every country, the particular circumstances of Bangladesh, in which a huge and still rapidly growing population is forced to rely on limited natural resources, mean that they are especially important for the country. Improving environmental management to reduce poverty requires comprehensive understanding of how local environmental conditions relate to poverty, the ability to identify and set priorities with regard to alternative policy options and the capacity of evaluating their effectiveness and impact.

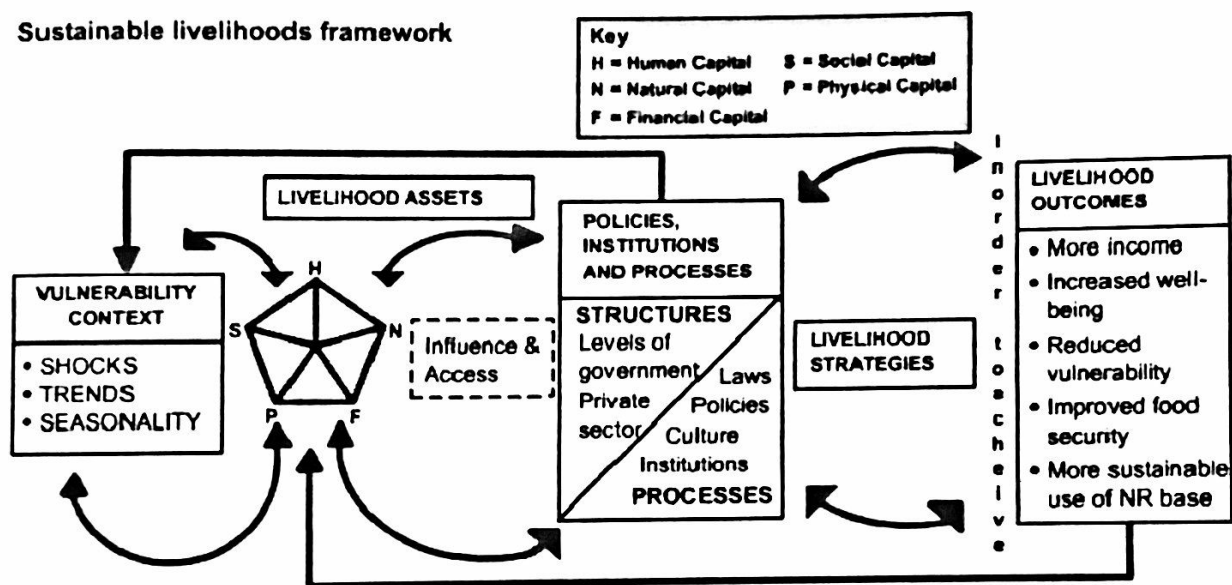
2.5 Forests and Livelihoods

Forests are among the most diverse and widespread ecosystems on earth and millions of people living in most tropical countries derive a significant part of their livelihoods from various forest products for centuries. These products also play a vital role to the livelihoods of people living in or adjacent to forests. According to the World Bank (2002), more than 1.6 billion people throughout the world relying heavily on forests for their livelihoods and some 350 million people depends only on forest both for their subsistence and income. Over two billion people, a third of the world's population, use biomass fuels, mainly firewood, to cook and heat their homes, and billions rely on traditional medicines for their ailment harvested from the forests. In some 60 developing countries, hunting and fishing on forested land supplies a significant amount of the protein requirements' (Mery *et. al.* 2005). Over the last two decades, the significant role of various forest products for household's food and livelihood security is increasingly recognized and the main emphasis was given on the Non- Timber Forest Products (NTFPs). In fact, for a large number of peoples of the world, NTFPs are more important forest resources than timber. Some estimates suggests that, part of South East Asia's tropical forest promote up to 50 US\$

per month per hectare to local people from exploiting forest resources, without considering the commercial timber values (Sedjo, 2002; Caldecott, 1988)

Framework for sustainability livelihoods

Figure 2.5.1: Sustainable livelihood framework



(Source: DFID, 1999)

2.6 Forest of Bangladesh

The total area of forestland of Bangladesh is 2.52 million ha of which the Forest Department (hereafter FD) manages 1.52 million ha. The other 0.73 million ha designated as Unclassed State Forest (USF) are under the control of Ministry of Land and the remaining 0.27 million ha fall under the category of village forests that are under private ownership (BFD 2008). However, contradiction exists on the actual coverage of the forests. Forest Resources Assessment 2005 (FAO 2007) shows the total area of forest is 0.87 million ha (some 6.7% of the country's total area). This includes only the designated government reserved and protected forests excluding the USF, plantations, village forests and other private forests (Muhammed et al. 2005).

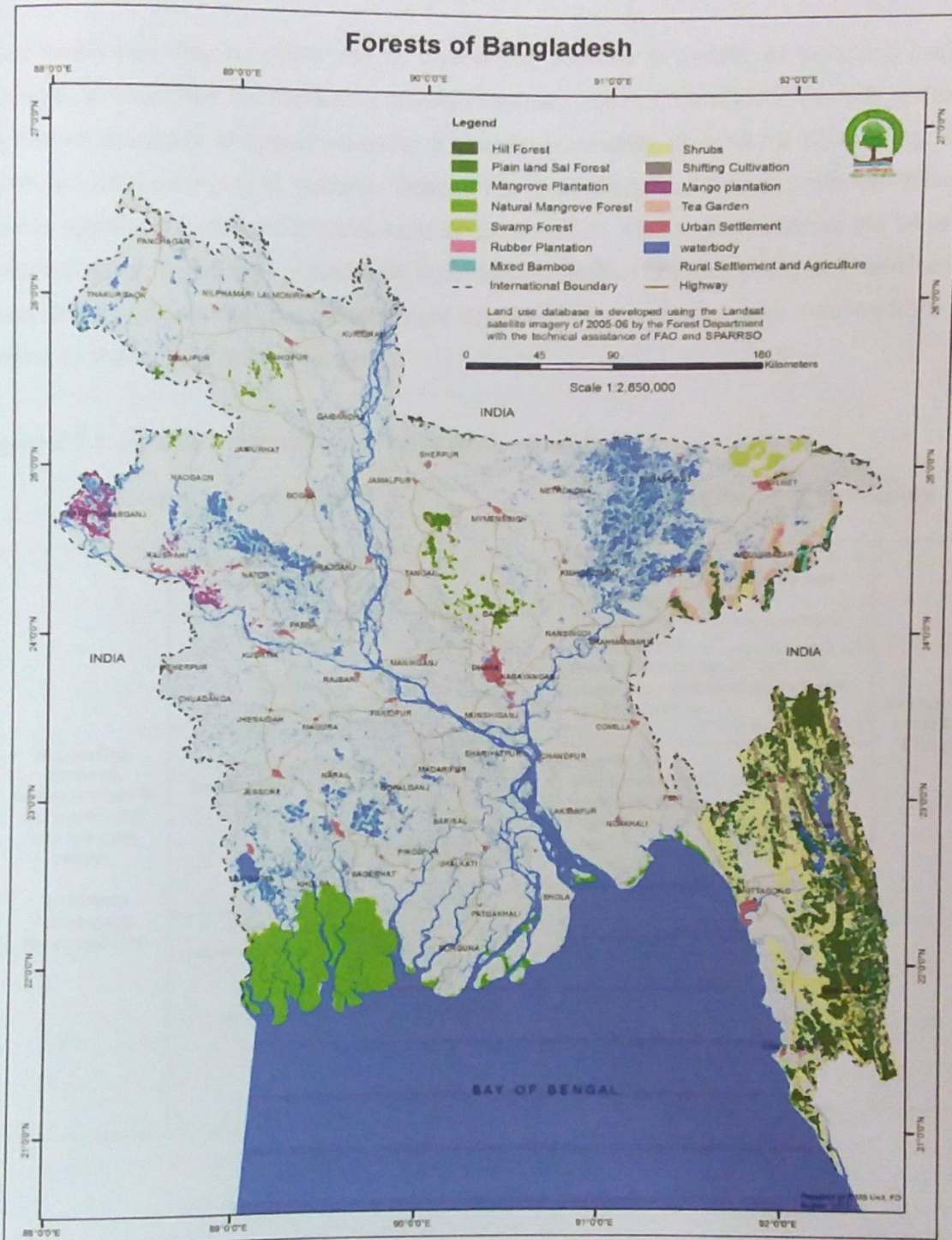
Table 2.6.1: Total forest lands of Bangladesh

Category	Forest Types	Area (Million hectare)	Percentage of total land
Forest Department	Hill Forest	0.67	4.54
	Natural Mangrove Forest	0.60	4.07
	Mangrove Plantations	0.13	0.88
	Plain land Sal forest	0.12	0.81
Total		1.52	10.30
Unclassed State Forests (USF)		0.73	4.95
Village forest		0.27	1.83
Grand Total		12.52	17.08

(Source: Bangladesh Forest Department, 2008)

The tropical evergreen and semi-evergreen forests (commonly known as hill forests) of Bangladesh occur in hilly areas of the northeastern and southeastern region, tropical moist deciduous forests (commonly known as Sal forests) are distributed in the central and a little part of northwestern region, the mangrove forest (commonly known as Sundarban) lie in the southwestern portion facing the Bay of Bengal, and the freshwater swamp forest (commonly known as reed-land forest) is located in the low lying wetland areas of northeastern region of the country. According to recent estimate, the total growing stock of Bangladesh's forests is 30 million m³ and the total biomass 63 million tons (FAO 2007), which contributes to wellbeing of the countrymen both in tangible and intangible ways such as by maintaining the quality of local and national environment, adding input in GDP, and providing livelihoods to local communities (Iftekhar 2006). The village forests or village groves in the country are the homesteads and are entirely private properties (Khan et al. 2007). These traditional homesteads are the dominating feature in the rural landscape of Bangladesh (Iftekhar 2006), forming the most productive tree resources of the country (BFD 2008). Vergara (1997) revealed that about 70% of fuel wood and timber and 90% of bamboos used in construction and cottage industries come from homesteads whilst Mustafa et al. (2002) reported about 55% of the national requirement of timber, fuel wood, and bamboo are met from those informal forests.

Figure 2.6.1: Forests of Bangladesh Map

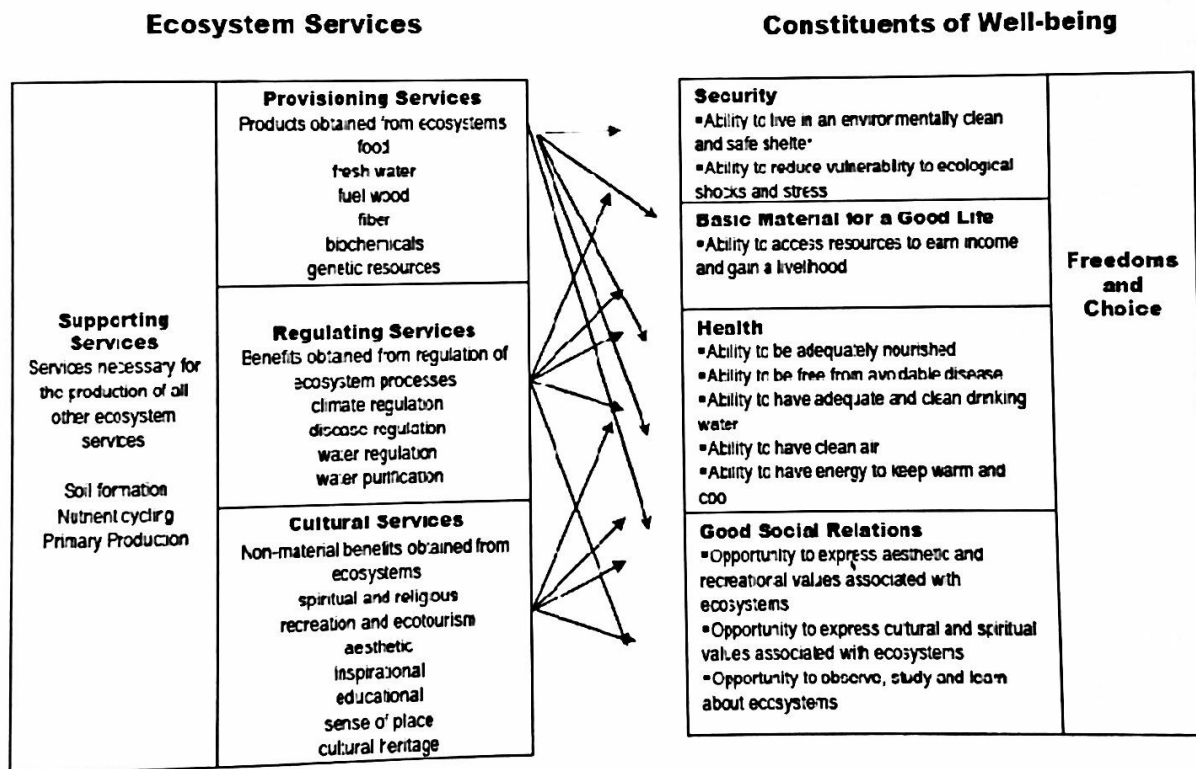


(Source: Bangladesh Forest Department, 1990)

2.7 The benefits of protected areas for local livelihoods

Local livelihoods may be enhanced by diversifying sources of assets, or switching livelihood strategies to a singular but rewarding activity (Twyman, 2001). Diversification entails opening up the correct assembly of opportunities for a specific community (Salafsky & Wollenberg, 2000), which can be challenging to achieve. Despite the costs discussed above, protected areas can provide significant livelihood benefits to local communities. This section reviews the benefits of protected areas; both those provided by successful protection of forest ecosystem services, and those directly gained from the management structure of the protected area, ranging from direct income to provision of local amenities.

Figure 2.7.1: Ecosystem services and constituents of wellbeing



(Source: Zakri, 2003)

Forest ecosystem services include supporting and regulating services, provisioning services, and cultural services, as defined in the Millennium Ecosystem Assessment (Figure 2.6). It is sometimes difficult to recognize ecosystem services and to quantify them accurately, partly

because they often provide indirect benefits, meaning that they remain poorly understood in relation to their importance (Myers, 1996). In 1997, Constanza *et al.* estimated the global value of biodiversity to be roughly \$38 trillion, although this remains a highly controversial figure. Using a careful analysis of existing case studies, Balmford *et al.* (2002) found that the benefits of conversion of land (and subsequent loss of ecosystem services) were always outweighed by the costs. In each case, private benefits were accrued at the cost of social (community) benefits.

2.7.1 The effectiveness of forest protected areas in biodiversity conservation

Forest protected areas and community conservation initiatives generally have lower deforestation rates than the surrounding non-protected areas (Clark *et al.* 2008). Less has been published, on the effectiveness of protected areas in conserving the animal and plant species contained within them, although the studies that have been carried out are often positive. WWF's analysis of over 200 forest protected areas suggested that biodiversity condition in protected areas was perceived to be good, and suggested that protected areas with an IUCN management category of I or II were likely to be more effective than less restrictive categories such as V or VI (Dudley *et al.*, 2004). The benefit of biodiversity conservation is clear at the global scale. Intact ecosystems are thought to have more resilience to change, and to provide more ecosystem services (e.g. Cardinale *et al.*, 2006; Fox, 2006). However, the direct benefits to local livelihoods depend upon protected area management strategies: the inclusion or exclusion of those local communities and their livelihood activities, or the sharing of protected area benefits with surrounding communities.

2.8 Protected forests and poverty reduction

The poorest members of society are the most vulnerable – vulnerable to natural disasters, but also for instance, to economic downturns. This group is characterized by few, if any assets and minimal options. In such precarious conditions, the slightest extreme event may have major repercussions. A flood, a hurricane or a tsunami will have more dire consequences on those living in poverty than on those with healthy bank accounts, land and a good social network. Equally, a major rise in the price of a commodity will impact poor people dependent on this commodity more severely than wealthier people who may have a more varied income base or at least more options (including education) to vary that income base. Protected areas may have a role to play in physically protecting poor people. They may also offer more alternatives for poor

people when economic conditions are worsened. In many cases, the most important social role of protected areas is through benefits that are not narrowly economic. Because for decades poverty has been interpreted as merely a financial issue, examples of protected areas' contributions to poverty reduction have been confined to the financial aspects of poverty and support packages reflect this. Thus, in some instances where protected areas were set up on ancestral lands, local people were given money to abandon these same lands rather than looking at co-management options or different ways of generating benefits. Alternatively, such compensation was sometimes 'in kind' through the establishment of new schools or hospitals. Unfortunately, the compensation often fell far short of the value of the land (Oviedo, 2005). Also, in more recent examples, approaches such as ICDPs sought to develop alternative income-generating activities to help local people develop long-term economic activities compatible with biodiversity such as bee-keeping or tree-nurseries. If, on the other hand, poverty is understood as about more than just dollars, there appears to be more scope for protected areas to contribute to poverty reduction. we can begin to see the different ways in which protected areas could potentially contribute to poverty reduction. Based on such a multidimensional approach to poverty, DFID undertook a study on wildlife and poverty (DFID, 2002).

The researchers identified five categories of positive livelihood outcomes that wildlife can provide poor people, namely: more income, reduced vulnerability, well-being, improved food security and environmental sustainability. These are delivered through for instance, ecotourism income, jobs as park guards, income from handicraft sales, natural medicines, building materials, NTFPs, bushmeat, provision of water etc.

CHAPTER – THREE

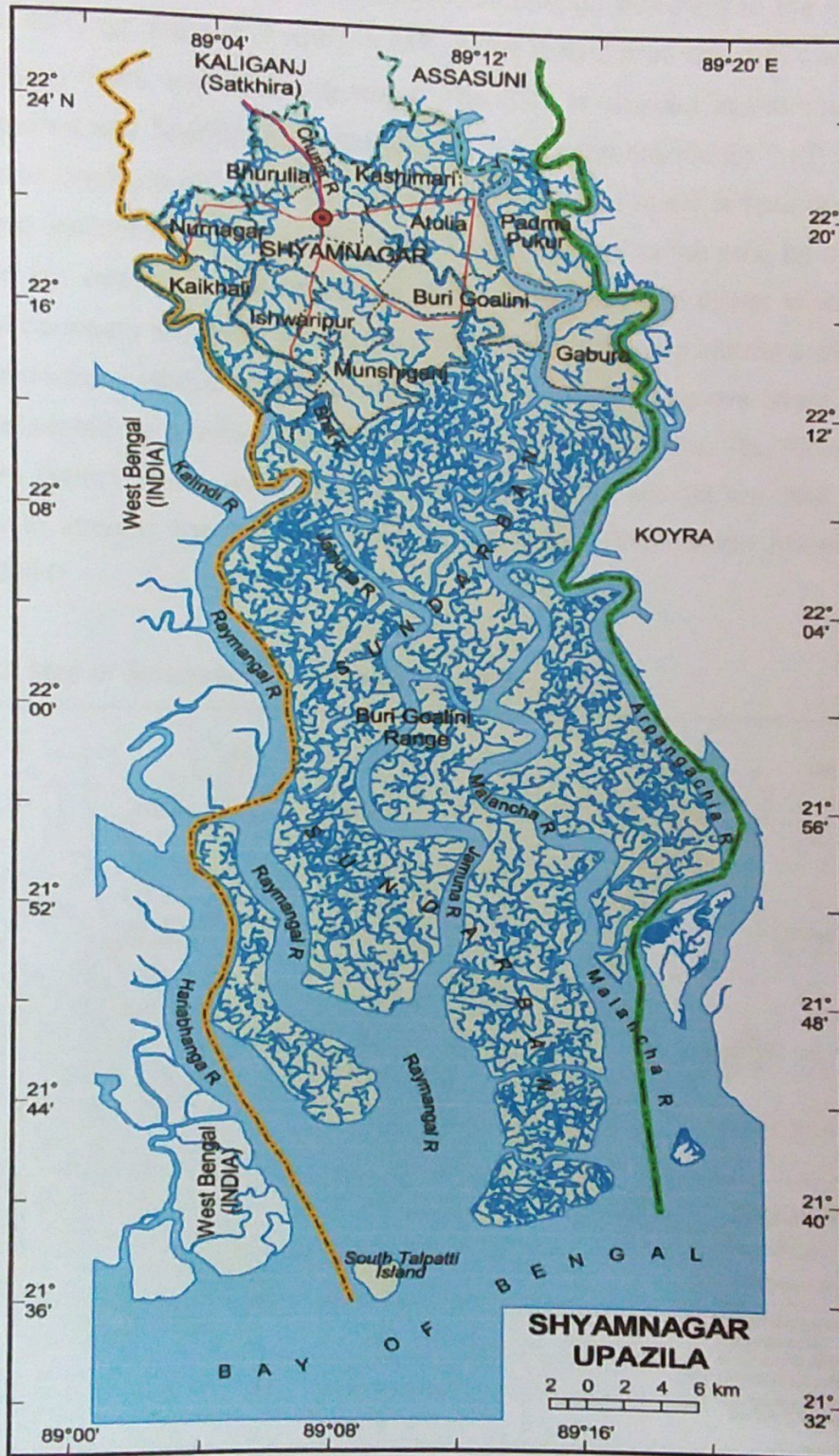
3. STUDY AREA

3.1 Geographical Location

Shyamnagar is located at 22.3306°N 89.1028°E . It has 46592 household units and total area of 1968.24 km². Shyamnagar Upazila is bounded by Kaliganj (Satkhira) and Assasuni upazilas on the north, Sundarbans and Bay of Bengal on the south, Koyra and Assasuni upazilas on the east, West Bengal of India on the west. The main rivers here are: Raymangal, Arpangachhia, Hariabhanga Kobadak, Kholpetua, Malancha, Kalindi, and Chuna. South Talpatti Island at the estuary of the Hariabhanga is one of the notable places. Shyamnagar town consists of 5 mouzas and 13 villages. The area of the town is 10.76 km². The town has a population of 11021; male 52.36% and female 47.64%.

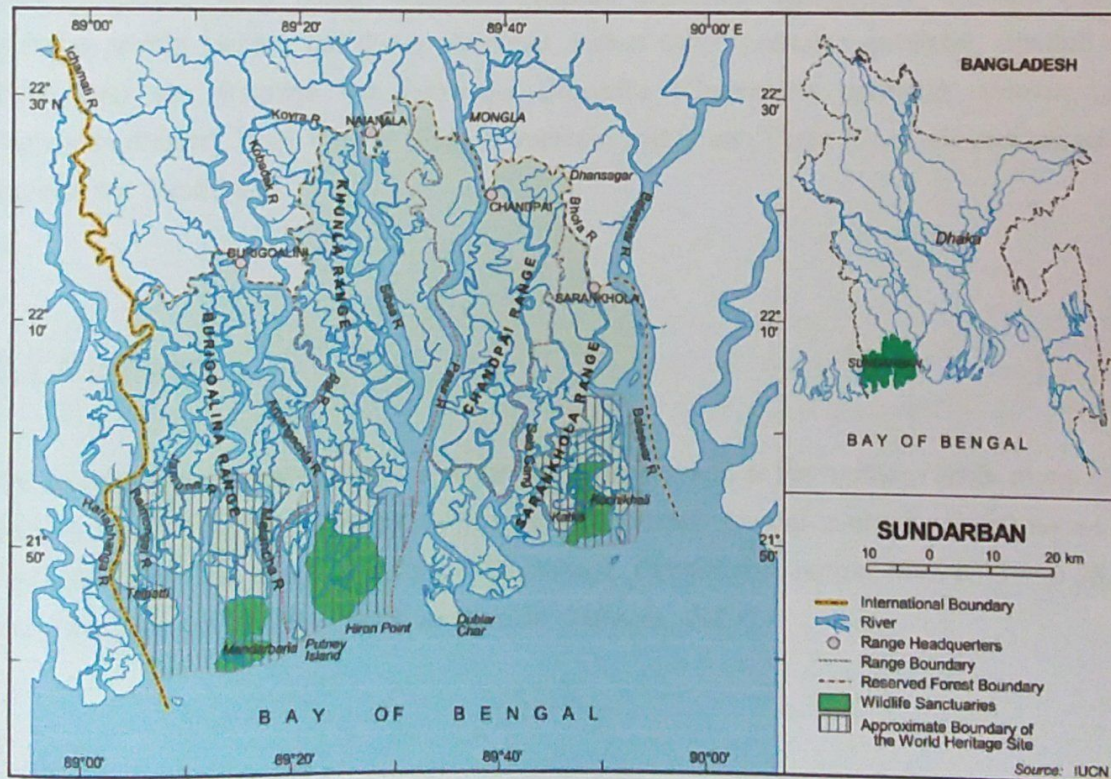
The density of population is 1024 per km². Literacy rate among the town people is 37.3%. The town has three dakbungalows and a BDR Headquarters. Shyamnagar thana was converted into an upazila in 1982. It consists of 12 union parishads, 127 mouzas and 216 villages. Average literacy in whole upazila is 28.1% (male 38% and female 17.4%). There are 5 colleges, 28 high schools, 98 madrasas, 96 government primary schools. Major occupations of local people are agriculture. About 32.93% people are engaged with this work. Main exports items of this area are Paddy, jute and shrimp. Shyamnagar is the largest thana of Bangladesh.
(Source: http://en.wikipedia.org/wiki/Shyamnagar_Upazila).

Figure 3.1.1: Map of Shyamnagar Upazila under Satkhira District in Bangladesh.



The Sundarbans Reserved Forest (SRF) is situated in the extreme south-west corner of Bangladesh between the river Baleswar and Harinbhanga adjoining to the Bay of Bengal and it covers 6017 sq. km. out of which 4,143 sq. km is land area and 1,874 sq. km is water area comprising rivers and tidal waterways. The SRF is situated at the southern part of Khulna, Bagerhat and Satkhira civil district lying in between latitude $21^{\circ} 27' 30''$ & $22^{\circ} 30' 00''$ North, and longitude $89^{\circ} 02' 00''$ & $90^{\circ} 00' 00''$ East. The forest is bounded in the north by the private settlement, in the south by the Bay of Bengal, in the east by the Baleswar River and in the west by the Harinbhanga, Raimongal and Kalin driver which is also the international boundary with India and to the north. There is a sharp interface with intensively cultivated agricultural land of the north with the Sundarbans mangrove forest of the south, which is intersected by a network of tidal rivers, canals and creeks. The Khulna, Bagerhat and Satkhira district towns are located at a distance of 35 km, 23 km, and 70 km north respectively in straight line from the edge of the forest. (Information Sheet on Ramsar Wetlands, 2001)

Figure 3.1.2: Map of Sundarbans area in Bangladesh.



Sundarbans harbours 334 species of trees, shrubs and epiphytes and 269 species of wild animals. World renowned Royal Bengal Tiger is the magnificent animal of the Sundarban. 1,39,700 hectare forest land of Sundarban is declared as World Heritage Site where three wildlife sanctuaries viz. Sundarbans East, Sundarban West and Sundarbans South wildlife sanctuaries are located. The forest inventory of 1998 exhibits that there are 12.26 million cubic meter timber is available from the species of Sundri (*Heritiera fomes*), Gewa (*Excoecaria agallocha*), Keora (*Sonneratia apetala*), Baen (*Avecennia officinalis*), Dhundul (*Xylocarpus granatum*), Passur (*Xylocarpus mekongensis*) etc with 15cm and above diameter.

Sundri is the most important tree species in the Sundarban which is distributed over 73% of the reserve. Extent of Sundri is followed by Gewa (*Excoecaria agallocha*), Baen (*Avecennia officinalis*), Passur (*Xylocarpus mekongensis*), Keora (*Sonneratia apetala*) etc. There are some other non-wood forest products like Golpata (*Nypa fruticans*), honey, wax, fish, crab etc which are also of high value.

Sundarban is a unique habitat for a number of wildlife. Among them some mammals are Bengal Tiger (*Panthera tigris tigris*), Gangetic Dolphin (*Platanist gangetica*), Monkey (*Macaca mulatta*), Indian Fishing cat (*Felis viverrina*), Indian Otter (*Lutra per spicillata*), Spotted Deer (*Axis axis*) etc. Reptiles like Estuarine Crocodile (*Crocodylus porosus*), Monitor Lizard (*Varanus alvator*), Rock Python (*Python molurus*) and Green Turtle (*Chelonia mydas*) etc. are found in the Sundarban.

3.2 Climate

The 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. The relative humidity is 80 percent. Temperature ranges from 7.70 C to 38.80 C round the year (Information Sheet on Ramsar Wetlands, 2001).

3.3 River Systems of Sundarbans

The Sundarbans mangrove wetland is intersected by an elaborate network of rivers, channels and creeks (Chaffey et al., 1985). A complex net of streams and rivers varying considerably width and in depth intersects the entire area. Some of the big rivers are several kilometres in width (Siddiqi, 2001). Rivers tend to be long and straight, also a consequence of the strong tidal forces and the clay and silt deposits which resist erosion. The width of these estuaries sometimes extends to about 10 km. The rivers such as the Passur, Sibsa and Raimangal are deep and wide (Hussain and Acharya, 1994).

Generally the rivers flow from north to south and are connected with a large number of side channels. These side channels connect two rivers and facilitate exchange of water between them. The larger rivers, while passing through the Sundarbans forest, join together and form estuaries at the confluence where they meet near the sea (Figure 3.3). The Sundarbans receives large volumes of freshwater from inland rivers flowing from the north and of saline water from the tidal incursions from the sea. The salinity of tidal water is the major force in the productivity of mangrove forest ecosystems. At a comparatively recent period all rivers were connected with the Ganges. The Baleswar River's waterways carry little fresh water as they are cut off from the Ganges; the main outflow has shifted from the Hoogly-Bhagirathi channels in India (Seidensticker and Hai, 1983).

Currently the Baleswar and Gorai Rivers have direct connection with eastern part of the Sundarbans carrying with them a substantial amount of fresh water to the area (Siddiqi, 2002). These ecological niches occur mainly along the Baleswar, Bhola, Passur, Marjata, Arpongasia, Shibsa, Jamuna and Raimangol Rivers. A number of rivers namely Passur, Sibsa, Selagang, Arpongasia, Kobadak, and Malancha and to a lesser extent Jamuna and Raimangal have indirect connections and receive the overflow of the Ganges during the rainy season.

Figure 3.3.1: Map Major rivers, river systems and estuaries in the Sundarbans



3.4 History of Sundarbans

In the 16th century, the Sundarbans forest was the property of the local king or Zamindar who imposed levy on the extraction of wood from the forest. During the British period, the proprietary right over the forest was assumed by the Crown. Forests were leased under the Act in 1830 to Europeans. This resulted in the progressive conversion of forests into agricultural land that

continued up to 1875. A number of prominent British foresters visited the Sundarbans between 1863 to 1874 and succeeded in raising awareness in the colonial administration about the value of the forest. Their recommendations resulted in the introduction of a set of guidelines initiating the first conservation activities. Leasing out of forest land was thus stopped in 1875 and the remaining un leased forest was declared as Reserve Forest under the Forest Act of 1876. A Forest Management Division was established in 1879 at Khulna that regulated export of timber and was in charge of management. The Boundary of the Bangladesh portion of the forest has remained mostly unchanged for the last 125 years. The conservation effort received a boost when in 1977 the government set aside 139,700 hectares for three wildlife sanctuaries under the Wildlife Act of 1973. (<http://en.wikipedia.org/wiki/Sundarbans>). The Sundarbans has been declared as a 560th Ramsar site in 1992 due to covering all criteria of wetland as well as Ramsar site. (<http://www.bforest.gov.bd/highlights.php>). World Heritage committee of UNESCO inscribed the Sundarban of Bangladesh in the World Heritage list by their 21st session in 1997 and accordingly the Government of the People's Republic of Bangladesh declared the Sundarban as World Heritage Site in 1999 (<http://www.bforest.gov.bd/conservation.php>).

3.5 Flora

Sundarbans have a considerably high floral diversity. A total of 245 genera and 334 plant species were recorded in this forest. 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*), Kripa (*Lumnitzera cymosa*), Dakur (*Cerbera odollum*) and Kankra (*Bruguiera gymnorhiza*).

Golpatta (*Nypa fruticans*) is a very useful palm commonly found in the Sundarbans. It is widely gathered for thatching purposes of the rural dwelling houses. Hantal (*Phoenix palludosa*) is another palm species, which is used extensively in the construction of small huts as roof rafters and frame of walls. Ullu grass (*Sacharum officinalis*) is widely gathered for thatching rural houses though it is the main fodder species of deer. Hogla (*Typhalea phentiana*) is gathered and split for cheap fencing and mat making. Nal (*Eriochloea procera*) is used extensively for making mats. Hargoza (*Acanthus illicifolious*), tiger fern and Ora (*Sonneratia caseolaris*) are canal bank protection species that prominently grow along river banks.

All the plant species found in the Sundarbans are growing naturally and considered as indigenous. There is no knowledge of endemic, exotic and invasive species in Sundarbans. The Sundri (*Heritiera fomes*) is considered threatened due to the occurrence of a disease commonly known as top dying Sundri disease. It is known that some species are becoming rare in the present time. The Bhat Kati (*Bruguiera parviflora*), Kala Baen (*Avicennia marina*) is now a days a rare plant in the Sundarbans.

The Sundri is the unique species of the Sundarbans Ramsar Site (Hussain and Acharya 1994, Canonizado and Hossain 1998).

3.6 Fauna

The Sundarbans is the only remaining habitat in the lower Bengal Basin for a variety of faunal species. With regard to wildlife, the Sundarbans possesses a rich faunal diversity even after disappearance of a good number of interesting species. With regard to mammals, birds, reptiles and the amphibians, the Sundarbans shares 45, 42, 46 and 36 percent with the rest to the country. However, seven species have become extinct in the beginning of the last century. Besides, 10 species of mammals, 11 species of birds, 16 species of reptiles and one species of amphibian is endangered (Siddiqi, 2001). They include Royal Bengal Tiger (*Panthera tigers*), Jungle Cat (*Felis chaus*), Irrawaddy dolphin (*Orcaellabre virostris*), Blyth's Kingfisher (*Alcedo hercules*), Estuarine Crocodile (*Crocodylus porosus*), Yellows Monitor (*Varanusfla vescens*), Rock python (*Python molurus*), Green Frog (*Euphlyctis hexadactylus*) and others (Siddiqi, 2001).

Table 3.6.1: Status of Mammals, birds, reptiles and amphibians in the Sundarbans

Class	Total number of species in Bangladesh	Existing species in Sundarbans (Number)	Sundarbans share with Bangladesh (%)	Extinct species (Number)	Endangered species (Number)
Mammalia	110	49	45	4	10
Aves	628	261	42	2	11
Reptilia	109	50	46	1	16
Amphibian	22	8	36	-	2

(Source: after Rashid et al., 1994; Siddiqi, 2001)

At present 49 mammals species have been recognised, and of these no less than eight spectacular species, namely Javan rhinoceros (*Rhinoceros sondaicus*), Single horned rhinoceros (*Rhinoceros unicornis*) Water buffalo (*Bubalus bubalis*), Swamp deer (*Cervus duvauceli*), Muger crocodile (*Crocodyl uspalustris*), Gaur (*Bosfrontalis*) and Hog deer (*Axis porcinus*) have become extirpated in the Sundarbans since the last century (Salter, 1987; Sarker, 1992). Generally, the wildlife population of the Sundarbans is under stress. So, evaluation and better wildlife management strategies are needed as soon as possible and should be immediately implemented for the protection of natural heritage and the ecosystem. The terrestrial type of animals is available for its suitable periodic inundation environment. The river terrapin (*Betagur baska*), Indian flap-shelled turtle (*Lissemys punctata*), Peacock soft-shelled turtle (*Trionyx hurum*), yellow monitor (*Varanus flavescens*), water monitor (*Varanus salvator*), Indian Python (*Python molurus*) and the Bengal tiger (*Panthera tigris tigris*) are some of the resident species.

3.7 Local communities and buffer zone of Sundarbans

A large number of communities live in the proximity of the forest (to its North and East), an area called Sundarban Impact Zone (SIZ). Most of these communities rely largely on the resources of the Sundarban for their livelihood. An estimated population of 3.5 million people (including the traditional resource users) inhabits the SIZ. Local people are dependent on the forest and waterways for such necessities as firewood, timber for boats, poles for house-posts and rafters, *Golpata* leaf for roofing, grass such as *Melegrass* (*Cyperus javanicas*), *ulugrass* (*Imperata cylindrical*), *nalkhagra* (*eriochloea procera*) for matting, reeds for fencing and fish mostly for their own consumption, and medicinal plants for herbal treatment. The traditional resource users of the Sundarban are the indigenous Munda community and local Bawali (wood cutters), Mouali (honey collectors), *Golpata* (nypah palm) collectors and Jele (fisherman) communities (Kabir and Hossain, 2006).

3.8 Aquatic Resources of Sundarbans

The aquatic resources of the Sundarbans Mangrove Forest (SMF) are an important component of its biodiversity and are an important source of food and income for human populations. Over 200 species of fish identified in the SMF are harvested by between 110,000 and 291,000 fishermen using approximately 25,000 registered small fishing boats. The water body inside the SMF, i.e. inshore fishing area, covers an area of 1,874 km², and the estimated annual production of finfish and crustaceans is about 3,054 t, equivalent to a yield of 16.3 kg/ha. The Sundarbans also includes a 20 km wide marine zone, i.e. offshore fishing area, which covers 1,603 km². A seasonal winter fishery of Dubla Island operates in this zone, consisting of about 30,000 fishermen and associated people. The annual production of the marine zone is estimated at 8,733 metric tonnes, or 54.5 kg/ha. Apart from the obvious structural complexity of this fishing area, the fishing area is strongly influenced by climate: fishing in the offshore area is very hazardous from May to August due to severe weather conditions.

(http://www2.fisheries.com/archive/publications/reports/11-1/46_haque.pdf)

The Sundarbans ecosystem supports rich fisheries diversity. Its water-bodies support 27 families and 53 species of pelagic fish, 49 families and 124 species of demersal fish, 5 families and 24 species of shrimps, 3 families and 7 species of crabs, 2 species of gastropods, 6 species of pelecypods, 8 species of locust lobster and 1 family and 3 species of turtles (IUCN 1994).

The fisheries of Sundarbans are very important for local economy and livelihoods of thousands of poor people living around and outside the landscape area. There are many other stakeholders. It produces 2-5% of the total capture fisheries (Rabbani and Sarker 1997). In 2003-04 the Forest Department (FD) production estimate was 433,000MT (Hoq, 2008). IPAC PRA finding is an average of 47% (Biswas, 2009; Ghosh, 2009) households within the 5km area in the landscape in Bagerhat & Satkhira district are engaged in fishing. Approximately 40,000-70,000 boats operate in the SRF for fishing. Forest Department revenue collection data has been considered for representing the value of different groups of fish. Mangroves are important nursery areas for many commercially important shrimp and crab species. In terms of value per unit catch and total value of catch, the penaeid shrimps are among the most important resources for coastal fisheries. Many species of palaemonid shrimps are also associated with mangroves, including the commercially important giant freshwater shrimp, *Macrobrachium*

rosenbergii (Macnae, 1974; Matthes and Kapetsky, 1988; Singh *et al.*, 1994). Mangroves also support vast numbers of small shrimp of which *Acetes* spp. (*Serges tidae*) are the most important to fisheries (Macnae, 1974; Macintosh, 1982). Hoqet *al.* (2001) reported 10 shrimp species occurring in the major river systems flowing through the mangrove forest in Bangladesh. The species are *Penaeus monodon*, *P. indicus*, *Metapenaeus monoceros*, *M. brevicornis*, *Palaemonstyliiferus*, *Macrobrachium rosenbergii*, *M. villosimanus*, *M. dyanus*, *M. dolichodactylus* and *M. rude*. The main macrozooplankton included *Acetes* spp., *mysids*, *alima larvae*, *copepods*, *isopods* and *megalopalarvae*. Crustacea accounts for by far the largest proportion of animal biomass, with an estimated 40 million kilograms of fiddler crabs and 100 million kilograms of mud crabs (Hendrichs, 1975). The mangrove crab fauna is of major ecological and economic importance (Macnae, 1974; Macintosh, 1982; Matthes and Kapetsky, 1988), including the high-priced mangrove mud crab, *Scyllaserrata*. Distributed from eastern Africa to the central Pacific, this crab is abundant enough to support local fisheries and aquaculture operations throughout the Indo-West Pacific region. (IPAC,2009) (http://www.nishorgo.org/nishorgo2/pdf/reports/GENERAL%20REPORTS/24012011/SRF_Fishe ries_19.12.2010.pdf)

3.9 Ecological importance of Sundarbans

The ecological importance of the SRF is associated with its rich biodiversity and the ecosystem's valuable ecological services. It is estimated that the SRF is home to 425 species of wildlife, including 300 species of birds and 42 species of mammals. The area serves a vital role in a variety of ecosystem functions including trapping of sediment and land formation, protection of human lives and habitation from regular cyclones, acting as a nursery for fish and other aquatic life, oxygen production, waste recycling, timber production, supply of food and building materials, and carbon cycling (Biswas *et al.* 2007; Islam and Peterson 2008).. These functions are increasingly at risk from the effects associated with climate change and sea level rise. The ecological importance of the SRF has been recognized and its conservation and management an obligation under a number of international treaties and conventions to which Bangladesh is signatory. (Source: Strategic Management Plan for the Sundarbans Reserve Forest, 2010)

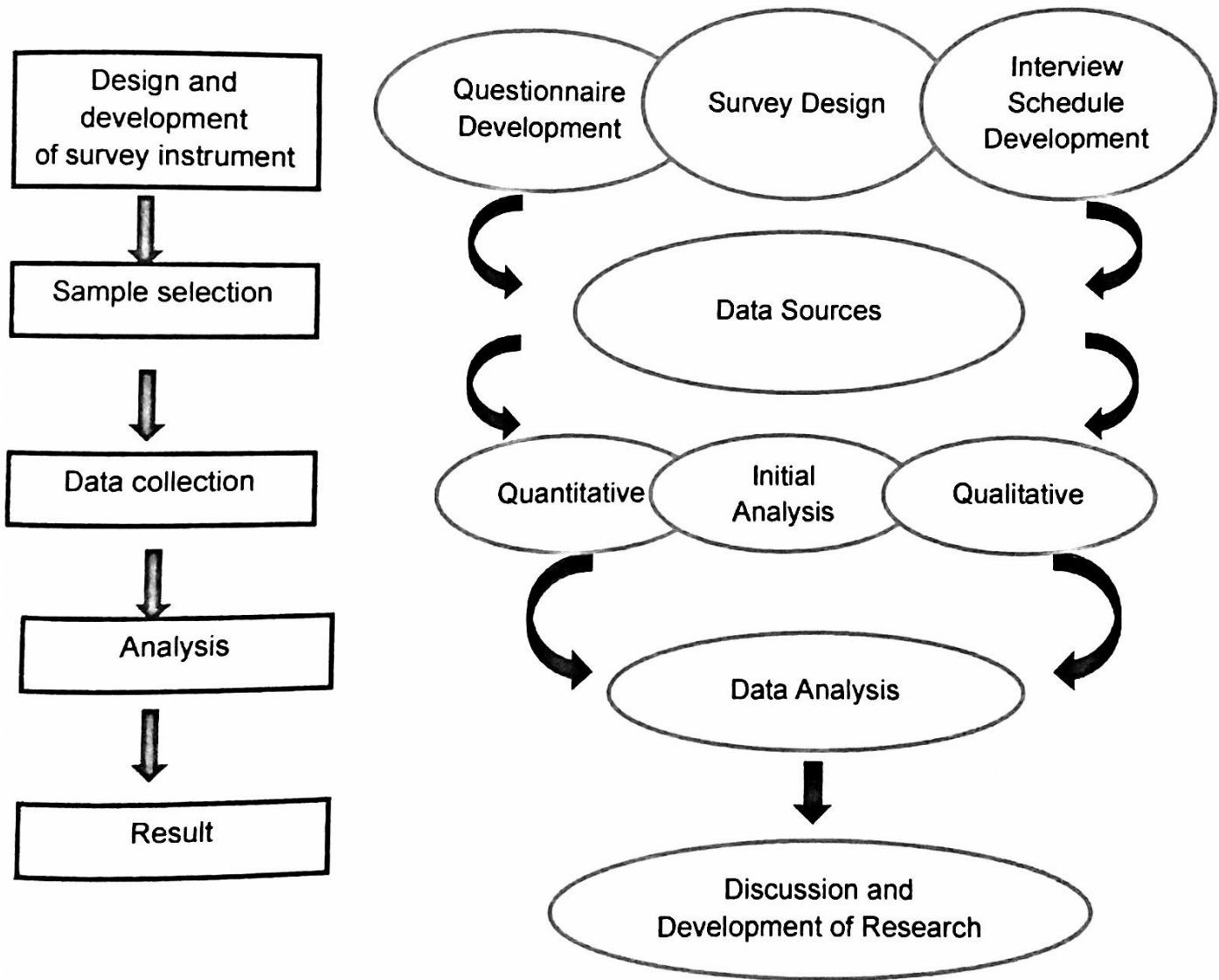
CHAPTER - FOUR

4. RESEARCH METHOD

4.1 Research Design:

The use of questionnaires and semi-structured interviews conduct in this study allowed for the collection of data from large and varied groups of households. After the data collection analysis phase is completed.

Figure 4.1: Summary of Research Design



4.2 Selection of villages

The selection of surveyed villages was done based on the distance of those villages from the core protected area (Sundarbans Reserve Forest) and dependency on Sundarbans resources. Selected villages and districts shown in the following Map and

Table 4.2.1: Surveyed villages at Shyamnagar under Satkhira Districts

Study Area			
Sl. No.	Villages	Union	Sample Size
1	Kalbari	BuriGoalini	31
2	Nildumur	BuriGoalini	24
3	Chandnimukha	Gabura	1
4	Chakbara	Gabura	2
5	Par Bukhary	Gabura	1
6	Nanusura	Gabura	6
7	Dumuria	Gabura	11
8	East Dumuria	Gabura	3
9	Mathurapur	Munshiganj	1
10	Munshiganj	Munshiganj	11
11	Chunkori	Munshiganj	18
12	Singhatali	Munshiganj	16
13	South Kadamtala	Munshiganj	6
Total	13	3	130

4.3 Data Collection Techniques

4.3.1 Reconnaissance Survey

In order to get a view of the nature of the study area and prior to data collection, a reconnaissance survey was initiated to acquire some basic ideas regarding to biodiversity and livelihoods through the personal interview with the local people of the study area. During the survey, views were exchanged with the peoples about the objectives. The survey has helped to realize the existing condition of the area.

4.3.2 Questionnaire Preparation and Testing

Considering the objectives of the study a questionnaire was prepared for the selected community after prepared the questionnaire, questionnaire was test to fulfill objectives of the study and to collect the selected information of the study. Then some necessary corrections are made to improve the questionnaire. The questionnaire was finalized after required addition and detection.

4.3.3 Household Questionnaire Survey

To obtain household information questionnaire was prepared to cover all possible aspects. Interviewing method was applied to collect information. Randomness was strictly ensured for better output. Primary data were obtained through Household survey. Total 130 household were interviewed. Data were collected by interview procedure. Direct questions and different scales were used to obtain information like age, education, family size, land area, amount of harvesting product, consumption and income. All of the information required for the study was collected with meticulous care.

4.3.4 Focus Group Discussions (FGD)

The focus group discussions were initially done in 5 villages around Sundarbans forest with selected groups comprised of five to 10 people, using a semi-structured question guide and a

checklist. The groups in the discussions included Fishermen, Honey collectors, Crab Collectors, Nypa palm leaf collectors, employed workers, women, and youth people selected from the community. The aim of the discussions was to collect quantitative economic data and qualitative data about forest products extracted, their prices, marketing chain, seasonal variability different kinds of products.

4.3.5 Direct Observation

It was very useful method for understanding actual condition of field by researcher himself. Observations were also made by systematically walking with informants and local leaders through the villages while observing, asking, seeking problems and solutions.

4.3.6 Secondary Data Collection

Secondary information such as statistical data, reports, maps have been collected from various Government and Non-government organizations such as: Department of Environment (DoE), Dhaka, Department of Forestry (DoF), Dhaka, Sundarbans Biodiversity Conservation Project (SBCP), Khulna, Khulna Forest Office, Relevant papers and reports of International Organizations through internet search, Journals and papers relevant to the study from NGO's, Seminar library of Urban and Rural Planning Discipline.

4.4 Data Processing and Analysis

The data were processed, analyzed and interpreted to find the result the study. After completion of data collection the responses to the questions of livelihoods in the Sundarbans and its surrounding interview schedule were transferred to a master sheet to facilitate tabulation. The analyzed data are represented through tabular and graphical form. The report of the study is written through the systematic way by using the computer program MS Word, MS Excel. Firstly I prepared the draft report and then the final report of the study is written.

CHAPTER – FIVE

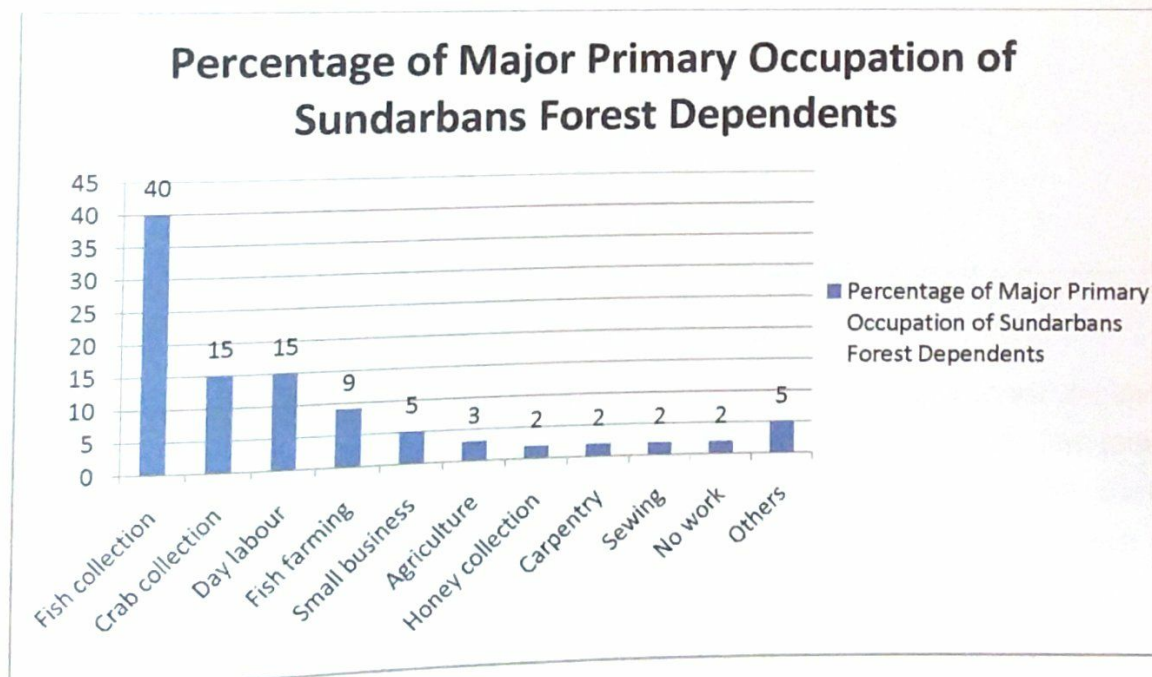
5. RESULTS AND DISCUSSION

5.1 Status of Sundarbans Forest dependents

5.1.1 Major primary occupation of Sundarbans forest dependents

Among the Sundarbans forest dependent peoples 17 categories of primary occupation and 14 categories of secondary occupations were found. All of the household head are involved in these occupations. Major occupations are Fish collector, Fish cultivator, Crab cultivator, Day labour, Small business, Agriculture, Agricultural labour, Boat maker, Boat man, carpenter, Honey collector, Temporary job, Logging, mat seller, Motor cycle driver, Poultry rarer, prawn farming and sewing. Forest Department of Sundarbans reserve forest allows for harvesting the forest resources of fish, crab, honey, Nypa Palm leaf (Non-timber forest products) etc.

Figure 5.1.1: Major primary occupation of Sundarban Forest dependents

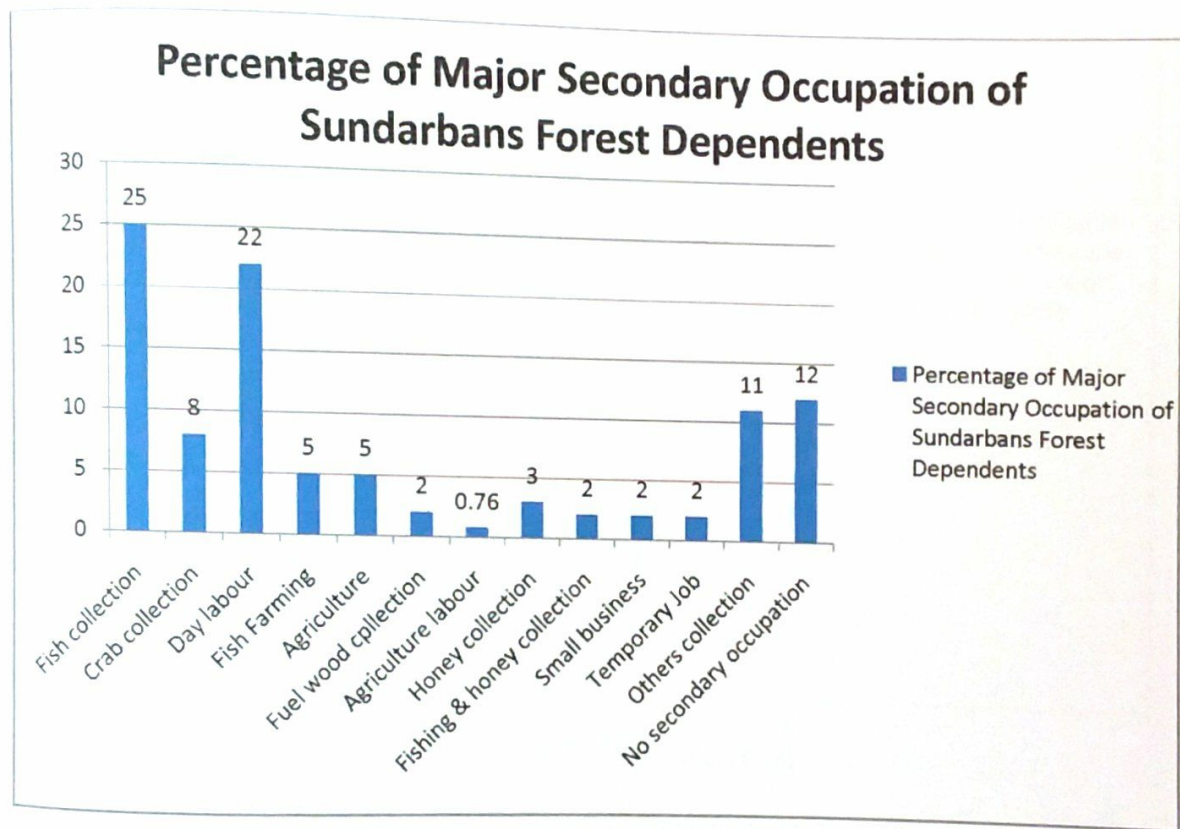


(Source: Field Survey, June 2014)

In the study area most of the household head's primary occupation is fish collection (about 40%) followed by crab collection (15%), day labour (15%), fish farming (5%), honey collection (2%), carpentry (2%), sewing (2%), no work (2%), small business 5% and rest of them are from 1 to 2% (Figure 5.1.1). Percentage of honey collector and Nypa palm leaf collector are very low.

5.1.2 Major secondary occupation of Sundarbans forest dependents

Figure 5.1.2: Major secondary occupation of Sundarbans Forest dependents

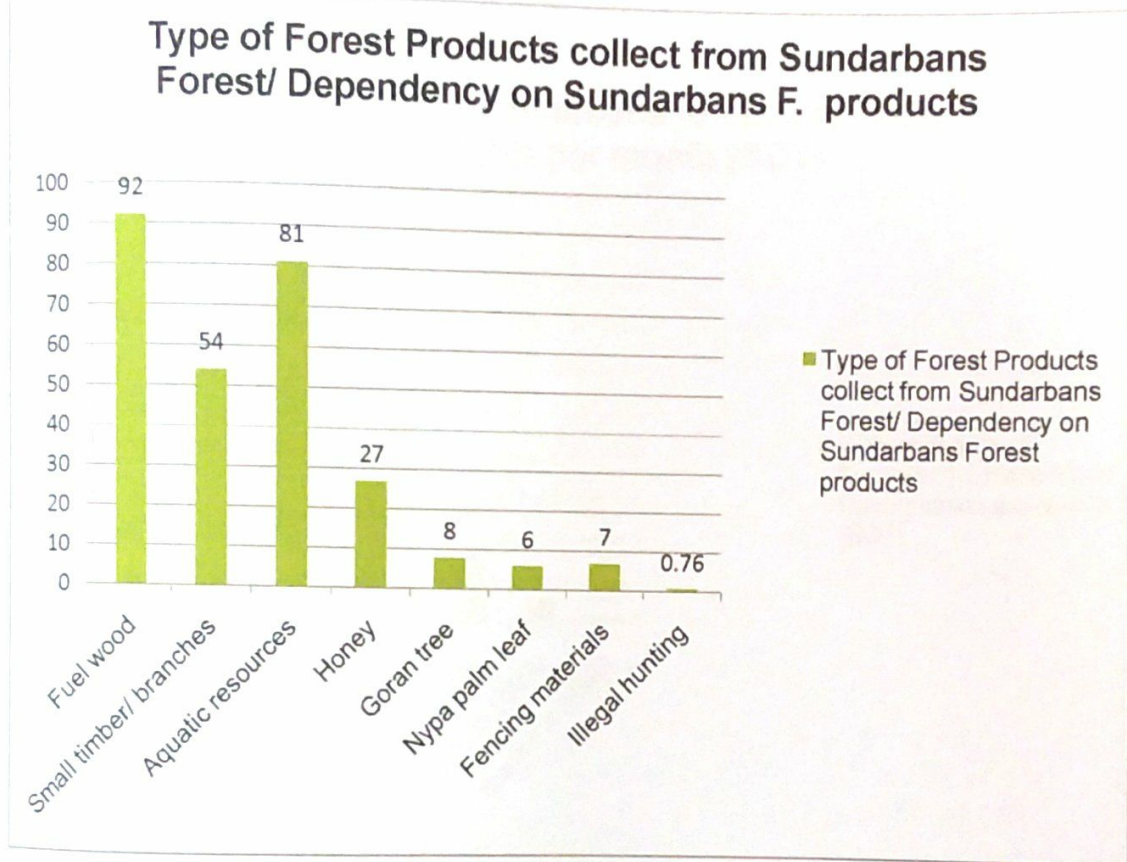


(Source: Field Survey, June 2014)

The figure 5.1.2 shows the major secondary occupation of Sundarbans forest dependent. Highest secondary occupations are fish collection (25%) and day labour (22%). Fish farming, crab collection, agriculture, fuel wood seller, agriculture labour, honey collector, small business, temporary job holder and others occupations are laying within 2 to 11%. It is noted that 12% dependents have no secondary occupation. Others secondary occupations is included agricultural labour, boat maker, honey collector, temporary job holder, firewood seller, mat seller, motor cycle driver and poultry rarer.

5.1.3 Type of forest products from Sundarbans Forest/ Dependency on Sundarbans Forest products

Figure 5.1.3: Type of Forest Products collect from Sundarbans Forest/ Dependency on Sundarbans Forest products

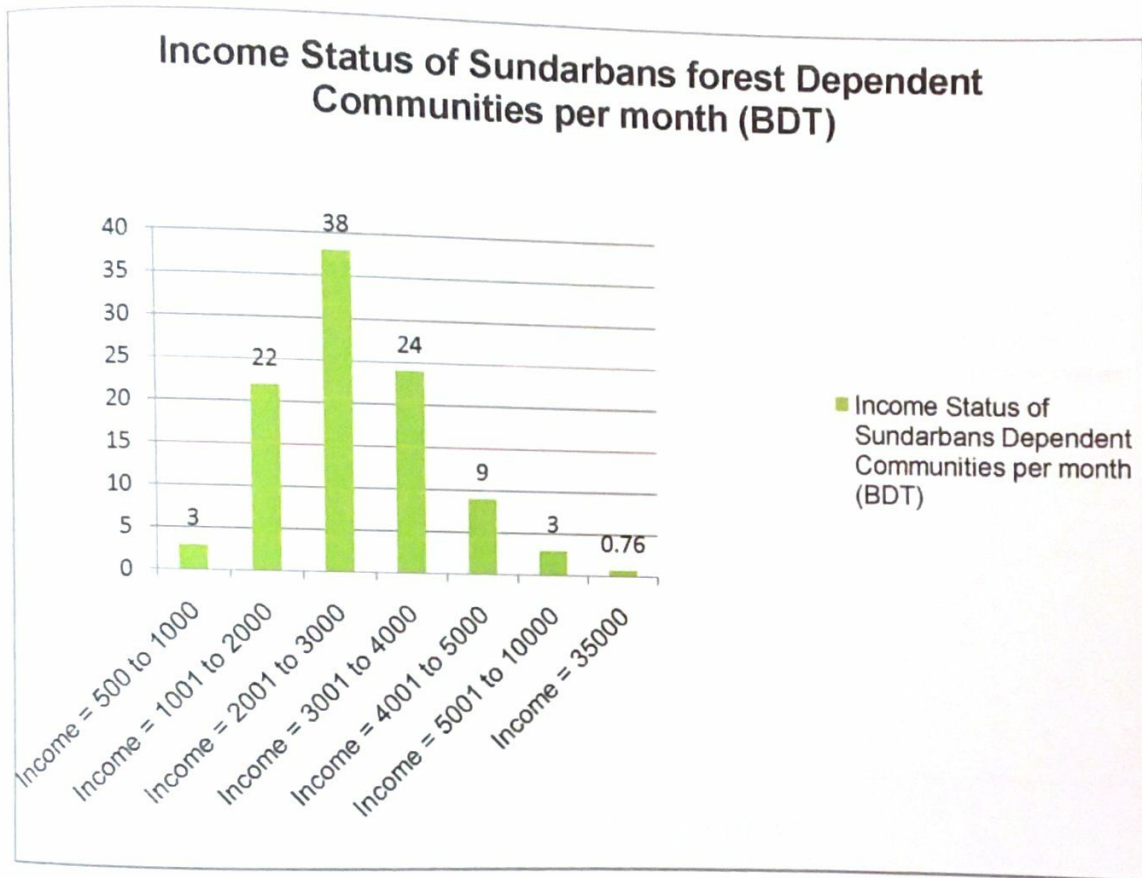


(Source: Field Survey, June 2014)

The figure 5.1.3 shows the type of forest products collected from Sundarbans, these are – fuel wood (collected by 92% people), small timber/ branches (collected by 54% people), aquatic resources including (fish, crab, tortoise, snail etc. collected by 81% people), honey (collected by 27% people), Goran tree (collected by 8% people), Nypa palm leaf (collected by 6% people), fencing materials (collected by 7% people) and illegal hunting of wildlife (is done by 0.76% people).

5.1.4 Socio-economic condition of the Households of Sundarbans forest dependents

Figure 5.1.4: Income status of Sundarbans forest dependent communities



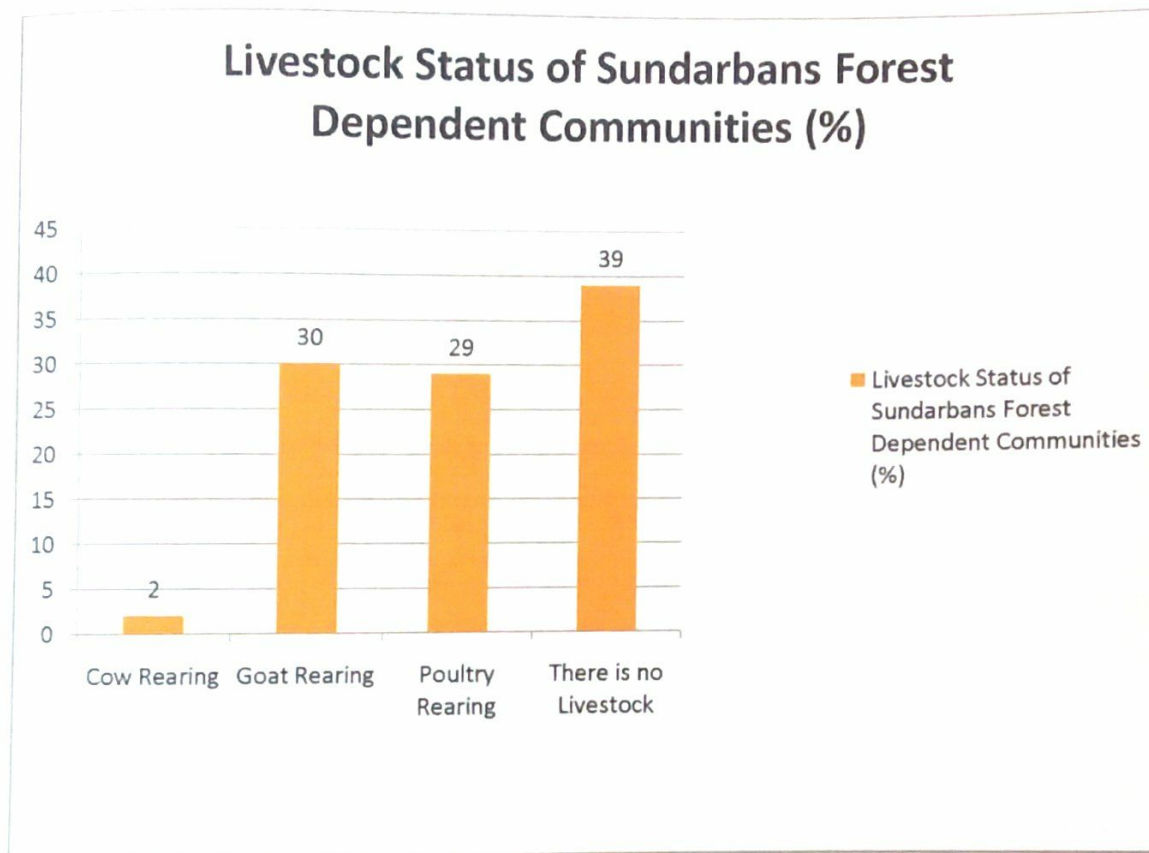
(Source: Field Survey, June 2014)

The figure 5.1.4 shows the income status of Sundarbans forest dependents. Three percent dependents have income of 500 to 1000 BDT per month whereas 22% have 1001 to 2000 BDT per month, 38% dependents have income of 2001 to 3000 BDT per month, 24% dependents have income of 3001 to 4000 BDT per month, 9% have 4001 to 5000 BDT per month, 3% have 5001 to 10000 BDT per month, 0.76% has 35000 BDT per month.

Among these 53% dependents have savings and 47% dependents have no savings.

5.1.5 Livestock status of Sundarbans forest dependents

Figure 5.1.5: Livestock status of Sundarban Forest dependent

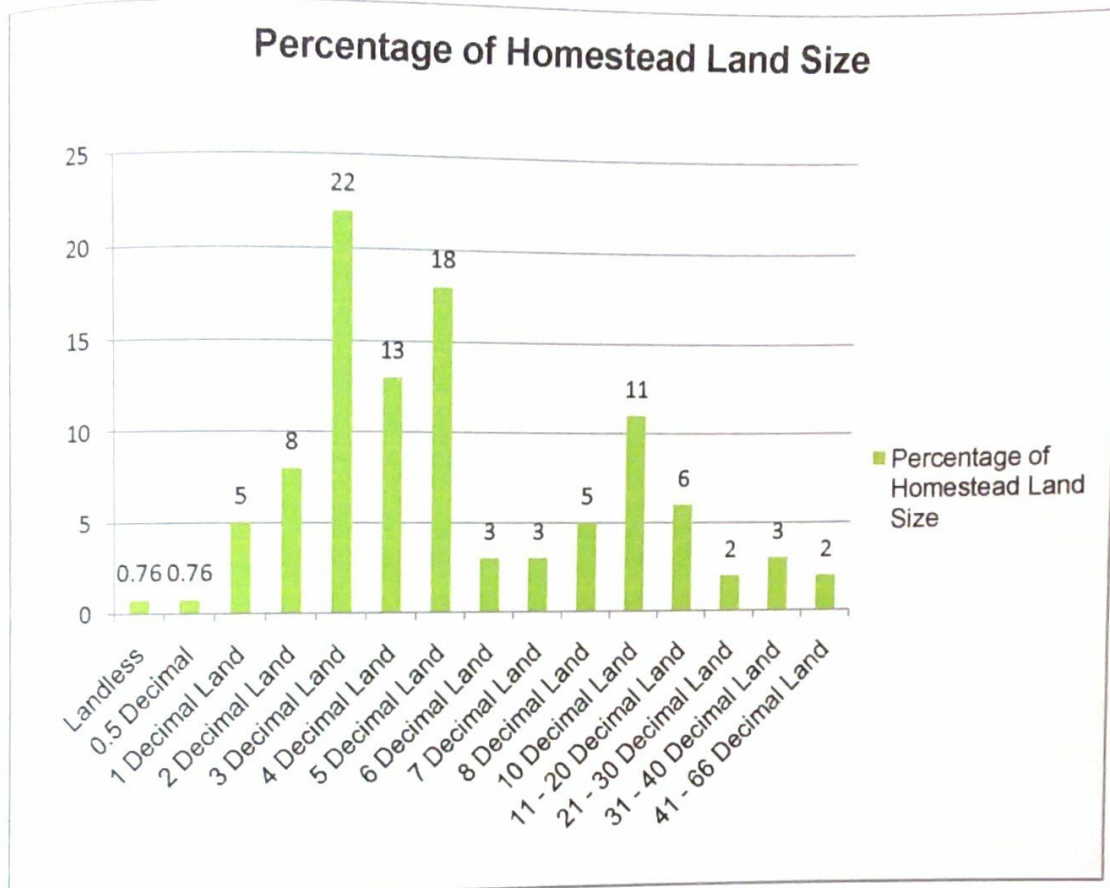


(Source: Field Survey, June 2014)

Figure 5.1.5 shows the livestock status of Sundarbans forest dependents. In this study, we found 2% cow rearing, 30% goat rearing, 29% poultry rearing and 39% forest dependents were found no livestock. Most of the dependents are not interested to rear livestock due to limited homestead land areas, fodder crisis. Salinity is also a major reason for not keeping livestock in this area.

5.1.6 Homestead land size of Sundarbans forest dependents

Figure 5.1.6: Percentage of homestead land size of Sundarbans Forest dependents

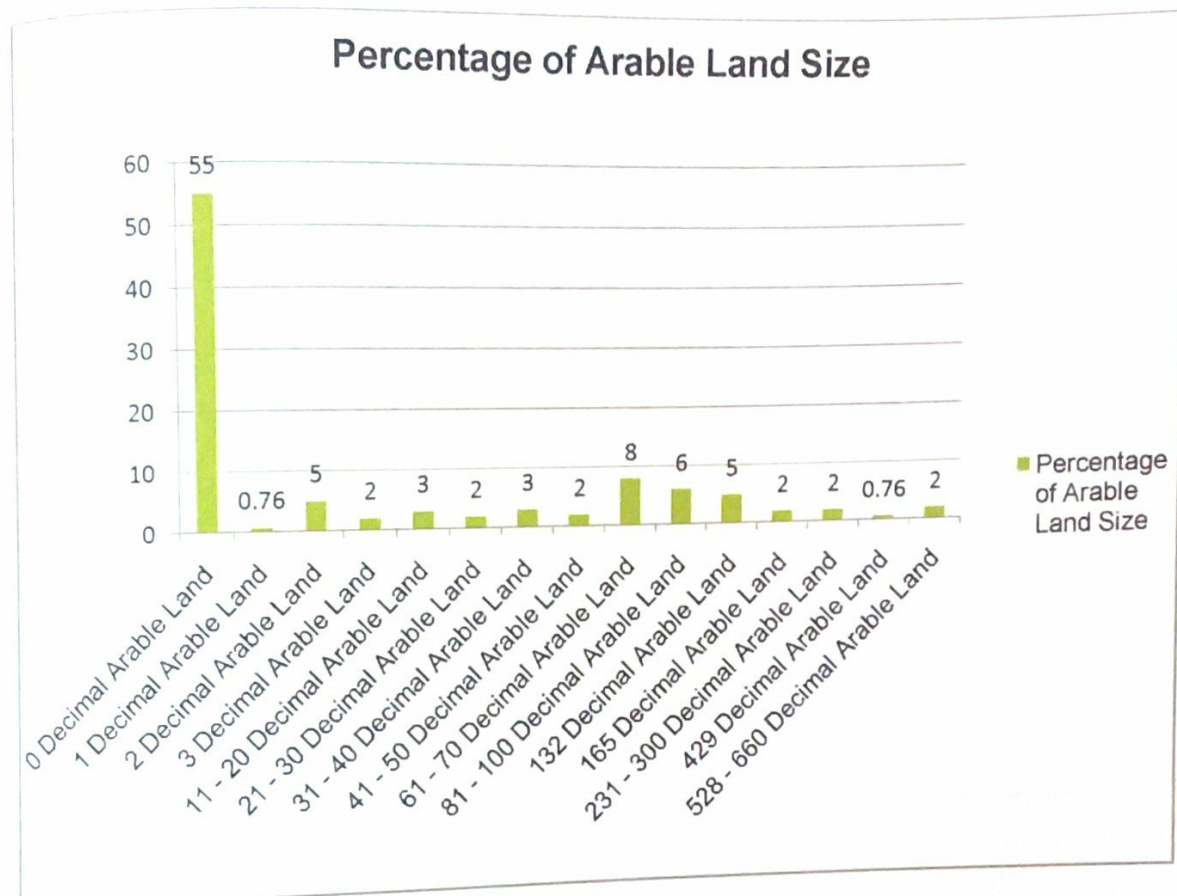


(Source: Field Survey, June 2014)

Figure 5.1.6 shows the land area of the respondents. 0.76% people are found as landless and 0.5 decimal land, whereas, 5% people have 1 decimal land, 8% people have 2 decimal homestead land, 22% people have 3 decimal homestead land, 13% people have 4 decimal homestead land, 18% people have 5 decimal homestead land, 3% people have 6, 7 and 5% people have 8 decimal homestead land, 11% people have 10 decimal land and 6% people have 11-20 decimal homestead land, 2% people have 21-30 and 41-66 decimal land and 3% people have 31-40 decimal homestead land.

5.1.7 Arable land size of Sundarbans forest dependents

Figure 5.1.7: Percentage of arable land size of Sundarbans Forest dependent

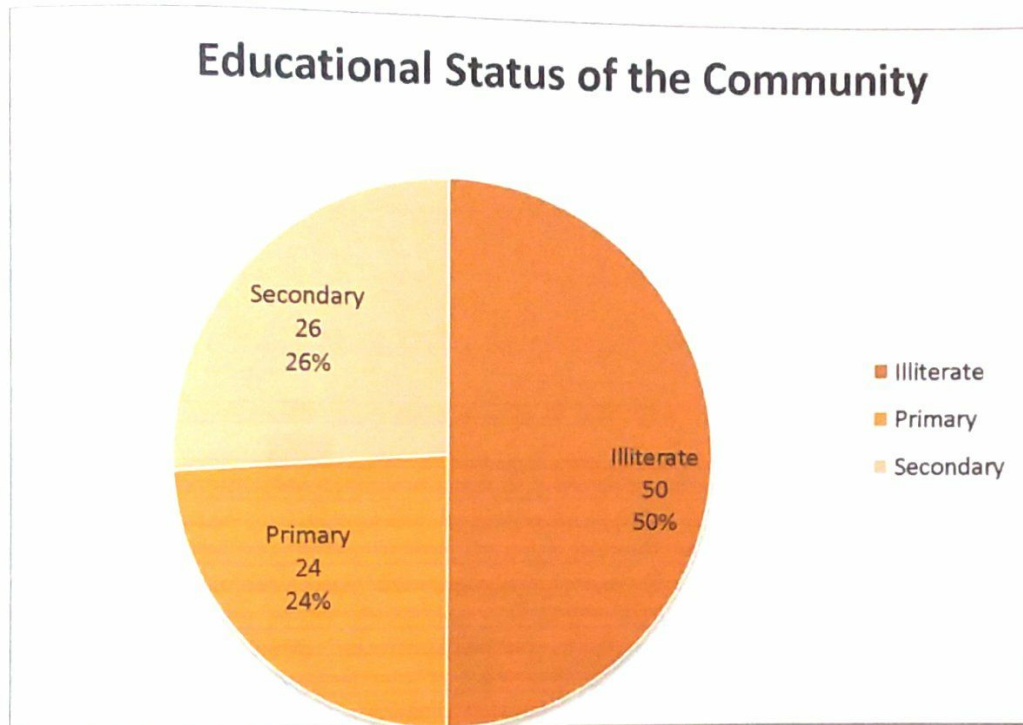


(Source: Field Survey, June 2014)

As shown in figure 5.1.7, 55% forests dependent have no arable land at all. 0.76% forest dependent have 1 decimal and 429 decimal arable land, 5% forest dependent have 2 decimal arable land, 2% forest dependent have 3 decimal, 21 to 30 decimal, 41 to 50 decimal, 165 arable land, 2% forest dependent have 31 to 40 decimal, 528 to 660 decimal arable land, 3% forest dependent have 31 to 40 decimal, 231 to 300 decimal, 528 to 660 decimal arable land, 3% forest dependent have 31 to 40 decimal, 231 to 300 decimal, 528 to 660 decimal arable land, 8% have 61 to 70 decimal land, 6% have 81 to 100 decimal land and 5% have 132 decimal arable land.

5.1.8 Education level of all Sundarbans forest dependents

Figure 5.1.8: Education level of all Sundarbans Forest dependents

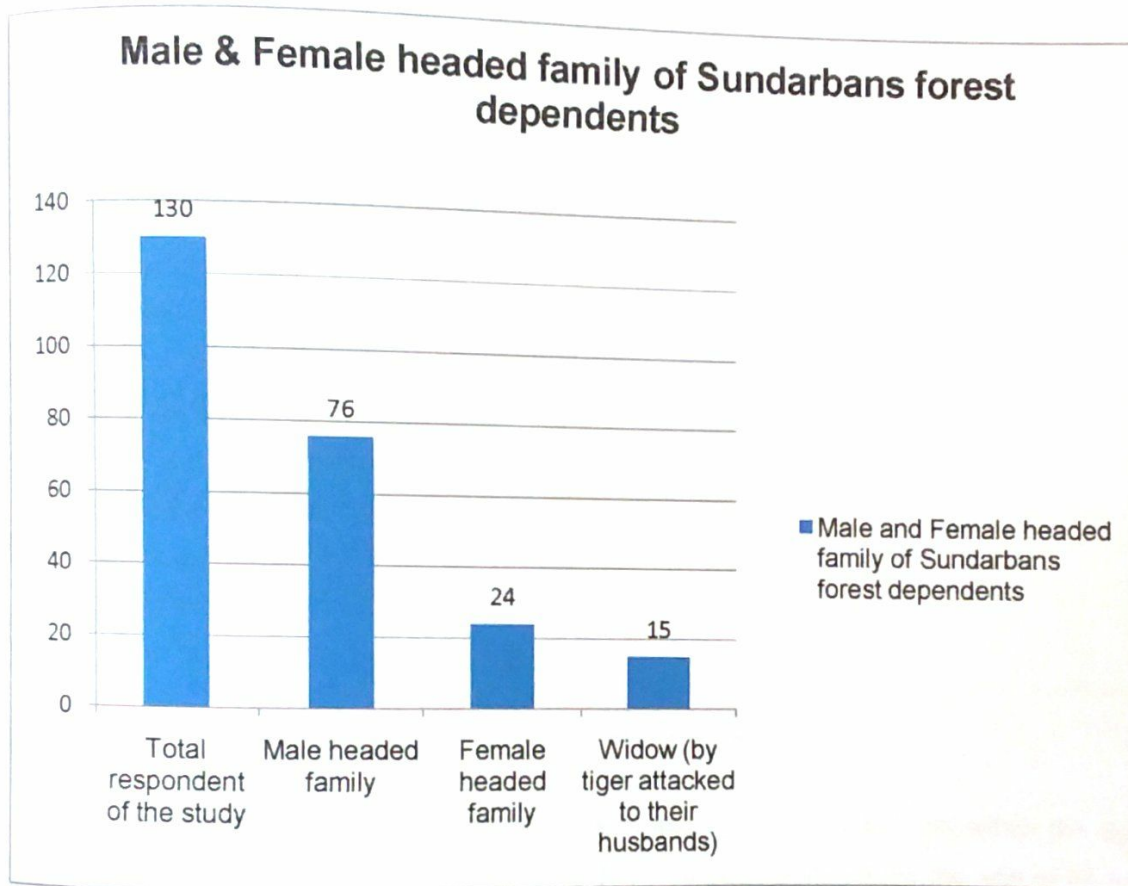


(Source: Field Survey, June 2014)

Education status of the peoples among Sundarbans forest dependents are shown in figure 5.1.8. Among Sundarbans Forest users 50% peoples are illiterate, 24% people have education up to primary level and 26% people are literate with secondary level education. From this study it is found that literacy rate of this area is very low and more improvement is needed in this sector.

5.1.9 Male and female headed family of Sundarbans forest dependents

Figure 5.1.9: Male and Female headed family of Sundarbans Forest dependents



(Source: Field Survey, June 2014)

The figure 5.1.9 shows the average family size of respondents of this study. It is found that 76% household within 130 respondents are male headed family, 24% household are female headed family and within these female households 15% female are widow as their husbands are killed by Tigers.

5.1.10 Age category of harvesters

Figure 5.1.10: Age category of harvesters of Sundarbans Forest dependents



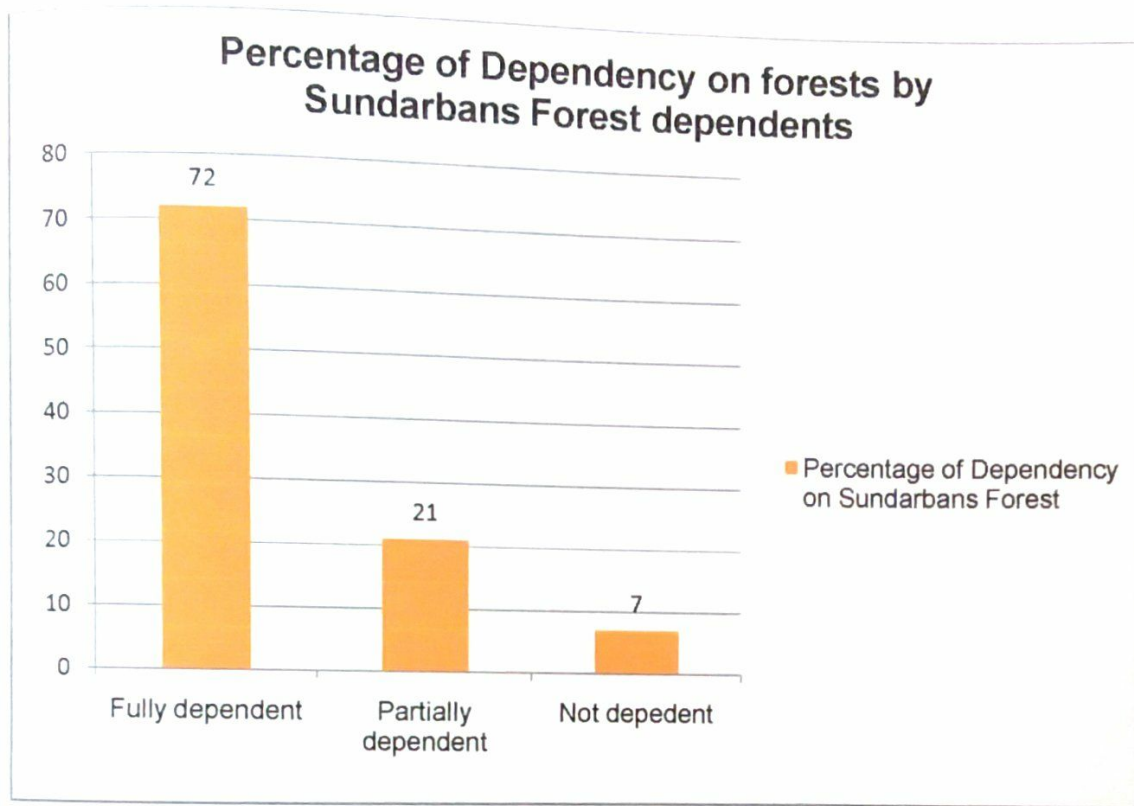
(Source: Field Survey, June 2014)

The figure 5.1.10 shows the age category of respondents. 17% harvesters are within the age of 21 to 30, 34% people are within the age of 31 to 40, 31% people are within the age of 41 to 50, 11% people are within the age of 51 to 60, 5% people are within the age of 61 to 70 and 2% people are within the age of 71 to 80.

Here, 15% respondents migrate seasonally one place to another for getting work and 85% respondents do not migrate seasonally. Seventy two percent respondents have access to disaster warning information before occurring the disaster and remaining 28% respondents have no access to get disaster early information to at least before the minimum time required to evaluate. 12% respondent has got training on IGA and 88% respondent did not get any training on IGA.

5.1.11 Percentage of dependency on forests by Sundarbans forest dependents

Figure 5.1.11: Percentage of dependency on forests by Sundarbans Forest dependents



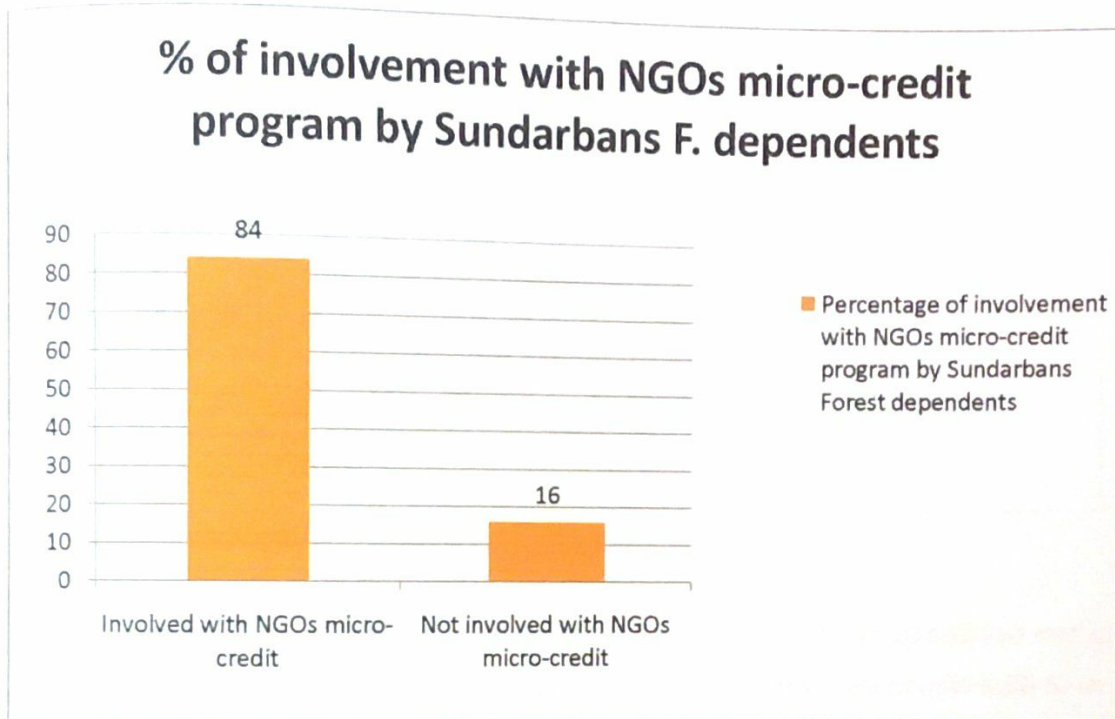
(Source: Field Survey, June 2014)

The figure 5.1.11 shows the dependency of respondent on Sundarbans Forest products. Here, it is found that 72% forest users are fully dependent on Sundarbans Forest products, 21% forest users are seasonally dependent and 7% forest users are not dependent on Sundarbans forest products.

This study also found that 89% people did not get any VGD/VGF card from Government and only 11% people has got VGD/VGF card. 8% people are aware on knowledge on co-management and 92% people are not aware on this issue. 92% people are interested to change their occupation and only 8% people are not interested to change their present occupation.

5.1.12 Percentage of involvement with NGOs micro-credit program by Sundarbans Forest dependents

Figure 5.1.12: Percentage of involvement with NGOs micro-credit program by Sundarbans Forest dependents



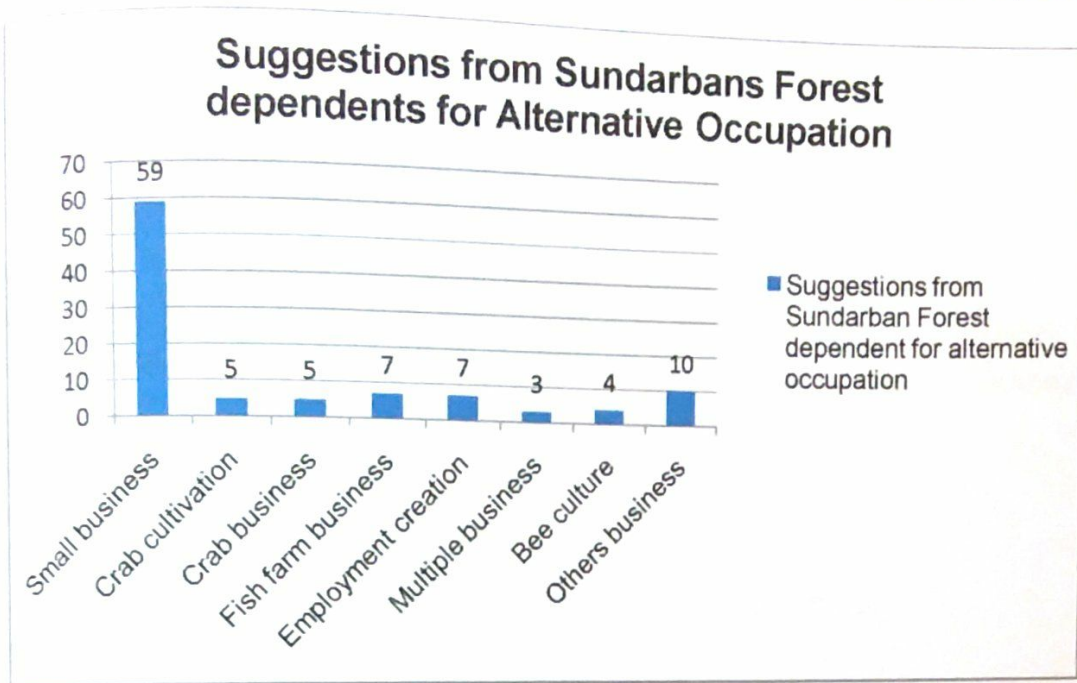
(Source: Field Survey, June 2014)

The figure 5.1.11 shows the dependency of respondent on Sundarbans Forest products. Here, it is found that 76% forest users are fully dependent on Sundarbans Forest products, 22% forest users are seasonally dependent and 2% forest users are not dependent on Sundarbans forest products.

This study also found that 92% people did not get any VGD/VGF card from Government and only 8% people has got VGD/VGF card. 8% people are aware on knowledge on co-management and 92% people are not aware on this issue. 92% people are interested to change their occupation and only 8% people are not interested to change their present occupation.

5.1.13 Suggestions from Sundarbans forest dependent for alternative occupation

Figure 5.1.13: Suggesstions from Sundarbans Forest dependent for alternative occupation



(Source: Field Survey, June 2014)

Figure 5.1.13 shows suggestions from Sundarbans forest dependents for alternative occupation in this study. 59% people said to take occupation as small business, 5% people said to do crab cultivation and crab business as occupation, 7% people are interested to do fish farm business and creating employment as occupation, 3% people are interested to take multiple business as occupation, 4% people are suggested to take initiative to do bee culture business as occupation and 10% people are suggested to do the businesses like agriculture, honey business, industrial work, livestock rearing, mason, van riding as occupation.

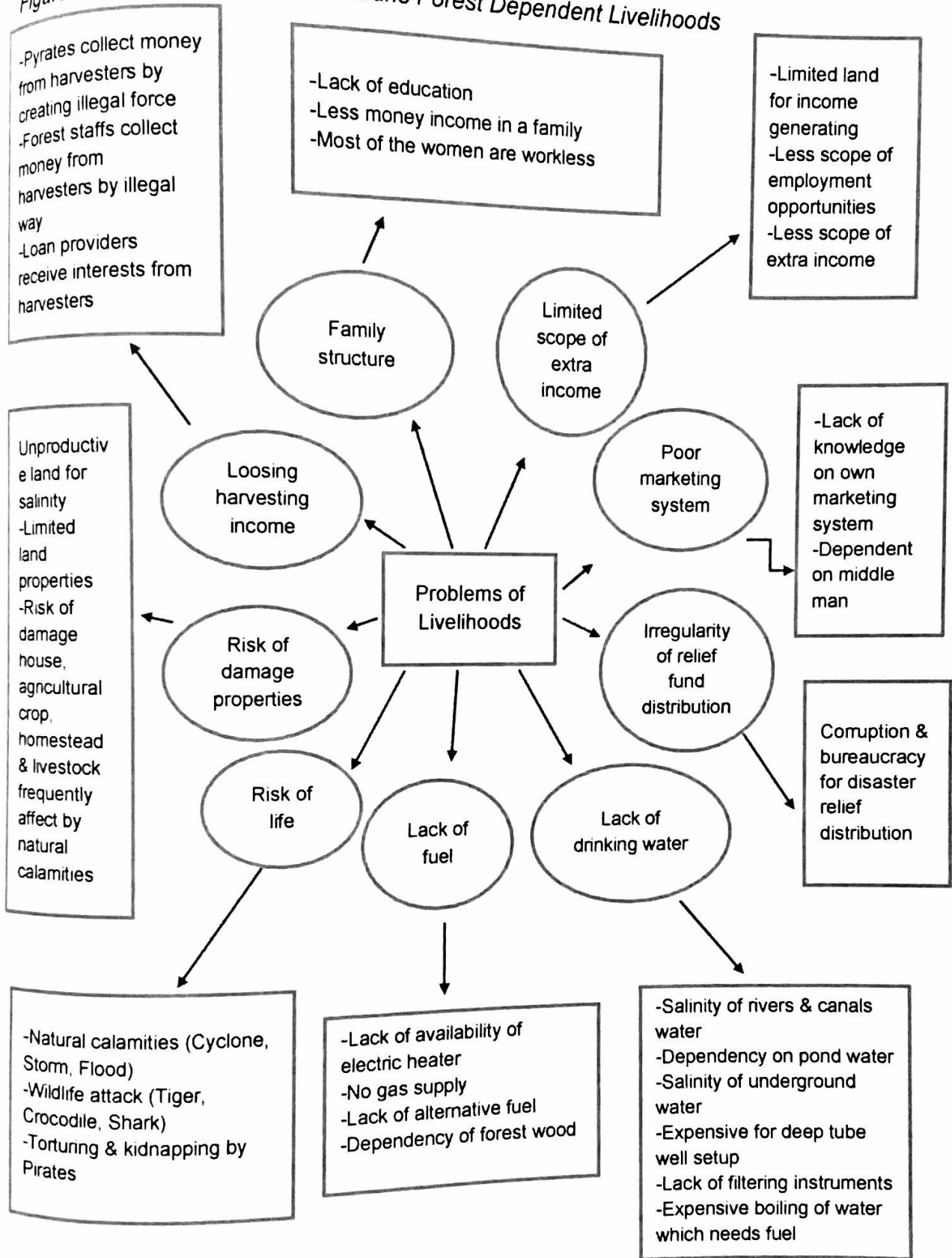
In these above findings, it is clearly seen that the household income level of fish collector, Crab collector, Honey collector, tree branches collector and Nypa palm leaf collector is very similar that is not so different from each other. Family size of all categories of harvesters is also very similar. Land properties of fishermen, crab and honey collector are more or less similar. Nypa palm leaf collector land property is better than other harvester but the variation is not high. So from the study we can say all of the Sundarbans forest resources harvesters' economic condition is not so different from each other. But every harvesters land status is very poor and maximum household land are very limited. So, they have limited scope to use of land for their income generating. Soil salinity is very high in Sundarbans buffer zone, unsuitable for

agricultural production. This condition is also adverse for their land use. In this study it is found that all household income person is very low (average 3396.15 BDT per month), most of the family depends on one person's income. All forest dependent household's annual income is very low in context of the economy of Bangladesh and other source of income of households is very poor. For the low income they have no capacity to educate their children. After primary level most children are not able to continue their study. All harvesters are highly dependent on forest recourses. Most of household incomes come from their forest harvesting products. Pyrates, Forest staff significantly affects the income of Sundarbans forest harvesters. Pyrates collect money from all harvesters by forcing and forest staffs collect money by following illegal way. If we see the problem it is clear that the Sundarbans dependent people livelihood is very much vulnerable.

5.2 Problems of Livelihoods of Sundarbans forest dependents

Every forest dependents people of Sundarbans are facing different challenges. Their income affected by pyrates, forest staff, loan and suffering for natural calamities like cyclone, flood, storm, risk of tiger attack, enforcing of pyrates and scarcity of drinking water, lack of land property, salinity, low scope of alternative income, lack of government support make their vulnerable livelihoods. The figure (figure 5.2.1) of livelihoods problems has drawn from the study survey in Sundarbans.

Figure 5.2.1: Problems of Sundarbans Forest Dependent Livelihoods



CHAPTER - SIX

6. CONCLUSION:

The objective of the study was to know the present livelihood status of Sundarbans forest's dependents considering biodiversity conservation, present situation due to climate change, causes of deforestation and how they are managing their livelihoods from poverty.

This research found the actual scenario of livelihoods of Sundarban dependents at Shyamnagar Upazila under Satkhira District, how biodiversity conservation of Sundarbans forest is declining due to climate change, deforestation, illegal hunting and breaking the role of regeneration day by day and how can they overcome the chronic poverty. The research explores that harvesters are not able to get actual benefit from the resources of the Sundarbans for pyrates, illegal money collector by Forest staffs and that led the lower income of forest dependents. For low income they take loan for mitigating their harvesting operating cost. Forest dependents also lose significant amount of money from their income for paying high loan interest. This research also found that the users are highly dependent on Sundarbans forest resources for their livelihood. Most of the households are dependent on Sundarbans specially for fuel wood for mitigating their fuel consumption. The research shows that if the forest dependents can be free from the factors of pyrates, forest staff and loan interest, their income well be improved by adopting AIGA can be a proper way to reduce the pressure on forest resources and for their sustainable development.

The paper recommends how the pressure by harvester on Sundarbans forest resources can be reduced and how can they protect the biodiversity of forests by creating alternative income generating activities and how they can recover from their vulnerability and suggests to establish good governance specially considering human rights, strong law enforcement and effective management system for improving their status of livelihood of Sundarbans forest dependents.

RECOMMENDATION

Biodiversity conservation, global warming, air pollution, ozone layer depletion and adaptation to climate change are global issues. At present demand of protected area is increasing in the globe for the well-being of human being and this can play a significant role for biodiversity conservation and the sustainable development of vulnerable communities. Sundarban Forest provide a diverse benefit to people. protected are establishment make a systematic way that people get proper benefit through sustainable use of Sundarban forest resources and ensuring local people participation and involvement for management and decision making process.

We should take the following initiative for poverty alleviation and livelihood improvement of the forest dependents people.

- To provide training for awareness on biodiversity conservation.
- To provide training on afforestation and impact of deforestation & wildlife hunting.
- To provide input support for their Alternative Income Generating Activities (AIGA).
- To provide input support for Improved Cooking Stove (ICS) for reducing the pressure on fuel wood.
- To encourage more planting of local trees by the side of crop fields and ponds.
- To introduce or find out drought & salinity tolerant varieties.
- To provide training on plant nursery raising (timber, fruits and medicinal trees), technique of seed collection and preservation.
- To provide training on preservation of rain water for drinking and irrigation technique for crop production.
- To provide training on DRR and Climate Change Adaptation.
- To ensure education for every child.

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Questionnaire for Livelihood Assessment

Date:/...../ 2014

Respondents' Name: Age:

Sex: M / F Religion: Ethnicity:

Village: Union: Upazilla:

HOUSEHOLD INFORMATION

1. Family size: and family information:

Age group	Sex		Education	Occupation	Any training received	Roles in livelihood activities
	M	F				
<5						
5-10						
10-20						
20-30						
30-40						
40-50						
>50						
Total						

2. Land Holdings (decimal):

Category	Size (decimal)	Tenure	
		Own	Leased
Homestead			
Agriculture			
Tree land			
Bamboo Graves			
Gher/Pond			
others			

Do you have Livestock? Yes / No

Type	Number	Sources of feed

If not, why? What are the problems of rearing livestock?

3. Occupation (Respondent):

SL No.	Criteria	Tick mark	SL No.	Criteria	Tick mark
1	Own Agriculture		12	Rickshaw/van/Boat driver	
2	Agriculture labor		13	Motor cycle driver	
3	Fish farming		14	Small business	
4	Fish labor		15	Housewife	
5	Mud crab collection		16	Small scale cottage	
6	Golpata collection		17	Unemployed	
7	Fishing		18	Rely on neighbors	
8	Logging		19	VGf/VGD	
9	Tourist guide		20	Fuel wood cutting	
10	Hunting		21	Others: specify	
11	Honey collection				

4. Which are the main income sources and total income per month?

.....

5. Do you have any secondary income source? Yes / No

6. What are your households'/your secondary or part time income?

7. Do you have savings after meeting all expenditure? Yes / No

8. Access to financial sources:

Sources	Access status	
Bank credit		
NGO credit		
Dadon/ Mohajon		
VGf/VGD		
Friends/Relatives		

9. Sources of drinking water, distance and availability?

.....

11. Did you get any training on alternate income generation activity?

Yes		No	
-----	--	----	--

If yes, what types of training?

.....

Duration of Training:

12. Do you know about Sundarbans Co-management Committee?

Yes		No	
-----	--	----	--

If yes, do you have any involvement?

Yes		No	
-----	--	----	--

13. Do you have any involvement with forest department with regard to forest management?

Yes		No	
-----	--	----	--

14. Is there any community based welfare Organization in your area?

Yes		No	
-----	--	----	--

Name of Organization:

If yes, do you participate?

Yes		No	
-----	--	----	--

15. What do you produce or sell?

Products	Produce	Sell
Rice		
Vegetable		
Poultry		
Milk		
Fish		
Handicrafts		
Honey		
Fuel wood		
Medicinal plant		
Others: specify		

16. Do you migrate seasonally outside?

Yes		No	
-----	--	----	--

Why do you migrate and where?

17. Does any member of your family get VGD/VGF social safety net support?

Yes		No	
-----	--	----	--

18. What types of disaster does occur regularly in your locality?

- 1) Flood 2) cyclone 3) River erosion 4) Soil degradation 5) Water Sanity

6) Others: specify

Is there any shelter for your life and asset?

- (1) Yes (2) No (3) Not applicable

- Did they get any awareness information or warning before occurring disaster:

Yes/ No

- What steps were taken by them after disaster (up to six months)?

.....

- Did they take loan from Bank /NGO/ CBO or others Yes / No

- Did they sell valuable asset like gold / furniture / Blanket Yes / No

- Did they sell land or homestead Yes / No

- Did they stop their children education Yes / No

- Did they get safe drinking water Yes / No

- Did they get three times food per day Yes / No

- How many days they did not get three times meal per day?days

19. If you suffer from illness where do you go for treatment?

- 1) Govt. hospital 2) Private clinic 3) NGOs 4) Others:

20. Are you affiliated with any financial organization or cooperatives?

- If yes, mention its name 1) Government 2) NGOs 3) Other

What types of help they provide?

.....

21. Are you dependent on the Sundarbans? Yes / No

If yes: Totally Seasonally

If seasonally then which season you depend on and why?

.....

22. What type of products do you / your family gather from Sundarbans?

Timber/Pole/Fence Fish/Marine resources Illegal hunting Honey and wax

Fuel wood Goran Golpata others

23. Do you want to change your present occupation if you get better opportunities?

Yes / No

24. What would be the alternative source of income other than entering Sundarbans?

.....

.....

25. Do you have shrimp gher? Yes / No

26. Are you willing to plant grass and/or trees on your gher /dike? Yes / No. If yes,

Name of Trees:

Name of grass: