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**Socio-Economic and Biophysical Impact of Coastal Green Belt
at
Munshiga: Union of Satkhira District**

Md. Golam Morshed Rajib



**FORESTRY AND WOOD TECHNOLOGY DISCIPLINE
KHULNA UNIVERSITY
KHULNA**

2014

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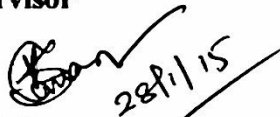
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This thesis paper has been prepared and submitted to Forestry and Wood Technology Discipline, Khulna University, Khulna, Bangladesh for the partial fulfillment for the degree of B.Sc. (Hon's) in Forestry.

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Declaration

I, hereby, declare that this thesis is the result of my own works and it has not previously been submitted or accepted for any degree in any university or institution. The results submitted in this thesis are entirely the author's own investigations.

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Dedicated
To
My Beloved Parents, My Elder Sister
And My Best Friends

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All praises are to the Supreme Being, creator and justice of the universe, whose mercy keeps us alive and enables us to persue my education in Forestry and Wood Technlogy Discipline and complete the thesis work for the completion of B.Sc. (Hon's) in Forestry.

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Abstract

Coastal Greenbelt is a measure to prevent coastal erosion and reduce other natural hazards by planting trees and creating forests along the coasts.

Present study was conducted to identify the socio economic and biophysical impact of the Coastal Green Belt plantation. At Munshiganj Union of Satkhira district a total of 80 respondents were interviewed from various places like Primary and High school, Bazar, Agriculture field, Upzilla parishad, near the riverside area etc. In the field survey, it was found that most of the respondent (78%) says there is Coastal green belt plantation and about 21% of the respondent lives near the river side where there no plantation in the embankment.

Respondent are very positive towards the Coastal Greenbelt plantation for the facilities they got. They got tangible and intangible benefit from the Coastal Greenbelt plantation. About 78% respondent says they got such facilities for the plantation and 21% respondent says they did not have any benefit from Coastal Greenbelt plantation.

There are many places; there is no plantation in the riverbank embankment. Therefore, there should be planted mangrove species. For saline water, mangrove species is suitable for the plantation. Therefore, these plantation sites not only give the biophysical protection, also gives the intangible benefit to the people.

Through the research work, there is found that the people's attitude towards the plantation are positive. They are very much interested and they understand the benefit of the Coastal greenbelt plantation.

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CHAPTER ONE: Introduction

1.1) Background

Coastal zone covers 29% of Bangladesh. The zone is rich with numerous natural resources. It has the largest single tract of mangrove forest in the world, the Sundarbans. It houses a substantial amount of mangrove plantation.

The coastal region includes offshore islands, mudflats, chars and new accretions. Because of the large population (140 million) in a very small country (147570 square kilometers), the coastal areas of Bangladesh are densely populated. More than 35.10 million people live here. Agriculture is the main occupation in the zone. Other important occupations include fisheries and salt production. With respect to natural resources such as gas and minerals and further prospects for aquaculture, capture fishery, salt production, the zone has the potential to make a significant contribution to the national economy. However due to the geomorphology of the area, the coastal zone is particularly susceptible to tropical storms and tidal surges which frequently occur in the Bay of Bengal (Iftekhar & Islam, 2004).

These natural calamities ravage the area almost regularly and are considered the greatest hindrance to the development of the region and the country as a whole. For this reason, mangroves as coastal shelterbelts are considered most important for the country. After a cyclone devastated the coastal region in the 1960s — except for Khulna District, which is protected by the Sundarbans — coastal, afforestation with mangrove species was initiated to protect life and property from cyclones and tidal surges.

Later, industrial raw material and fuel wood production, conservation of coastal ecosystem and the environment, protection of wildlife and aquatic resources, protection of agricultural land against salt intrusion, tourism, poverty reduction and enhancing land accretion were added to the objectives of development programmes. In this context, over the last four decades the Forest Department has successfully implemented several massive projects and has established some 148 000 hectares of mangrove plantations scattered over on- and offshore areas mostly along the central part of the coast (Islam, 2006).

1.2) Objectives of the green belt program

- To rehabilitate local livelihoods through sustainable restoration and management of coastal ecosystems.
- Protecting the Greenbelt functions and boundaries as a biodiversity reserve.
- Supporting the preservation and enhancement of agricultural lands.
- Promoting public awareness of the value of the Greenbelt and encouraging participation.
- Raising the Mangrove plantation by Species *Lumnitzera spp*, *Ceriops spp*, *Avicennia spp*, *Excoecaria agallocha*, & *Sonneratia spp*.
- Protect land from the landslide and River bank erosion.
- To participate in the climate change and mangrove plantation works as carbon sinker.
- Protect residential area from natural disaster and calamities.

1.3) Justification

Mangrove plantations along the riverside embankment protect the land from the erosion and landslide. To protect from the natural disaster, the plantation plays a vital role in the embankment. People near the Greenbelt get some supports like, \tangible and intangible benefit from there.

CHAPTER TWO: Literature review

2.1 Concept of greenbelt Plantation

Green belt land refers to an area that is kept in reserve for an open space, most often around larger cities. The main purpose of the green belt policy is to protect the land around larger urban centers from urban sprawl, and maintain the designated area for forestry and agriculture as well as to provide habitat to wildlife (ebanglapedia).

Coastal Greenbelt a measure to prevent coastal erosion and reduce other natural hazards by planting trees and creating forests along the coasts. The south and eastern coasts of Bangladesh face tidal surges and erosion every year. It has been determined that the main protection against tidal surges will not come from the so-called strip planting but from largescale non-raised foreshore and charland mangrove planting. Planting along roads and embankments contributes to the establishment of a greenbelt and plays a role in coastal protection, but a greenbelt has other positive effects too (ebanglapedia).

A greenbelt has two main functions: to protect the embankment from tidal surges through plantings on its outer slope, and to protect life and property in the region by embankment plantings as well as planting in the agricultural hinterland. It also enhances environmental quality. Moreover, it restores and protects the important mangrove forest. It also increases the country's forest resources through perennial vegetation on sea or river embankments (ebanglapedia).

Areas that are designated as green belt must not be built upon because green belt is defined as an open space, however, that does not mean that no buildings can be erected in green belt. Buildings for agricultural uses and sanitation facilities, for instance, are usually allowed. In some cases, it is also possible to change the use of land in green belt and even gain permission for structures that are officially not allowed in green belt. However, such cases are very rare and the local

authorities grant permission only if no suitable site for the building can be found in the urban centre or outside the green belt and there is an accessible business electricity source (ebanglapedia).

2.2) Background of Coastal Green Belt In Bangladesh

The coastal zone has extensive areas of both natural and planted mangrove forest. Natural forest includes the Sundarbans, the Chakaria Sundarbans and fringe mangroves along the eastern coast. The Sundarbans is the world's single largest tract of mangrove forest and in terms of mangrove biodiversity, the richest forest in the world; it is a Ramsar site, part of which has been designated as a World Heritage site. For about a century, the Sundarbans has enjoyed the status of Reserved Forest and has been managed for its productive value.

After a cyclone devastated the coastal region in the 1960s — except for Khulna District, which is protected by the Sundarbans — coastal, afforestation with mangrove species was initiated to protect life and property from cyclones and tidal surges. Later, industrial raw material and fuelwood production, conservation of coastal ecosystem and the environment, protection of wildlife and aquatic resources, protection of agricultural land against salt intrusion, tourism, poverty reduction and enhancing land accretion were added to the objectives of development programmes. In this context, over the last four decades the Forest Department has successfully implemented several massive projects (2.2.1) and has established some 148 000 hectares of mangrove plantations scattered over on- and offshore areas mostly along the central part of the coast (Islam, 2006).

2.2.1) Projects/Schemes for Coastal Forests Executed by the Forest Department, Bangladesh.

- Afforestation in the coastal belt and offshore islands (1960–61 to 1964–65).
- Afforestation in the coastal belt and offshore islands (1965–66 to 1969–70).
- Afforestation Project in the coastal regions of Chittagong, Noakhali, Barishal and Potuakhali (1974–75 to 1979–80).
- Mangrove Afforestation Project (1980–81 to 1984–85).
- Second Forestry Project (1985–86 to 1991–92).
- Forest Resources Management Project (1992–93 to 2001–2002).
- Extended Forest Resources Management Project (2002–03 to 2003–04).
- Coastal Green Belt Project (1995–96 to 2001–02).
- Coastal Char Land Afforestation Project (2005–05 to 2009–10).
- Management Support Project for Sundarbans Reserve Forest (2005–06 to 2009–10).

(Islam, 2006)

2.3.1) Importance of Coastal Green belt Prospect of Bangladesh

Past climate, disasters have shown that resilience to cyclones and storm surges is greater where mangrove greenbelts and buffer ecosystems exist. It is evident that mangroves can mitigate or reduce risk of natural disasters such as cyclones and tsunamis. In 2007 cyclone Sidr damaged severely the south-western part of coastal zone but the damages were less in the localities of the northern side of Sundarban, which indicates that wider mangrove forests play an important role to protect life and properties in the coastal zone.

There are two ways to protect from sea surges, i.e. 1) creating greenbelt and 2) construction of concrete wall or embankment. Protection only by the earth embankment is not enough as it is damaged during the strong surges. However, we do not have enough resources to build concrete

walls. Thus, creating green belt along the coast is the easiest and cheapest way for us to protect our lives and properties from cyclones and sea surges. The forces of cyclones and surges retard when they are obstructed by the greenbelt of trees. As a result, the cyclones and surges become weak before hitting the localities.

Hence, the damages are less. Greenbelt can be established in the following places-

- Two-three meter wide greenbelt along the coast line.
- Greenbelt can be created by establishing plantations in the newly accreted char lands.
- Tree plantation in the both sides of the embankments.
- Homestead plantation.
- Institutional plantation.
- Highways and rural roads plantations.

Environmental, biodiversity related and recreational values of the Sundarbans forest have been appreciated. The forest is now considered for management at the ecosystem level. People become more conscious about the values of the forest.

The coastal afforestation program of Bangladesh has come into being primarily to reduce the effect of cyclones and tidal surges by creating a protective belt of mangrove forests along the coast (Baksha and Islam, 1997). It has been estimated that a 100 to 200 meters wide mangrove belt reduces dimensioning wave heights respectively by 20 to 25% (CPP-II, 1992 in Anon, 2000). Mangrove plantation also helps in land maturation and makes the land suitable for human settlement. Plantation on new accreted land enhances the process of siltation. Within 9 – 10 months of planting, deposition of silt up to 3 meters has been recorded (Das and Siddiqui, 1985).

2.3.2) How Coastal Forest Works as a Barrier:

The function of a barrier – whether coastal forest, breakwater, seawall, or cliff – is to absorb the impact forces and to retard the flow of large storm waves and tsunamis. A seawall, if tall enough, reflects the waves back out to sea. On the other hand, permeable structures, like breakwaters and coastal forests, partly reflect and partly transmit the water. In the case of a coastal forest, energy is progressively absorbed as it passes through the forest. Without the forest barrier, the tsunami will run-up to a maximum height determined by the magnitude and nature of the seismic event that created the tsunami and local factors such as the coastal profile, offshore bathymetry and beach slope that modify the wave's force. Once the tsunami comes on shore, the amount of reduction in water depth, velocity, and force depends on how much water is reflected and energy is adsorbed by the coastal forest (Bari and Chakma 2001).

2.3.3) Effectiveness of Coastal Forests as a Solution:

There is considerable evidence that coastal forests can reduce the force, depth and velocity of a tsunami, lessening damage to property and reducing loss of life. Numerous anecdotes, field surveys and scientific studies in India, Indonesia, Japan, Malaysia, Maldives, Myanmar, Sri Lanka, and Thailand of the 2004 tsunami and other tsunamis show a connection between areas with the highest levels of damage and the absence of coastal forests.

The destructive force of a tsunami is subject to local factors which are often unavailable for analysis (e.g. local bathymetry and coastline configuration) and therefore the protection offered by trees and forests may not be fully quantifiable. On a case by case basis, however, studies often show reductions in the degree of damage to trees with distance from the leading edge of a coastal forest, implying that the force of the tsunami is reduced by the forest and areas to the rear are afforded protection. An additional source of information is provided by studies in which adjacent areas of coastline, with and without trees, are compared. Such studies provide core evidence of

the mitigation potential of forests. Empirical findings are also supported by experiments using models and mathematical analogues of tsunami-forest interfaces. Such methods add further weight to claims of protection by forests against tsunamis. Data from field studies across Asia show that where coastal forests failed, waves were very large or forest width was limited.

2.3.4) The Pre-Tsunami Status of Coastal Trees and Forest Resources and the Forest related Affects of the Tsunami

Reportedly the coasts of Bangladesh and West Bengal in India were not affected by the tsunami of 2004 as the sea was at low tide. As in other parts of the world, mangrove habitat degradation is evident. Despite a long history of management the Sundarbans is said to be experiencing degradation — a decline in crown density and change in vegetation composition in favour of less valuable seral species (*Excoecaria agallocha*) are well-established facts. Causes are probably attributable to changes in the physical environment (e.g. changed sedimentary condition, increased salinity) and overexploitation of resources. Along the southern margin, the forest is shrinking owing to wave-induced erosion. During the 1980s, the entire Chakaria Sundarban was converted into shrimp ponds on the grounds that the substrate in the area was too saline to support productive mangrove forest (Islam, 2006).

The scattered fringe mangrove along the eastern part of the coast is not under any management and is disappearing rapidly due to shrimp pond conversion.

Plantations are generally in good condition and early plantations are now approaching maturity. However in places, they are subject to degradation and encroachment. A second generation of plantation needs to be established to sustain the shelterbelt along the coast. The urgent need to rehabilitate these natural and planted mangroves and develop forestry practices to establish second-generation mangrove plantations is appreciated by the government and steps have been taken accordingly (Islam, 2006).

2.3.5) Implementation of Coastal Forest Rehabilitation: Issues that have emerged and lessons learned

The Sundarbans Forest Department has implemented rehabilitation programmes such as Assisted Natural Regeneration (ANR, 5000 hectares) and Enrichment Planting (EP, 10000 hectares) under the Sundarbans Biodiversity Conservation Project with financial assistance from the Asian Development Bank. The success of these programmes is highly variable and generally they can be viewed as unsuccessful. The main reason for this failure has been inadequate knowledge about ecological processes in the mangrove habitat. For the rehabilitation of degraded mangrove plantations, which are presently thought to be unsuitable for mangroves, the Bangladesh Forest Research Institute (BFRI) has worked over the last two decades to select appropriate species.

In addition the Forest Department has raised 2500 hectares of nipa plantation and created 650 kilometres of strip plantations; it has also distributed 1.40 million seedlings for homestead plantation for improvement of livelihoods in the impact zone surrounding the Sundarbans. To build a green (tree) belt along the coastline (except the Sundarbans region), from 1995 to 2002 the Forest Department also implemented the Coastal Green Belt Project and planted 8 934 kilometres of rail, road and embankment sides as well as 635 hectares on foreshore islands with people's participation (Islam, 2006).

The Forest Department has taken up the Coastal Char Land Afforestation Project (2005–2006 to 2009 2010) at a cost of Tk.180 million which will involve following major activities:

- Raising mangrove plantations with keora (*Sonneratia apetala*) and baen (*Avicennia officinalis*, *Avicennia alba*, *Avicennia marina*) on 11150 hectares.
- Rehabilitation of old plantations with non-mangrove species on 2500 hectares with people's participation.

CHAPTER THREE: General Description of the study area

3.1) Geography of Study Area

Khulna is the south-west division of the country with an area of 22273 sq km (see fig 1), (Dasgupta, 2011) and is bounded by Rajshahi division on the north, Bay of Bengal on the south, Dhaka and Barisal divisions on the east and West Bengal on the west. The Ganges, Gorai Madhumati, Ichamati, Kobadak, Shibsra, Kumar, Rupsa-pasur, Bhairab, Chitra, Raymangal and Mathabhanga are the major rivers that pass through the region. Satkhira is a district in south western Bangladesh. Part of the Khulna Division, it lies along the border with West Bengal in India. Munshiganj is an Upazila of Satkhira District in the Division of Khulna, Bangladesh.

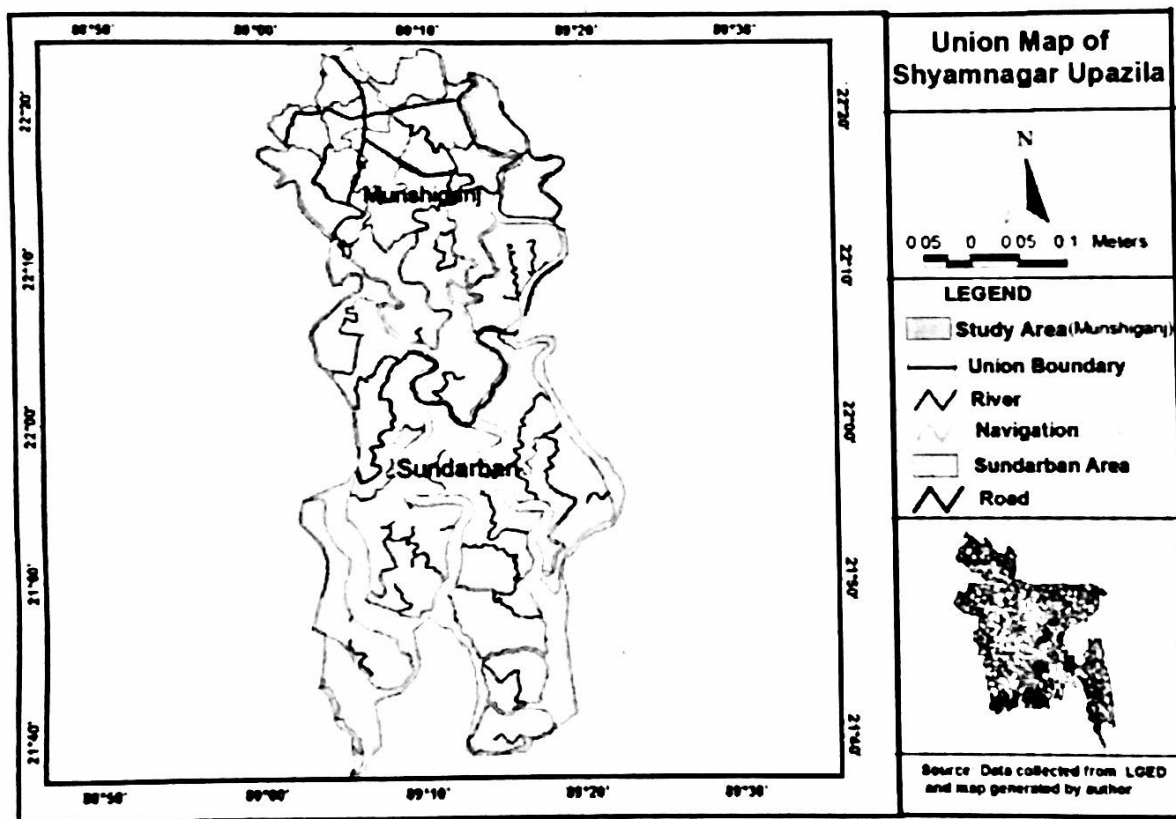


Fig 3.1: Location of the study area (inside the Upzilla Union Map)

3.2) Natural Disasters

Khulna is generally subjected to natural hazards such as flood, cyclonic storm surges, drought and tornado almost every year. In addition, the region has severe constraints due to certain unfavorable soil and land qualities such as salinity and water-logging. Also included are a plethora of hydro-geo-morphological hazards which include poor drainage through its river systems, high rates of sedimentation on river beds, acute low flow conditions during the dry season, salinity ingress along the rivers, moisture stress in the dry season, rise in sea level, and to a lesser extent, and flood. While Khulna located in the coastal zone and Munshiganj lying in the exposed coastal zones of the country, these regions are significantly influenced by tidal effects. According to available statistics on Coastal Zone, majority of the land is within one meter from mean sea level, a significant proportion of which again falls below high-tide level.

Over the past few years, natural disasters in this south western region have become more frequent and devastating. After the flood in 1998, there was another inundation in 2004 that flooded about 2/3rd of the country including the dry & drought prone south-western regions and affected in total more than 30 million people and destroyed around 2 million acres of crop land (www.dmb.com).

In October 2008, the southwest coast was hit by Cyclone Rashmi, and in November of the same year Cyclone Sidr, a category four super cyclone, hit the south and south-west coast causing extensive damage and the loss of over 4,000 lives. Cyclone Sidr devastated around 4 million families and displaced 6 million people (Anon, 2000)

According to unofficial sources, Sidr claimed over thousands of lives in Southkhali union under Sharankhola upazila of Bagerhat of Khulna while thousands of families in the area near the Baleshwar River were rendered homeless by tidal surges.

In 2009, cyclone Aila , the category 1 cyclone, hit South-Western coastal region of Bangladesh on 25 May 2009 and affected 1 million people, displaced around 2 lakh, damaged embankment and 6393 acres of crop fields with saline water.

Cyclone Aila affected an estimated 3.90 million people in 11 coastal districts of the Bangladesh's 64 districts. About 2.3 million people were affected by Aila and many of them stranded in flooded villages as they had no alternative to save themselves. More than 5 lakhs

people were alone affected in Satkhira district of Khulna division. Even though Aila was a weak category cyclone by definition, its economic cost outweighs the impacts of Super cyclone „Sidr“ and brought in long-term sufferings for the southwestern people of Bangladesh. The impact was aggravated as the cyclone hit Bangladesh during the high tide cycle that resulted to tidal surges of up to 22 feet.

The surge of water caused portions of the embankments to collapse and people who believed that the embankments could protect them did not have enough time to evacuate to higher and safer ground. During Cyclone Aila, the storm spent more time over-land than Cyclone SIDR in 2007, lingering over the coast of Bangladesh and increasing its impact on the vulnerable villages. Over 50% of displaced people (more than 200,000) are still living in the same condition in severely affected Khulna and Satkhira District (Das gupta, 2011). The devastations left by Cyclone Aila still remain chronic till date jeopardizing the livelihood patterns and settlements in the area.

CHAPTER FOUR: Materials and Methods

4.1) Study Area

The study was conducted in the Munshiganj upzilla, Satkhira District of Bangladesh over a period from Month June to July 2014. An exploratory survey was conducted in Munshiganj Upzilla to explore actual information regarding the present status, advantage and lack age of Green belt project. To know the way through which people get benefited from the Green belt plantation site.

4.1.1) Selection of the study area

Among 6 Upzillas in Satkhira districts, Munshiganj was selected purposively for the study. The criterion for selecting the site was the presence of Green belt near the riverbank embankment. For the convenient of being carrying out the research as, it is i visit there three times. Information about the Green belt was collected from observation of the places and questionnaire survey among the village people.

4.1.2) Questionnaire Survey

For questionnaire survey of the Up Zilla, sample size was 80, and it was done through random sampling techniques.

4.1.3) Data Collection

The data collection was conducted from the primary data sources. Raw Data collected from the selected location. Secondary data has been also used from different journals; reports; research papers, web sites and others published and unpublished documents of government and non-government. To collect primary data there, different methods had been adopted which were informal interview, a pre-formulated questionnaire survey and Focused Group Discussion (FGD).

4.1.4) Primary data

The primary data has been collected by conducting a survey work with a well-prepared structured questionnaire. For this reason, interviewers were selected randomly. It is also done by physical visit to the village people near the green belt and then interviewing the respondent. In it, informal discussions with the participants and villagers of the target areas also included.

4.1.5) Secondary data

The secondary sources of data including books, journals, various publications of government, institutions and other organizations, articles of local and national newspapers and other research papers on same or similar issues have been used for data collection. In addition to this, internet browsing has also been used as the secondary source of data collection.

4.1.6) Report Writing

After successful information completion of primary data analysis and arrangement all primary and secondary information, then a draft final report was prepared, and it was finalized after some necessary correction.

4.1.7) Limitations of the study

- ❖ Extension survey is costly and time consuming.
- ❖ Literature of this type of study is less available and not rich.

4.2) Flow chart of the methodology

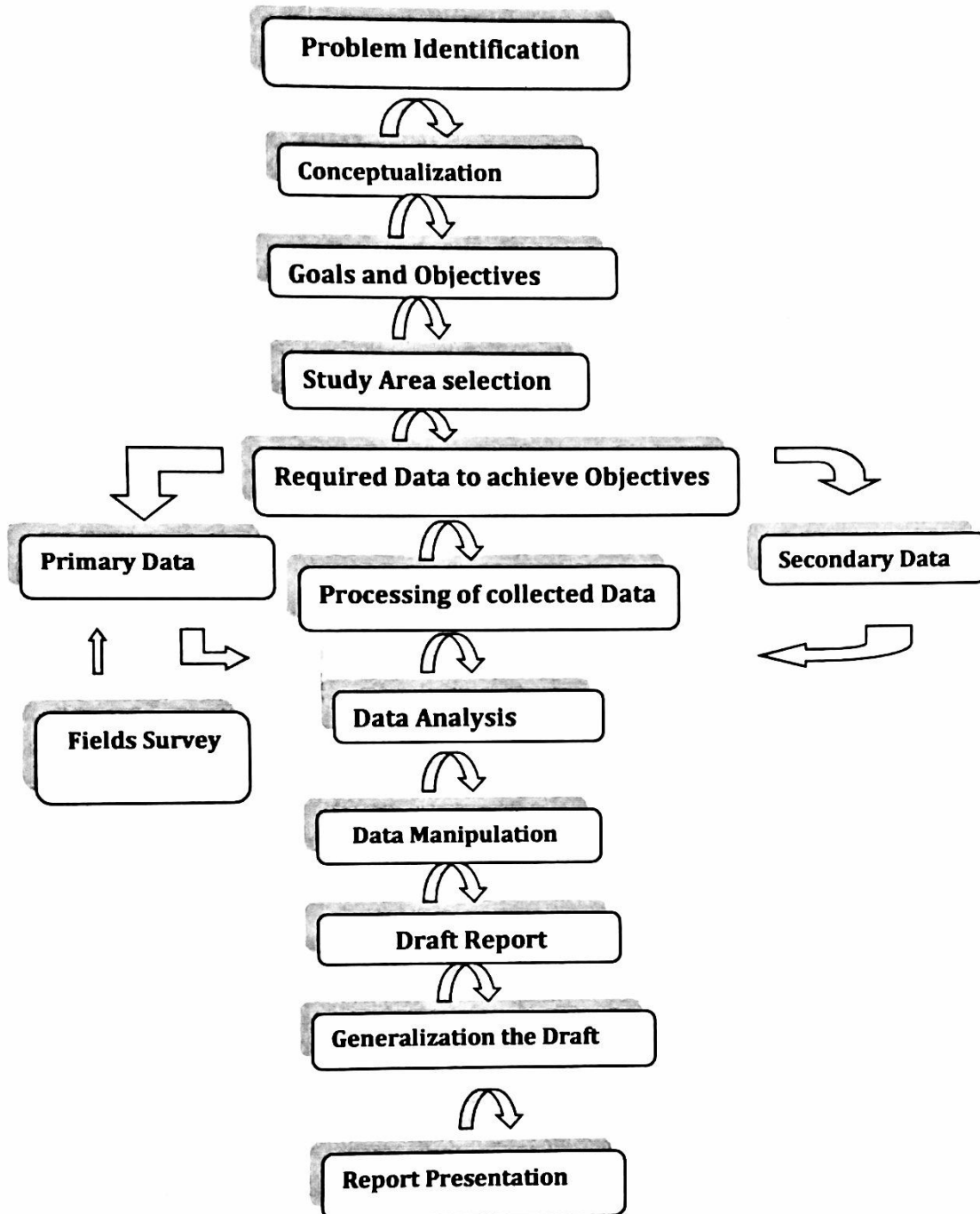


Fig: 4.1: Flow chart of the methodology

Chapter Five: Result and Discussion

5.1) Demographic and Socio Economic profile of respondents

A total of 80 respondents were interviewed from various places like Primary and High school, Bazar, Agriculture field, Upzilla parishad, near the riverside area etc. A questionnaire was used to collect essential information from the respondents. Wide ranges of indicator were collected in various aspects of socio-economic characteristics of the respondents.

5.1.1) Gender:

Among 80 respondent, 83% were male and 17% were female. It was found that, these male and female were resident near the Coastal Green Belt plantation.

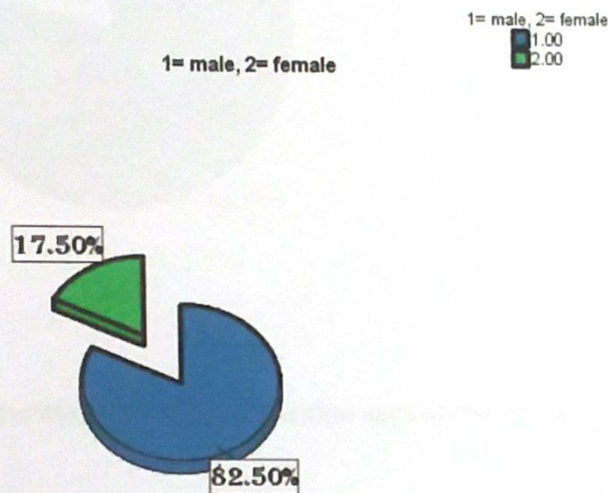


Fig: 5.1 Percentage of respondents according to their sex.

The respondents are very much interested about the coastal embankment plantation. Our respondents are actively participated to protect the plants that was plated to the coastal embankments from destructions and encourage people to plant more plants in the Coastal embankment plantation.

5.1.2) Existence of greenbelt:

In the field survey, it was found that most of the respondent (78.75%) says there is Coastal green belt plantation and about 21.25% of the respondent lives near the river side where there no plantation in the embankment.

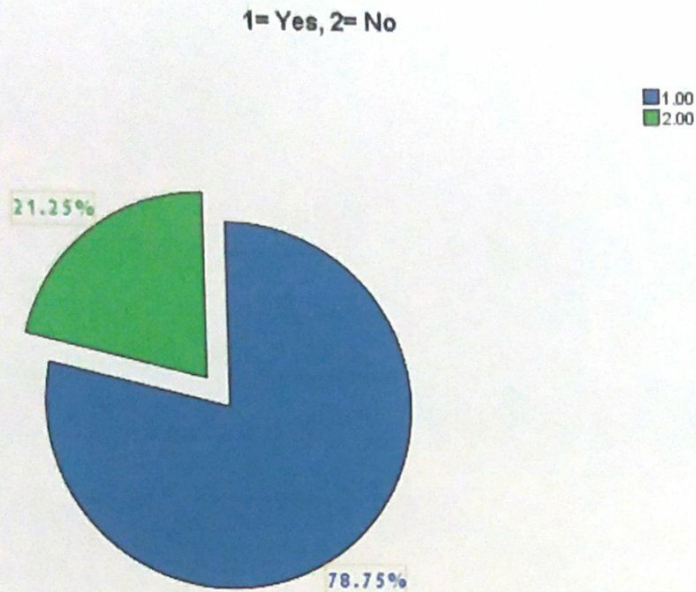


Fig 5.2: Percentage of respondents that says about existence of Green Belt

Trees are not planted all embankment areas or there is no natural regeneration along all the embankments sites.



Photo 5.1: Coastal embankment Green belt plantation site

5.1.3) Attitude towards Coastal embankment plantation:

It was found that people are very much interested about the Coastal embankment plantation. Sixty-five respondents are supportive to the Coastal embankment plantation, where as ten respondents were neutral and two respondents are opposition against the Coastal embankment plantation.

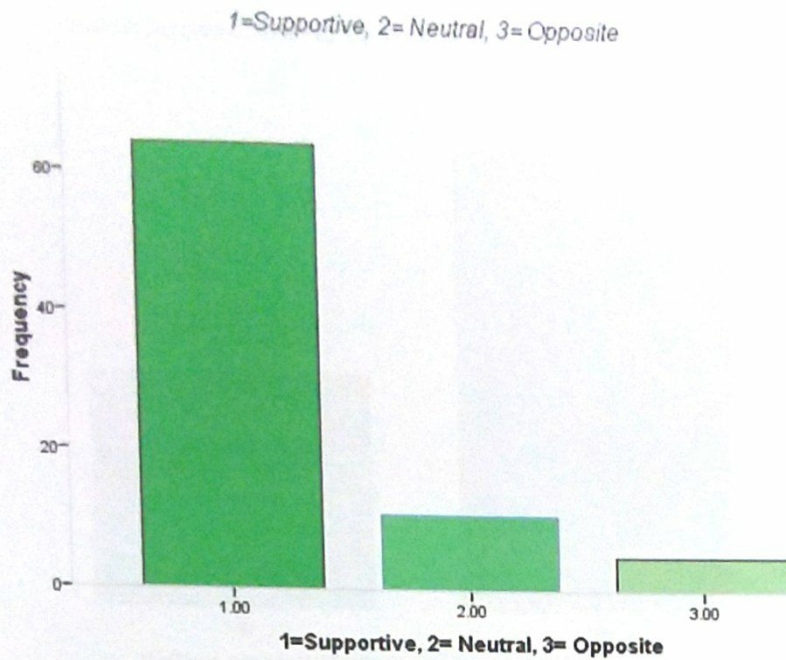


Fig 5.3: People's attitude towards Green belt program.

Most of the people are supportive to the coastal embankment plantation. Some are neutral. Respondents got economical, social and biophysical support by the coastal embankment plantation. NGO's and government organization encouraged people to involve with the program.

5.1.4) Benefit sharing mechanism of Coastal greenbelt:

Respondents are very much dependable to the any other system like NGO's benefit sharing mechanism rather Govt. adopted sharing scheme. About 60 respondents, are positive to the other system and 20 respondents are happy with the Govt. adopted sharing scheme.

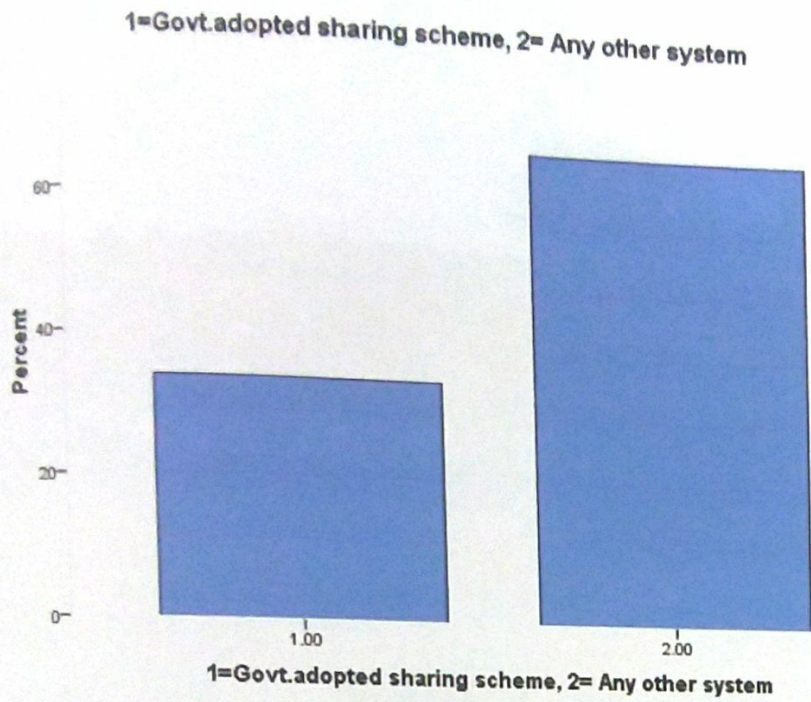


Fig 5.4): benefit sharing mechanism of greenbelt program.

Government or Non-government organization give 60% benefit and they take 40% benefit from the harvested plant. People are interested about the coastal embankment greenbelt program for this benefit sharing mechanism.



Photo 5.2: Green belt Plantation site by NGO (SUSHULON)

5.1.5) Training program on public awareness campaigns for upgrading and development Coastal embankment plantation:

Respondent are very much interested about the training program and campaign for upgrading and development of coastal embankment plantation. About 70% respondent says there is no such campaign program and 30% people says there public awareness program for the development of coastal embankment plantations.

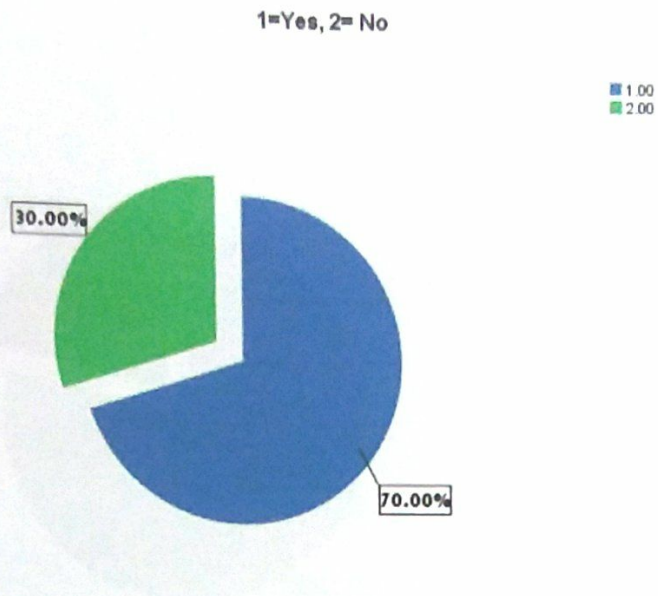


Fig 5.5): People’s attitude towards the training campaigns.

People can be motivated through the training program. The training program and awareness campaign is more needed to develop the Green belt program. People near the embankment site, they are trying to protect natural plantation if there is no artificial plantation by the Government and NGO. Awareness and training campaigns worked towards change on those people’s attitude.

5.1.6) Facilities from the Coastal Greenbelt plantation:

Respondent are very positive towards the Coastal Greenbelt plantation for the facilities they already got. They get tangible and intangible benefit from the Coastal Greenbelt plantation. About 78.75% respondent says they got some facilities for the plantation and 21.25% respondent says they do not get benefit from Coastal Greenbelt plantation.

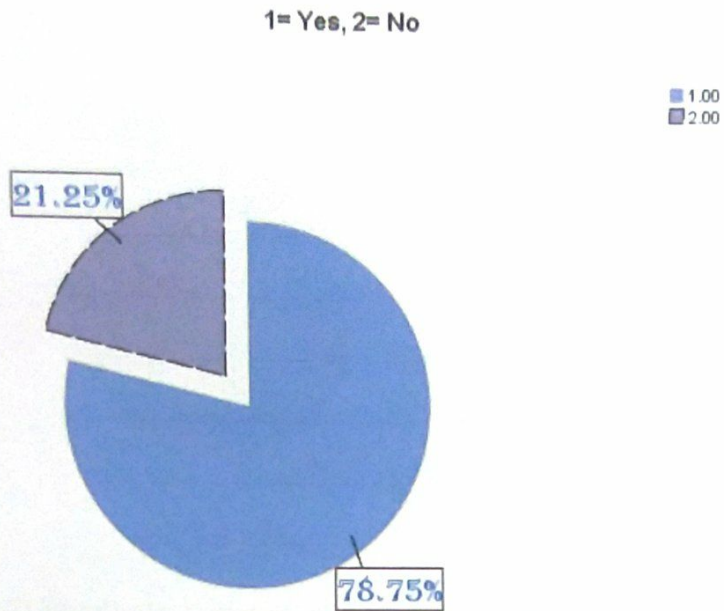


Fig 5.6): Facilities from the coastal green belt project.

Coastal greenbelt embankment plantation provides Social, economical and biophysical support for the beneficiaries. People adopted and conducted the greenbelt mechanism for the social welfare and individual benefit. Grazing and natural disaster are the main problem of the Green belt embankment plantation.

5.1.6.1) Biophysical support:

Coastal green belt plantation supports to protect the natural disaster and natural calamities. About 87% respondent says that it gives biophysical supports to the people living the Munshiganj and 12% people says that they does not get Biophysical supports from the Coastal Green Belt embankment plantation.

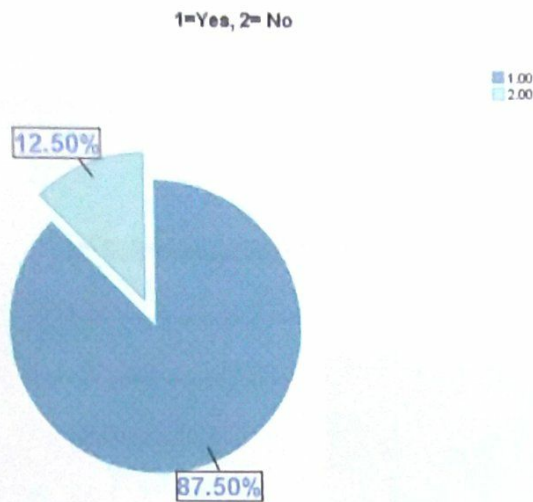


Fig 5.7: Biophysical support by the coastal Green belt project.

The coastal zone has extensive areas of both natural and planted mangrove forest. Natural forest includes the Sundarbans, the Chakaria Sundarbans and fringe mangroves along the eastern coast. The Sundarbans is the world's single largest tract of mangrove forest and in terms of mangrove biodiversity, the richest forest in the world; it is a Ramsar site, part of which has been designated as a World Heritage site. For about a century, the Sundarbans has enjoyed the status of Reserved Forest and has been managed for its productive value.

5.1.6.2) Economic impact:

Economic impact of the Coastal Greenbelt program found positive among the beneficiaries. The benefits through the plantation are social forestry oriented. Tree products and fuel wood are the main source of income from the plantation. After the rotation period, the planted trees are harvested. People get 60% of benefit and Government take 40% of benefit. The beneficiaries can take the fruits and flower of the trees. Fuel wood and leaf litter can be collected from above the ground. However, they cannot cut branches from the tree.

5.1.7) Trusted Organization for Greenbelt

Respondent trusts Non-government organization than Forest department. 50 respondents say they prefer NGO and 25 respondents say they trust on Forest department.

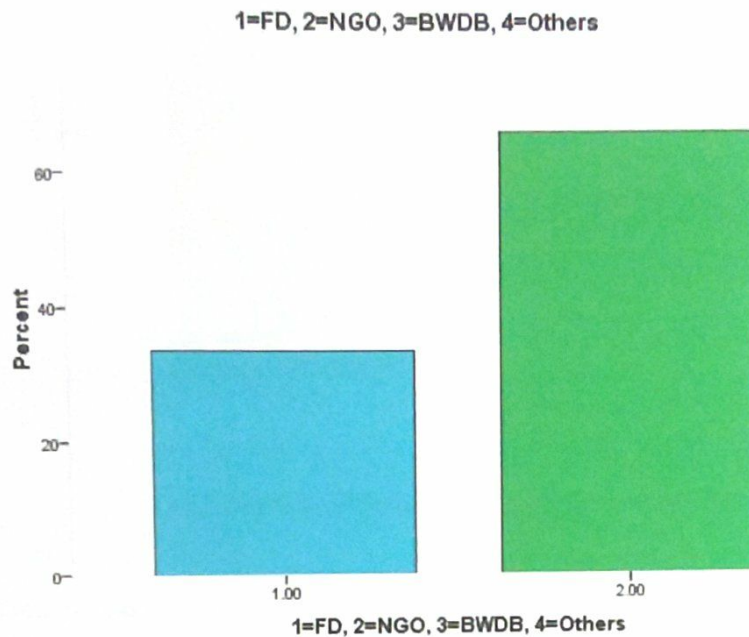


Fig 5.8: Trusted organization for the Green belt project.

5.1.8) Existence of Maintenance mechanism:

Coastal embankment plantation in the Munshiganj is not a simple task. However, there is artificial site and natural plantation site. About 50 respondents say there is maintenance mechanism for the embankment plantation and 35 respondents says there is no maintenance mechanism for the Coastal Greenbelt plantation.

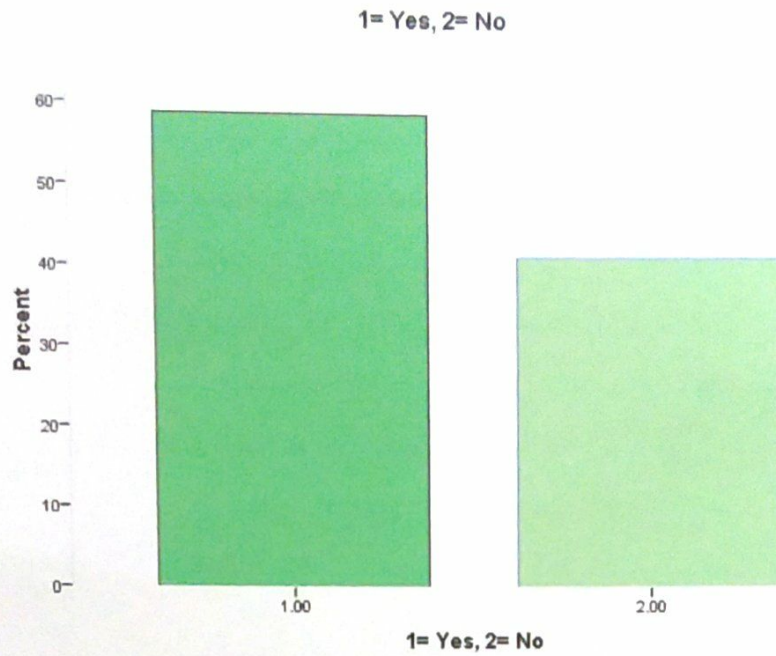


Fig 5.9: Existence of maintenance mechanism

Community action is essential to maintaining the coastal green belt. Local communities had historically developed and maintained the green belt to protect their houses and agricultural lands from coastal hazards. Proper maintenance is required to preserve the forest's DRM function: trees should be planted with moderate density, and frequent thinning is required otherwise, the trees will not develop to their full size.

Maintenance mechanism is necessary for the Coastal Green belt mechanism. Government and Non-government organizations activities are necessary for maintenance mechanism. Participation of community people in the Munshiganj Union is necessary for the developing the embankment plantations.



Photo 5.3: Natural regeneration in the embankment area

Chapter Six: Recommendations and Conclusion

6.1) Recommendation

- **Utilize the forest as a means of livelihood:** In Bangladesh, forests have been used along rivers to mitigate floods and farmers use bamboo from the green belts to produce handicrafts that provide them with additional income. Farmers can also earn from fuel woods and nontimber products, such as fruits, flowers, and medicinal plants.
- **Foster participatory maintenance:** Restoring the green belts includes two major activities: cultivation and sustainable management, which should involve several stakeholders. The government and civil society, including the community, can jointly implement plantations.
- **Support community:** Local governments and civil society organizations play an important role in increasing awareness and engaging the local community.
- Community participation in cultivation leads to a sense of ownership. Communities can continue using the green belt as a space to learn skills and as a way of maintaining relationships with external organizations.
- Involve local people from different government departments to create appropriate adaptation measures.
- Ensure that there is on-going cooperation and consistent support between the people and the government.
- **Natural Plantation:** Local people can make the Coastal embankment plantation site easily, if they place a net in the riverbank. *Avicennia* species will start there as pioneer species.

6.2) Conclusion

River bank erosion and landslide is the common problem in the riverbank. In the coastal area, plantation is needed to protect the land erosion. It gives the biophysical supports as well as protects lands from natural disaster and calamities. People at the Munshigonj union are very much interested about the coastal embankment greenbelt plantation. For the tangible and intangible benefit, people are involving in the scheme. However, there some places, benefit-sharing mechanism is not clear among the people.

Training and awareness campaign program can motivate people about the development program. There are many places; there is no plantation in the riverbank embankment. Therefore, there should be planted mangrove species. For saline water, mangrove species is suitable for the plantation. Therefore, these plantation sites not only give the biophysical protection, also gives the intangible benefit to the people. Involvement of local people is very necessary, if they can understand the benefit of the coastal embankment plantation, surely they will plant or protect the coastal embankment Green belt plantation.

References

Anon (2000) Draft final report on improved project planning and implementation methods, Vol 1: Main report. 2nd coastal embankment rehabilitation project, Bangladesh Water Development Board, Ministry of Water Resources.

Baksha M W, and Islam M R, (1997) Insect pests attacking mangrove nurseries and plantations of keora (*Sonneratia apetala*) along the coastal belt of Bangladesh. *Bangladesh Journal of Forest Science*, 26: 2, 69-75.

Bari A, and Chakma R, (2001) Coastal Green Belt project Nursery and Social forestry Manual. *Coastal Green Belt Project*. Bhan Bhavan, Dhaka. Bangladesh.

Das S, and Siddiqi N A, (1985) The mangrove and mangrove forests of Bangladesh. Mangrove Silviculture Division Bulletin No. 2. Bangladesh Forest Research Institute, Chittagong, Bangladesh.

Iftexhar M S, & Islam M R, (2004) Managing mangroves in Bangladesh: a strategy analysis. *Journal of Coastal Conservation*, 10: 139–146.

Islam M M, (2006) Coastal forest rehabilitation and management in Bangladesh. *Country papers*. Appendix 3. Bangladesh.

www.ebanglapedia.com accessed on (5-5-2014)

www.dmb.com). accessed on (5-5-2014)