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SOCIAL FORESTRY PROGRAMME FOR COASTAL
PROTECTION AGAINST CYCLONE SURGE

BY

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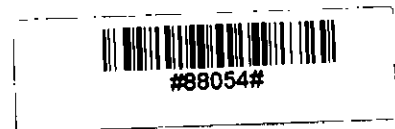
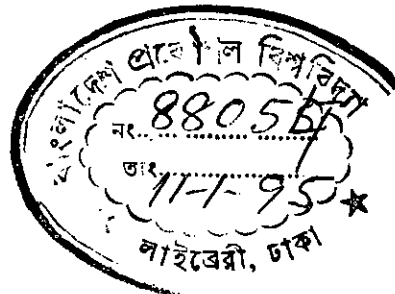
**SOCIAL FORESTRY PROGRAMME FOR COASTAL
PROTECTION AGAINST CYCLONE SURGE**

BY

SHABBIR HOSSAIN

MASTERS THESIS

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ABSTRACT

Cyclones and tidal surges are one of the major calamities that batter the coastal areas of Bangladesh. They cause damage to the infrastructure and loss of lives. Consolidated national and international efforts towards cyclone disaster management has resulted in development of several structural and non-structural approach towards prevention and mitigation of adverse effects of cyclone.

The concept of afforestation has been recognised as a non-structural measure against cyclone and tidal upsurge. Afforestation programmes can be implemented in two ways - firstly, by the employees of the Forest Department, secondly, by the people at the grassroots level. In the latter case, which is more popular as Social Forestry approach, both government and non-government organisations are involved with the process.

In recent years, special attention has been given to such programmes with a view to improve coastal environment as well as to protect embankment, properties and lives against cyclones and storm surges.

The present study was conducted in order to understand the nature and status of social forestry programmes of some selected non-government organisations who are working in the coastal belt. The specific objectives of the study were (i) to evaluate selected social forestry projects under implementation, (ii) to identify the constraints and (iii) to suggest policy proposals to overcome the existing constraints and to recommend more effective means for successful social forestry projects.

A questionnaire survey on participants was conducted in the project areas of three NGOs, namely, BRAC in Kutubdia, POUSH in Harbang and

UBINIG in Badarkhali. Detail interviews were taken of the concerned official at the local and national level.

The study revealed that social forestry programmes have great potentialities to generate employment opportunities for the rural people, specially the women folk. At the same time, it can contribute in reducing the extent of cyclonic damages. It can also be highly effective in saving human lives during cyclone. Social forestry can also contribute in resisting large scale soil erosion and protection of coastal embankments.

Some NGOs are working to increase the forest coverage in the coastal area by organising the local people to plant more trees in their homesteads, along roads and over embankments and other fallow lands. They are also providing technical support and supplying necessary inputs.

The study finally suggests that such projects should be extended in other parts of the country to enrich and regenerate the forest resource as well as to protect the vulnerable areas from cyclone and tidal surge. In order to facilitate more effective and people oriented approach, the involvement of the rural people in the forestry programme is necessary right from the initial stage. The benefit sharing mechanism should be clearly defined and based upon legal contracts. Selection of trees is an important issue. The tree species should be selected after considering the wind resistance capacity, soil condition and local demand.

The success of any such project will depend upon the presence of sound national policy on forestry programme and involvement of grassroots level populations and institutions in the process.

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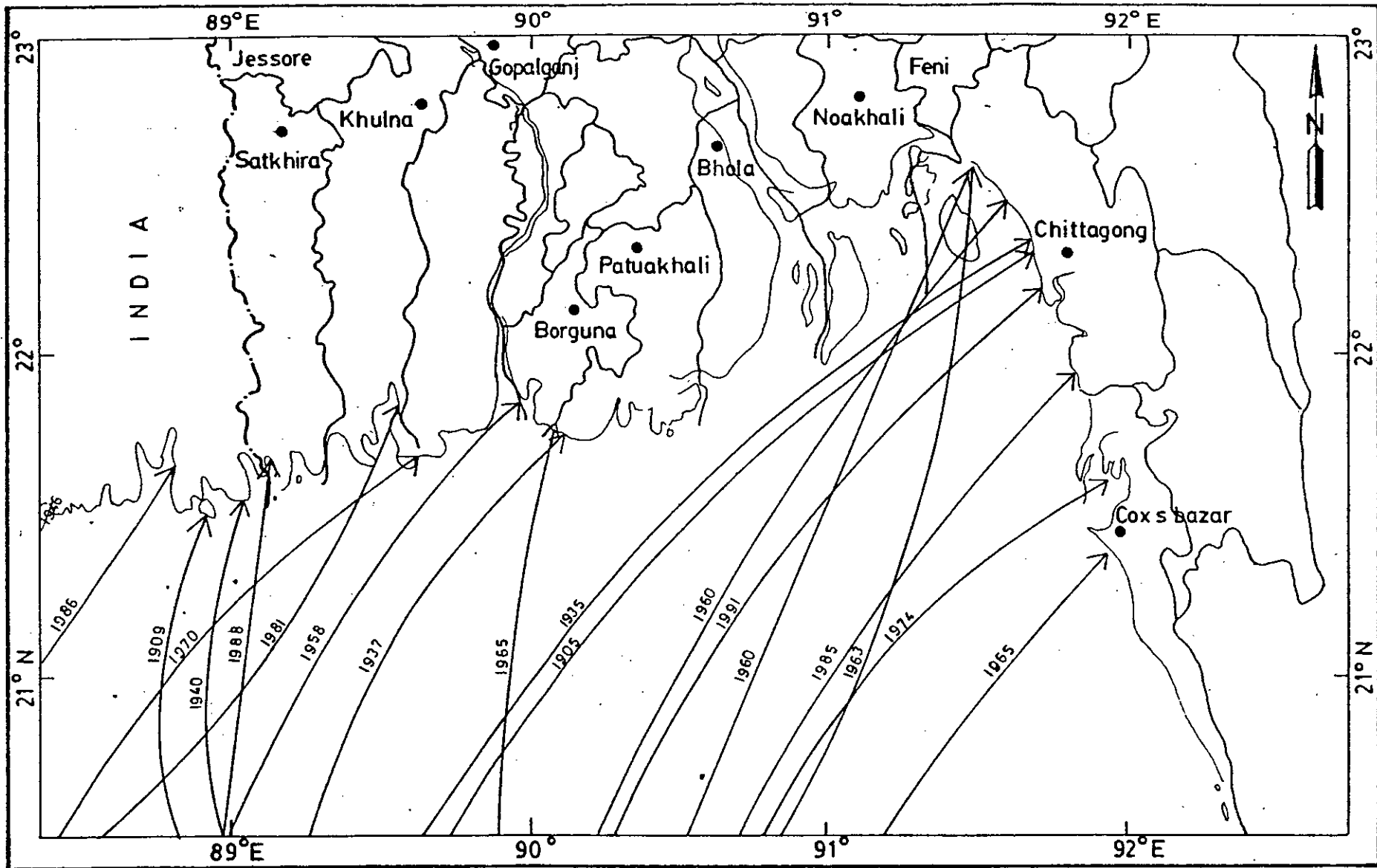
CHAPTER-1

INTRODUCTION

Every year tropical cyclones frequently strikes all the continents of the globe with a devastating blow. Whether it is cyclone, or hurricane or typhoon it is the same natural phenomena which causes death, destruction of wealth, and leaves behind a legacy of despair among those who survives the aftermath.

Tropical cyclones are usually depressions in the sea or ocean which develops into storm. There are certain regions in the ocean or the seas where cyclones are more frequent. It is called cyclones in the areas of Bay of Bengal, Indian Ocean and the Arabian sea. Tropical cyclones/storms in the South Pacific along with the Northern coasts of Australia and north-west pacific are known as typhoons while in the Caribbean, USA. and central America it is called hurricanes. Tropical storms which develops in the Bay of Bengal (commonly known as cyclones) moves towards two directions, if does not weaken along its way. They either move westwardly towards the coastal belts of Orissa and West Bengal of India or north-easterly towards the coastal areas of Bangladesh, stretching over 750 kilometers long area from Teknaf river in the south-east to the mouth of Raimangal river in the south-west. This includes districts like Chittagong, Noakhali, Patuakhali, Barisal, and Khulna where the cyclones strike most in Bangladesh (Map 1.1). The frequency and intensity of cyclones gradually decrease towards the interior part of the country. As such, the most immediate area along the coast are devastated by most severe cyclones (Map 1.2).

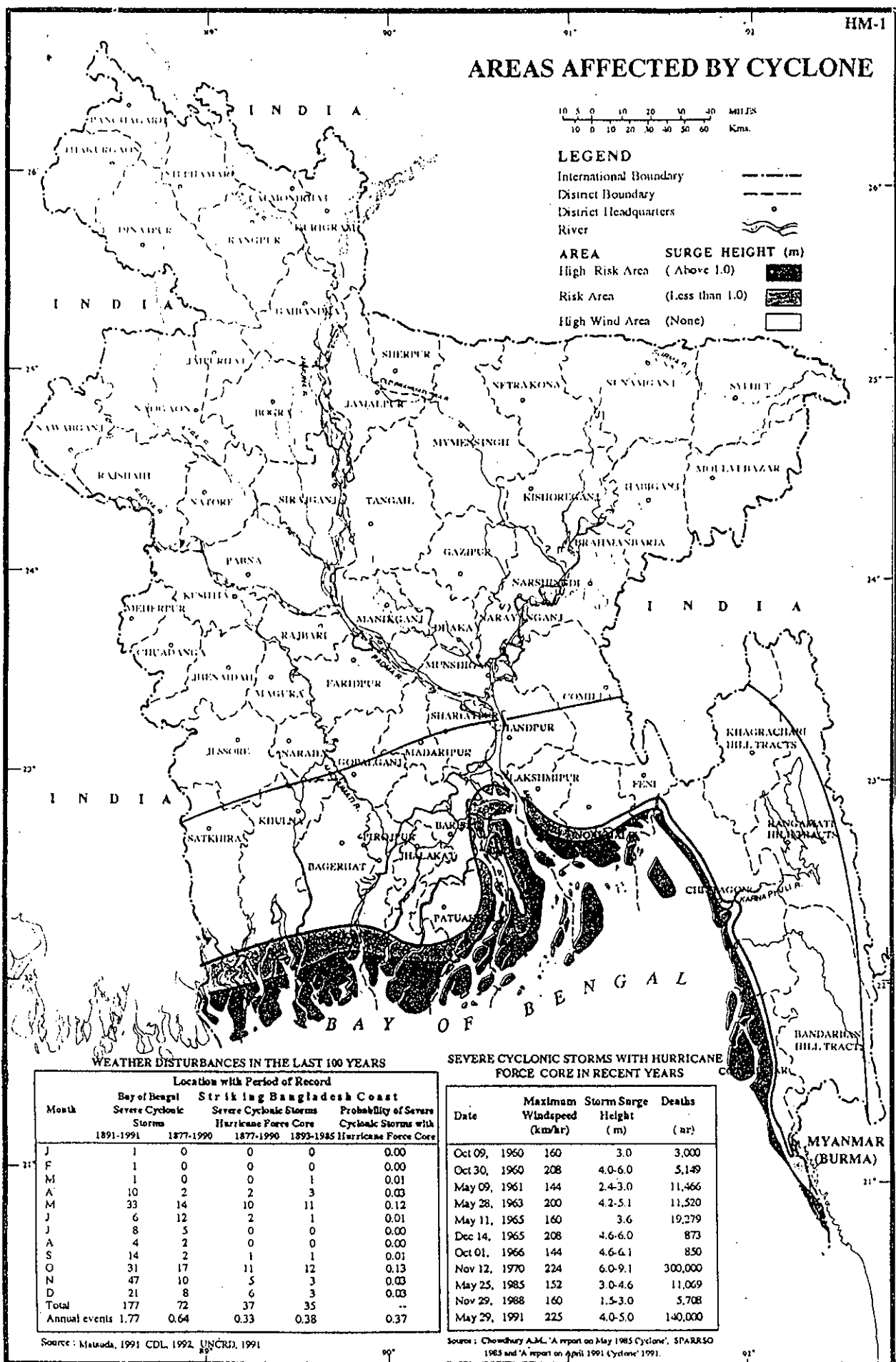
In this belts about 30 million people are constantly engaged with two types of battle with nature for their survival . Firstly, almost all are heavily dependent on basic activities like agriculture, fishery, salt-making etc. for living and on the other hand rebuilding homes and lives after every cyclone which strikes their area. It is unique that due to the density of the population in that area, the number of deaths are very high after a major cyclone, and that not only battle for survival has to be fought



Map 1.1 : Tracks of the severe cyclonic storms in Bangladesh from 1905 to April 1991 (Source of data 1905 to 1970 is Islam and Miah, 1981)

Source : Tarreque, A.K.M. (1992)

AREAS AFFECTED BY CYCLONE



Map: 1.2 Source : Disaster Management Bureau.

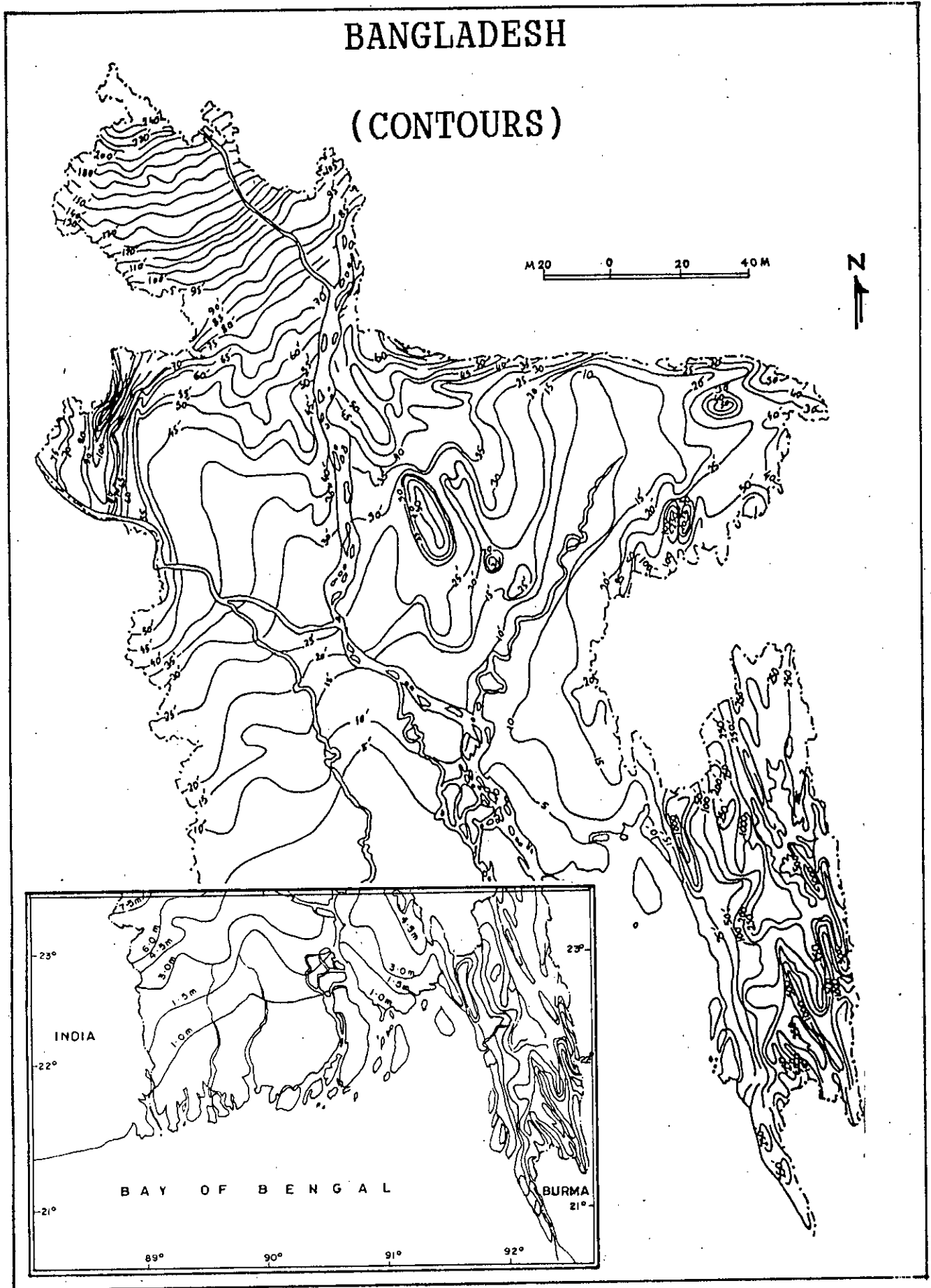
again, but also they have to prepare for a major cyclone which hits frequently.

The Bay of Bengal is one of the vulnerable areas on the earth where tropical cyclones form . About 10 percent of the world tropical cyclones form in the Bay of Bengal (Ali,1992). Storm surges, associated with tropical cyclones, lashes out all parts of the Bangladesh coast. The storm surges along the north Bay of Bengal are the most significant and they occur frequently causing terrible destruction of lives and properties. About 90 percent of all cyclonic casualties in Bangladesh are due to storm surges. These significant storm surges along the coast are due to the combined effect of its geographical position, bay configuration (funnel shaped bay), physiography (almost flat terrain having gentle slope towards the sea and less than 0.5m to 2.0m elevation of coastal areas above mean sea level), shallowness of the bay, and climatic condition (Ali,1992) (Map 1.3).

This region of the Bay of Bengal has a history of cyclone and storm surges. Between 1960 and 1990, the region was hit by small and big cyclones accompanied by tidal surges. On an average bordering countries of the Bay of Bengal (i.e. India, Burma and Bangladesh) suffer three to four severe cyclones a year. On October 23,1970 a severe cyclone with storm surge hit Khulna and Patuakhali, no heavy damage was reported. A second cyclone on 12 November 1970, occurred in the coastal areas of Bangladesh. Its velocity was recorded at 209 km.per hour.The duration of the cyclone was 15 hours while the tidal surge was 4.5 to 6 m high. This devastating cyclone accompanied by storm surge battered five coastal districts of Noakhali, Patuakhali, Barisal, Khulna and Chittagong. Officially the death figure, due to this cyclone, was 0.5 million but in reality it could be more. Extensive damage to houses was also reported. About 2,35,000 houses were destroyed and partial damage occurred to 0.1 million houses. A large number of animals were also killed. The damage to the infrastructure including roads, embankments and schools was colossal.

The cyclone that hit the Bangladesh coast on 29 April 1991, is being described as a super-cyclone. The maximum wind speed observed

BANGLADESH (CONTOURS)



Source : Bangladesh in Maps

Map: 1.3

at Sandwip was 225 km/hr, Chittagong 210 km/hr, Kutubdia 180 km/hr, Cox's Bazar 185 km/hr, Teknaf 157 km/hr and Khepupara 180 km/hr.

The maximum wind speed estimated from NOAA-11 satellite picture obtained was about 240 km/hr. For long nine hours the storm and the surge hammered the off-shore islands of Kutubdia, Moheshkahali, Sandwip, Urir Char, Hatia and the south eastern and southern coastal areas and at times driving walls of water 20 to 25 feet high.

In this cyclone many islands and belts of the coastal areas and in certain places whole population and habitation have been washed away by the surge. Entire herd of cattle were swept away. The sea shores and rivers, ponds, ditches and fields became littered with swollen corpses and carcasses after the surge. Loss of human life has been estimated at 1,38,868. Houses, mostly huts of mud, bamboo and straw had vanished. The standing rice, which was ripe for harvest, was totally lost.

Huge damage and loss have been caused to Chittagong port and the city with all its industrial and commercial establishments. Hundred of industries and thousand of establishments have suffered incalculable losses in terms of physical, inventory and production. The cyclone also destroyed or crippled much of the countries maritime fleet and the sunken hulls had nearly blocked the seaport.

Heavy damages have also been caused to the fishing industries. Most of the fishing boats and trawlers have been destroyed, sunk or washed away. The entire shrimp culture and salt-beds of Cox's Bazar and Chittagong district were washed away with losses more than Tk.2.23 billion in shrimp industry alone and the total loss is estimated at US \$ 2.07 billion. The whole event left a nightmarish shock for the surviving masses.

1.1 PROTECTION AGAINST CYCLONES:

What can be done to protect our selves from the cyclones?A cyclone is a natural phenomenon like an earthquake or a volcanic eruption.We have to learn to live with it. There are many ways to minimize cyclone damages. Two important means for prevention and mitigation are structural and non-structural approaches.Structural approach is mainly preventive and requires professional staff and capital expenditure.On the other hand , non-structural approach is mainly mitigative and is less expensive,moreover for the countries like Bangladesh with its limited economic resources, it is more suitable.

Afforestation is the most cheaper and ecologically more beneficial than any other measure to protect coastal areas and offshore islands from cyclone. Thick forest can reduce the wind velocity and tidal surge. From the past cyclones it has been observed that cyclone hit the shore lines strongly became almost inactive within five kilometres (Sobhan,1992). Presence of thick vegetation diminishes the wind velocity and reduces the tidal height,thus arresting the magnitude of devastation.

In 1988, a severe cyclone with hurricane intensity associated with 14.5 ft. storm surge hit the Khulna region, south west of Bangladesh. Casualties and property damage were at a minimum and even less than what had happened in 1991.During the last 100 years more than 80 cyclones struck the coastal areas,but only two could do damage to greater Khulna. The loss of life and property in Mirsharai and Sitakunda, in Chittagong district was minimum during the 1991 cyclone. The reason was the protection from a one to two kilometer shelter -belt.The concept of raising coastal plantations began during mid sixties. The people of Khulna were safe from cyclones and tidal surges due to Sunderbans, the vast mangrove forest in that region. Different studies (Haider et. al 1991; ZRC, 1991, FAP-7,1992, MCSP,1992) described afforestation of the coastal area as a paramount importance to minimize the scale of cyclonic damage.It was reported by Bangladesh

Center for Advanced studies(BCAS) that casualties during 1991 cyclone were very high in Chokoria of Cox's Bazar, where there was a beautiful mangrove forest named Chokoria Sundarbans. This forest has been completely denuded and prawn farms have been established.

Recognizing the importance of forestry in the national life and economy and in view of the continued depletion of tree stock and the consequent environmental degradation, the Fourth Five Year Plan emphasized to expand the forestry in the country. Development of forestry in Bangladesh, specially the state owned forest, is beset with many problems and constraints. The traditional custodian approach of forest management practice have been found to be inadequate to cope with the problems of technical and administrative supervision.

Social forestry, a people oriented forest management approach is being looked upon as the new and sustainable frontier to expand tree cover and the resource base, generate employment and income, ensure active participation of women, youth and the unemployed specially in the rural areas. The pioneering project in this field was initiated in 1979 firstly in Betagi, secondly in Pamora in Chittagong (Bhuiyan, 1994). Later on another project started in the early eighties in seven northern districts under financial assistance from the Asian Development Bank. Under this program, fuel, timber, and fruit trees were planted by the sides of railway lines and roads, marginal lands and embankments. It met with appreciable success initiating active participation of rural target groups including the landless farmers.

Social forestry activities have been further expanded and people are being involved to plant trees by the sides of railway lines, roads, flood protection embankments, vacant land in offices, educational institutions and in all available marginal private and public lands. Social forestry is also being intensively practiced under Non Government Organizations(NGO). The different models of social forestry are being monitored for further large scale replication in different areas of the country including the coastal areas.

In the backdrop of this situation the present study attempts to highlight the effectiveness of forestry to mitigate cyclone destruction and at the sametime find out the constraints of some social forestry projects under implementation to make them more participative and profitable to the common people and make the program sustainable.

1.2 OBJECTIVES

The main objectives of this research project are:

- (a) To evaluate selected social forestry project under implementation in terms of tree preference, adaptability, economic return, and peoples participation.
- (b) To identify the social, economic and legal constraints of social forestry projects.
- (c) To suggest policy proposals to overcome the existing constraints and to recommend more effective means for successful social forestry projects (specially for the protection of coastal area from cyclone surge).

1.3 METHODOLOGY OF THE STUDY

The methodology of the study covered the following steps as described below :

- A. Selection of the study area
- B. Justification of selecting the area
- C. Data collection
- D. Data Processing and analysis
- E. Recommendations

1.3.1 Selection of the study Area

In this study three areas were selected, from which primary information was collected through pretested questionnaire. The resource persons of different organizations engaged in social forestry research in Bangladesh such as Bangladesh Agricultural Research Council (BARC), Bangladesh Forest Research Institute (BFRI), Association of Development Agencies in Bangladesh (ADAB) and different NGOs were consulted with to identify various problems and prospects of social forestry in the country. The individual project areas were chosen from Cox's Bazar District. Three NGOs have their project areas in this district. The detail description of the location and NGO's involved in the programme are presented in Table 1.1 (Map 1.4A; 1.4B).

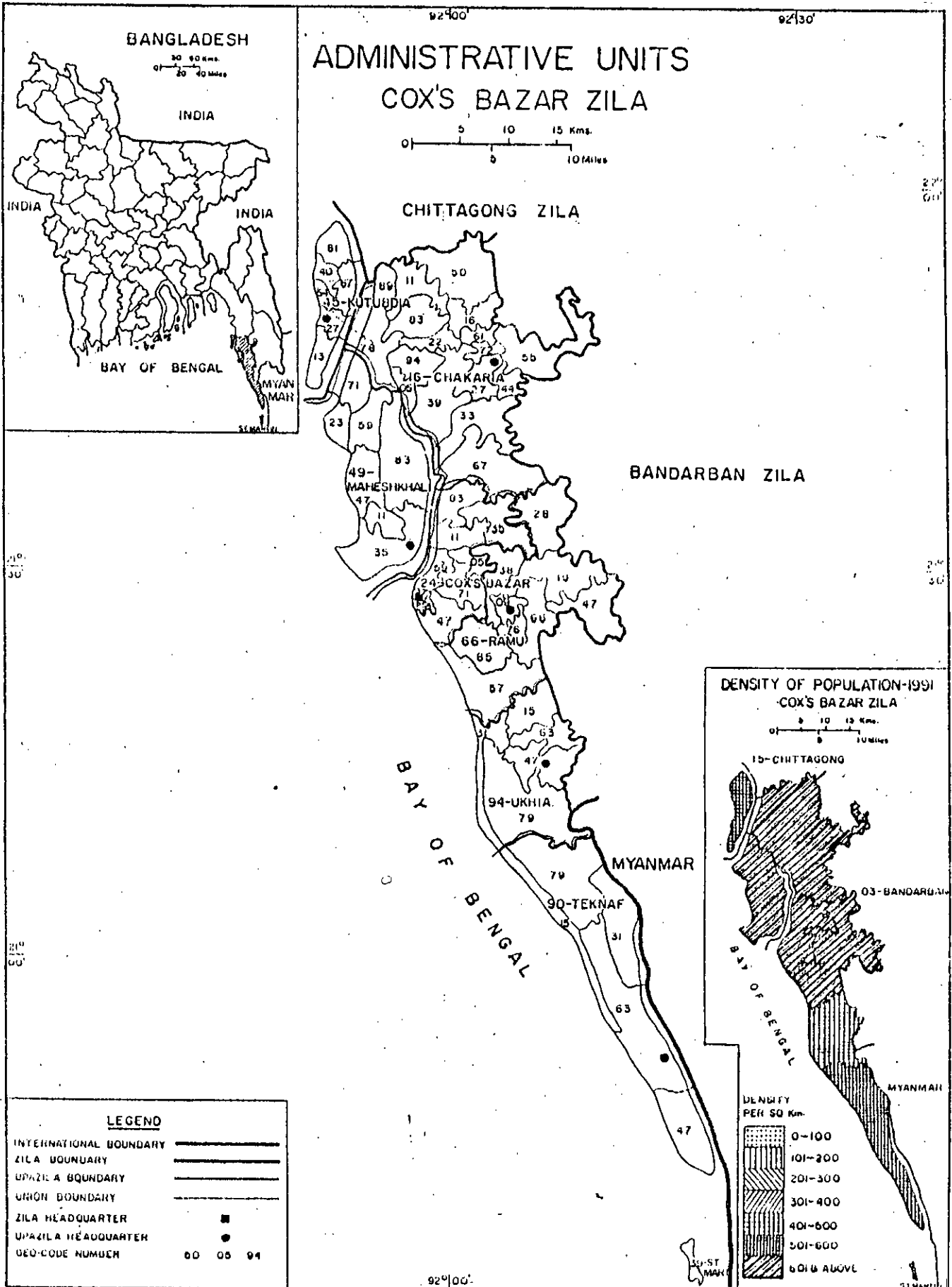
TABLE 1.1 Name of the study Area and the NGOs

THANA	UNION	NGOs
KUTUBDIA	UTTAR & DAKHIN DHRUNG/KAIYARBIL BARAGHOP/ALIAKBARDEIL	BANGLADESH RURAL ADVANCEMENT COMMITTEE (BRAC)
CHOKORIA	HARBANANG	POLLI UNNAYAN SANGSTHA (POUSH)
CHOKORIA	BADARKHALI	UNNAYANA BIKALPER NITI NIRDHARONI GOBESHONA (UBINIG)

1.3.2 Justification of selecting the study Area

Various NGOs are engaged in forestry programmes in different parts of the country. These particular project areas were chosen for two major reasons. Firstly, all these project areas are located in the high risk zone of the coastal belt (Map 1.5), secondly, these areas represent three types of land mass, i.e. off-shore island, sea shore area and main land area.

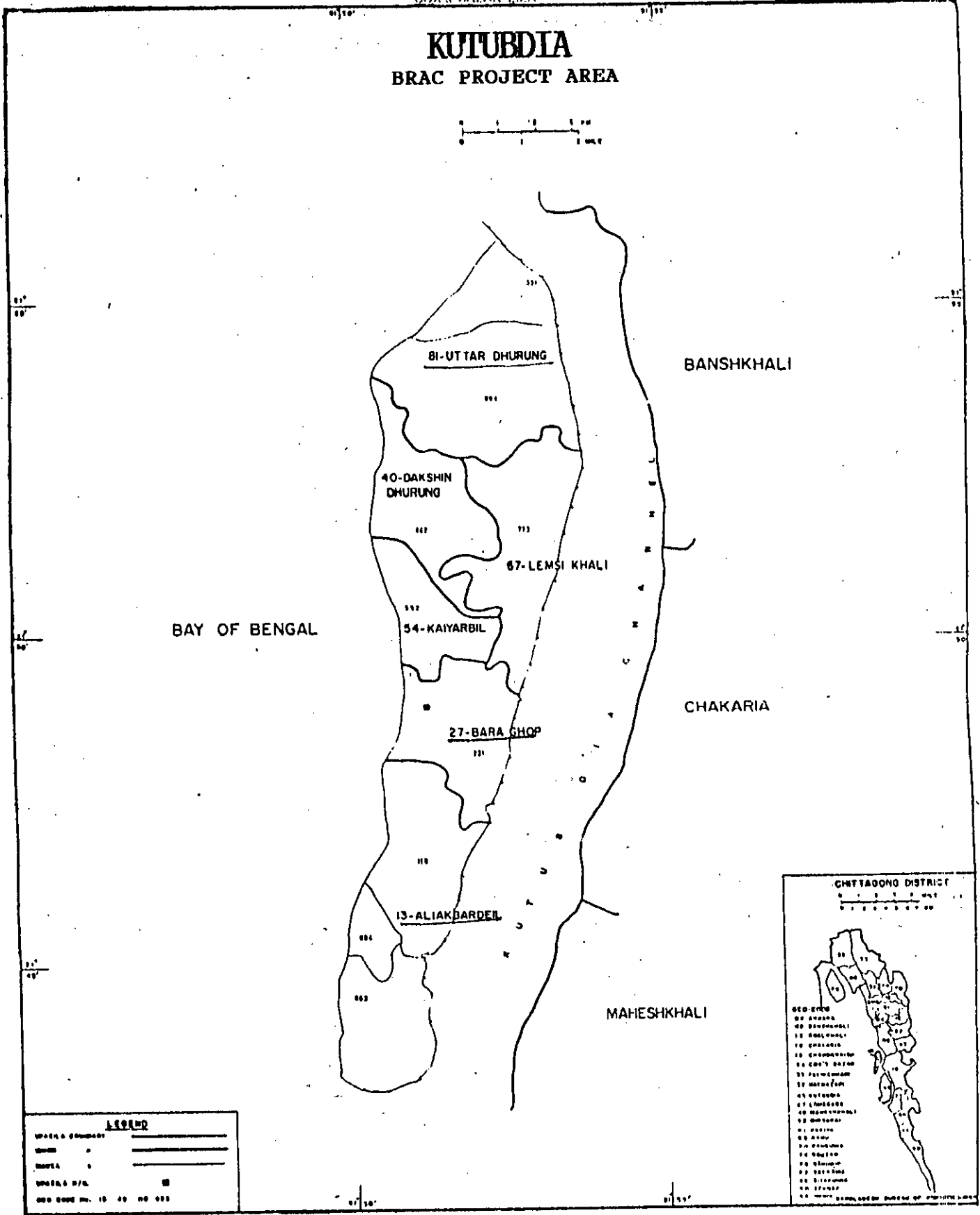
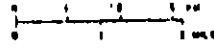
Tree plantation are now considered as one of the most effective ways of fighting negative impacts of cyclone. These projects are expected to bring fruitful results in the field of environmental management as well as income earning opportunities for the people.



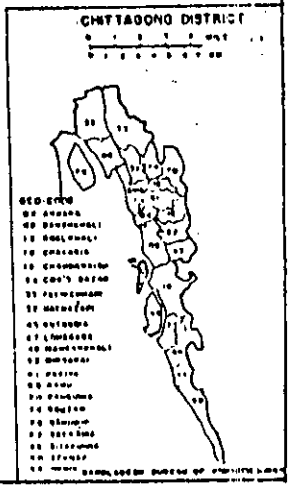
Map: 1.4 Source : Small Area Atlas of Bangladesh

COX'S BAZAR ZILA

**KUTUBDIA
BRAC PROJECT AREA**



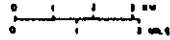
LEGEND	
WATER CHANNEL	—————
ROAD	—————
RAILWAY	—————
SETBACK LINES	■
GRID CODE No. 10 20 30 40 50	



Map: 1.4A Source : Small Area Atlas of Bangladesh

COX'S BAZAR ZILA

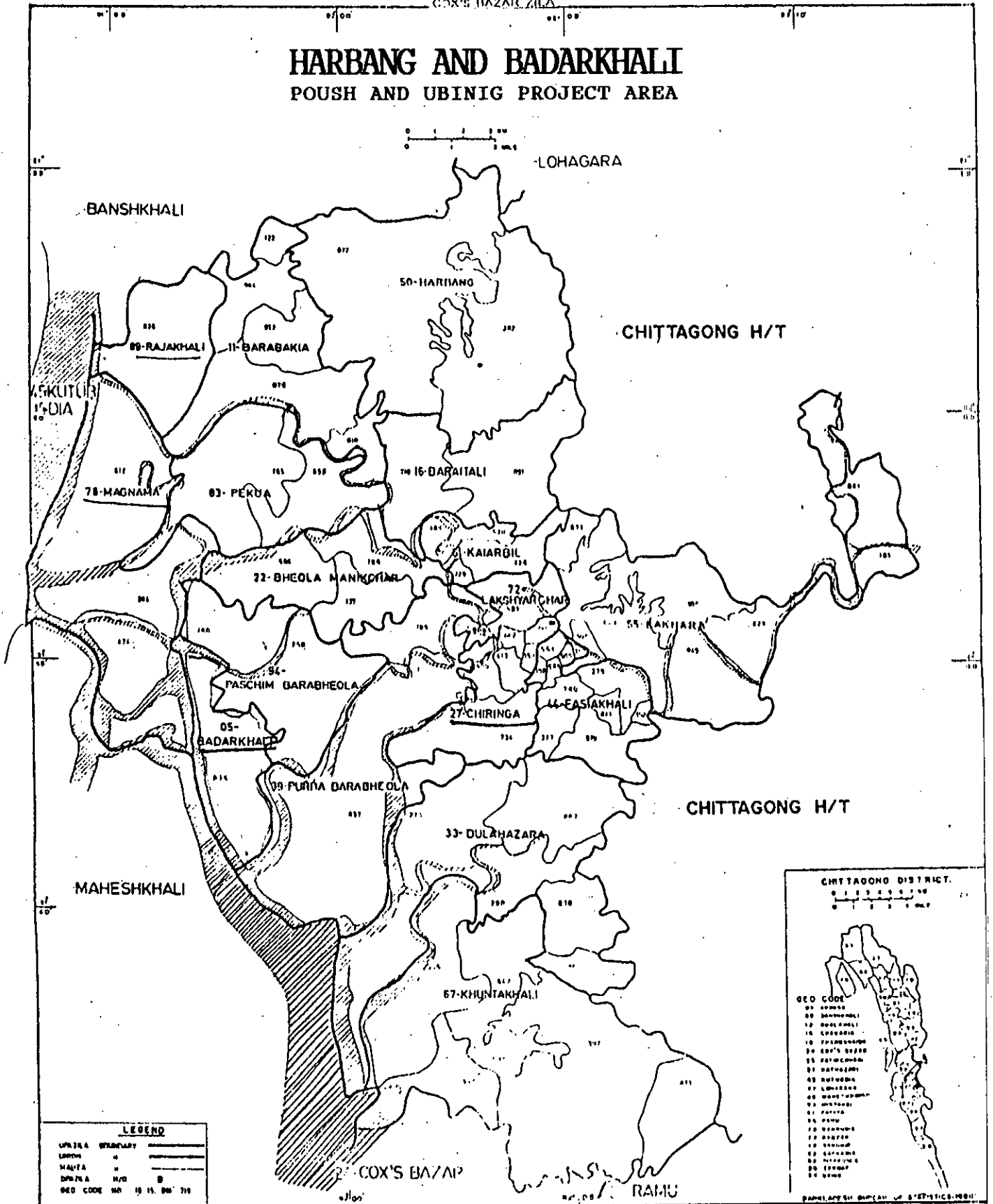
HARBANG AND BADARKHALI POUSH AND UBINIG PROJECT AREA



LOHAGARA

BANSHKHALI

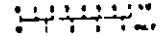
CHITTAGONG H/T



LEGEND

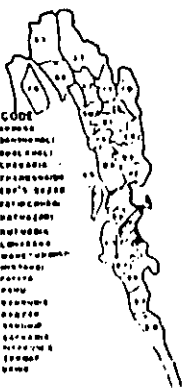
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DIPOTLA	—————
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CHITTAGONG DISTRICT

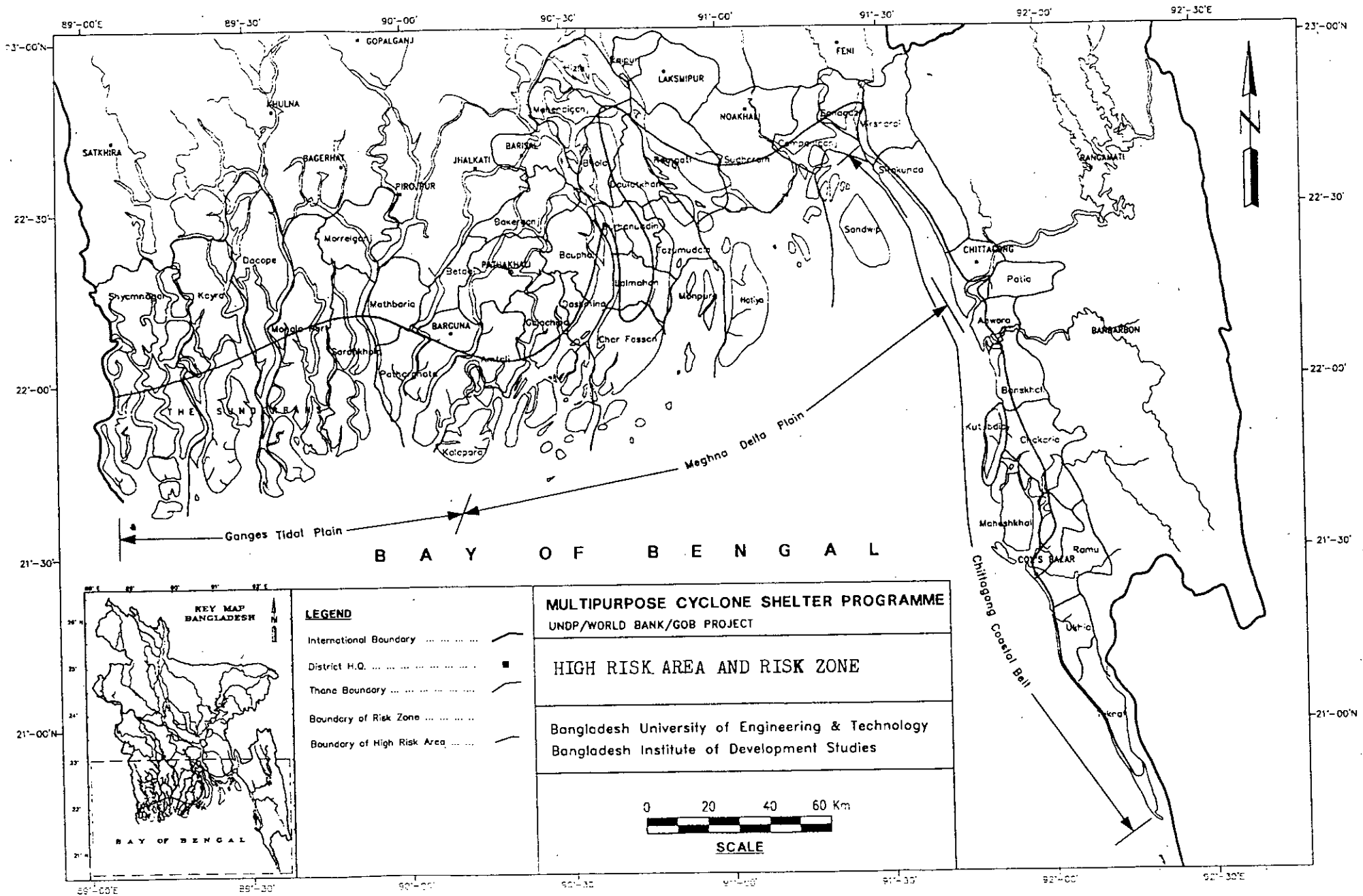


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01	BANSHKHALI
02	CHANDRA
03	CHITTAGONG
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19	CHITTAGONG
20	CHITTAGONG



Map: 1.4B Source : Small Area Atlas of Bangladesh



Map: 1.5

1.3.3 Data collection

In order to fulfill the objectives set out for this study relevant information were collected from two sources, which are-

- (i) Primary source, i.e. through questionnaire survey and
- (ii) Secondary source i.e. though collection of information from published or unpublished reports, studies etc.

Persons who were involved in caretaking trees and nursery workers were interviewed. In total 195 persons were interviewed through structured questionnaire (32 from Kutubdia, 105 from Harbang and 58 from Badarkhali). A detailed information on participants knowledge and involvement in social forestry programme has been obtained through this survey. Another set of questionnaire survey was administered to collect information on social forestry programme of the relevant NGO. To further clarify issues and to obtain additional information, unstructured interviews and informal group discussions were also held with the informants of the programme. Secondary data were collected from various reports and publications of the Government of Bangladesh, Bangladesh Institute of Development studies, Bangladesh Agricultural Research Council, Bangladesh Water Development Board, Asian Development Bank, World Bank, FAO etc. Various Government, semi-Government, and Non-Government level experts were interviewed to accumulate ideas and views.

1.3.4 Data Processing and Analysis

Computer software package programme was used for the processing and analysis of the survey data. The data are then presented in tabular and graphical forms, keeping in view the objectives of the research study.

1.3.5 Recommendations

The study attempted to identify existing limitations of on going projects and on that basis recommendations are proposed to design

future programmes in a better way which would also enable successful implementation of social forestry programme in Bangladesh.

1.4 LIMITATIONS OF THE STUDY

This type of study is rather new in our country. Several constraints were encountered during this research which are mentioned below:

- a) The number of published materials on this subject in the context of Bangladesh is very limited in number. Supportive information was difficult to obtain.
- b) The social forestry projects are still in infantile stage. It is too early to evaluate the economic profitability of such projects. Apart from this there is no system of keeping record of financial investment and actual financial return from the trees and their products at the household level. Besides, there exists some inputs (i.e. cowdung, compost etc.) which cannot be evaluated in monetary term. These aspects makes it difficult to synthesize the economic return from such projects at national and household levels.
- c) Information on investment and economic return of the social forestry projects of the NGOs could not be collected due to denial of access to the official records by the authority.

1.5 STUDY AREA

- a) Location :

The three study areas Kutubdia, Harbang, Badarkhali are located under the jurisdiction of Cox's Bazar district. More precisely the study area extended latitudinally between 21° 30'N to 22° 00'N, and longitudinally 91° 30'E to 92° 00' E. Kutubdia is an offshore island, Badarkhali is on the sea shore and Harbang is situated in further inland consisting of both floodplain and low level hills.

b) Climate :

Climate of the study area is characterised by heavy rainfall, often with excessive humidity and fairly marked seasonal variations. The mean minimum temperature and mean maximum temperature of Cox's Bazar is 56⁰ F and 88⁰ F accordingly, which can be regarded as representant of temperature variation pattern of the study areas since no information is available for such micro levels. But compared to the northern part of the country, the coldness is milder because of the sea. The study area is a high rainfall region, the average annual rainfall is 143 inches at Cox's Bazar (Rashid, 1977).

c) Land:

The study area is located in the physiographic region Matamori delta and costal islands. Kutubdia has an area of 34 sq. miles which is divided by Kutubdia channel from the main land. The channel was very deep in the past, but due to soil deposition from the upstream the deepness has been reduced significantly. The study areas were mainly selected considering the topographic diversity of the area. Kutubdia is an offshore island, Badarkhali is in the shore line and Harbang represent interior floodplain area with low hills.

d) Population :

The total population of Kutubdia thana is 95055 of them 49110 is male and 45945 is female. The sex ratio is 113. In the thana, there are 14,463 households. The average household size is 6.6 persons. 61.41 percent of the dwelling households depend on agriculture as the main source of household income while 32.13% depend on cultivation/share cropping, 5.00% on livestock, forestry and fishery, 0.29% on pisciculture and 23.99% are working as agricultural labour. Other sources of household income are non-agricultural labour (5.76%), business (11.88%) and employment (3.94%).

The literacy is 24.1% for both sexes, 31.5% for male and 16.2% for female.

The total population of Harbang and Badarkhali union under Chakaria thana are 17420 and 19750 respectively. And of them 8621 are male and 8799 are women in Harbang while 10359 are male and 9391 are female in Badarkhali. In Harbang, there are 2987 households and the average household size is 5.8 persons. In Badarkhali the number of households are 2647 and the average size is 7.5 persons.

In the thana, 58.80% of the dwelling households depend on agriculture as the main source of household income while 29.55% depend on cultivation/share cropping, 4.11% on livestock, forestry and fishery, 0.64% on pisciculture and 24.50 as agricultural labour. Other sources of household income are non-agricultural labour (6.74%), business (14.02%) and employment (4.96%). The literacy is 23.4% for both sexes, 29.2% for male and 17.1% for female (BBS,1992).

e) Land Use :

Land uses in the coastal zone are mostly ad hoc and un-managed, resulting in misuse of resources in some places and undue exposure of people to cyclone threats in others. In many thanas there are conflicts over land use between sectors as well as between people, eg. aquaculture use versus mangrove shelter-belts. Coastal natural

resource uses reflect primarily subsistence agriculture, with an emphasis on food production along with some cash crops and coastal fisheries which provide a major food and income source. Also important in some areas is aquaculture, with an emphasis on shrimp production for the export market, and some salt production for domestic needs (Clark et al, 1993).

Major use pressure is exerted on the ecosystems and resources of the coastal zone, especially the near-shore zone, coastal islands and beaches. Land use conflicts and clearly unsuitable uses are found in these areas. Other conflicts arise from land leases issued by the Ministry of Lands permitting deforestation of areas reforested in the recent past. The latter has left coastal areas unprotected resulting in significant loss of human lives and environment destruction, especially as compared to adjacent areas, protected by shelter belts (Clark, et al, 1993).

CHAPTER-2

CYCLONE SURGE PROTECTION MEASURES

2.1 STRUCTURAL AND NON-STRUCTURAL APPROACHES

In a country like Bangladesh, where about 30 million people living in exposed settlement areas are vulnerable to cyclone disaster. Their ability of overcoming the disaster is limited. But there are many ways to prevent or at least to minimize cyclone damages. Two important means for prevention and mitigation are structural and non - structural approaches. Structural approach is mainly preventive and requires professional staff and capital expenditure. Existing structures like cyclone shelter and embankments are insufficient to save the people. On the other hand non-structural approach is mainly mitigative and is less expensive. In this case it is better to give attention to the non-structural measures along with the structural measures, as it is less expensive. But it needs social adaption. In short term non-structural measures are not very effective but in long term these will be effective and some of these may become preventive measures.

Non-structural approach includes-

- i) Risk and vulnerability analysis
- ii) Land use and zoning
- iii) Cyclone forecasting warning service
- iv) Disaster preparedness
- v) Coastal afforestation and social afforestation etc.

2.2 SOCIAL FORESTRY APPROACH TO MITIGATE CYCLONIC DAMAGES

Social forestry (afforestation) is the most cheaper and ecologically more beneficial than any other measure to protect coastal areas and offshore islands from cyclone. Thick forest can reduce the wind velocity and cyclonic surge. From the past cyclones it has been observed that cyclone hit the shore lines strongly became almost inactive within five kilometers (Sobhan, 1992). Presence of thick vegetation weakens the wind velocity and reduces the surge height, thus minimising the magnitude of devastation. It may also reduce the deforestation activities and may increase vegetation, which may also improve the environmental and socio-economic conditions of the people. It includes plantations around the houses, along the roads, field boundaries, embankments, rivers etc.

In case of Bangladesh, it is necessary to make a green belt/shelter belt along the coast to protect lives and properties from cyclones. Primarily, these forests will be protective ones for coastal areas and offshore islands from cyclonic hazards and land erosion; on the other hand will accelerate land accretion method. Trees can also serve as a life saving device, enabling people climb on or holding them during cyclone surges and floods.

In the former USSR, the harmful effects of dust storms was recognised from a long time. Before forest belts were planted, dust storms used to carry away considerable quantities of soil, and in the region the Stone Steppe of the former USSR there were severe droughts which depressed agricultural yields. In 1934 and 1935 millions of tons of soil in the USA were carried away and deposited in the ocean; it prompted the wide-spread introduction of forest belts over the whole of the USA, the north-south oriented belts having the function of interrupting the continuous air flow from ocean to ocean (Riedl and Zachar, 1984).

To a lesser extent, forest belts have also been planted in the USA from the canadian border to Mexico, on the plane of Padua of Italy, and in Rumania, Bulgaria, Austria, Germany, Denmark, Holland, Switzerland, France, China and India.

2.3 CONCEPT OF SHELTER BELTS

Shelter-belts are barriers of live vegetation, usually trees and shrubs, planted in one or more rows at right angles to the direction of prevailing winds. Their primary purpose is to reduce the velocity of winds across agricultural crops, around buildings and livestock enclosures.

Shelter-belts have been used successfully in temperate climates since the middle of the 19th century. They have been effective in improving the microclimate, reducing wind erosion, increasing crop and livestock yields, reducing heating costs, and providing fodder, fuel-wood, and other wood products. It has also been demonstrated that shelter-belts can be even more effective under the harsher conditions of arid lands. On these lands, the value of planted tree species may be even higher than that of other products of land use.

Planning a shelter-belt operation requires a development worker to consult with local inhabitants to determine goals of establishment and management, and to provide a foundation for long-term development.

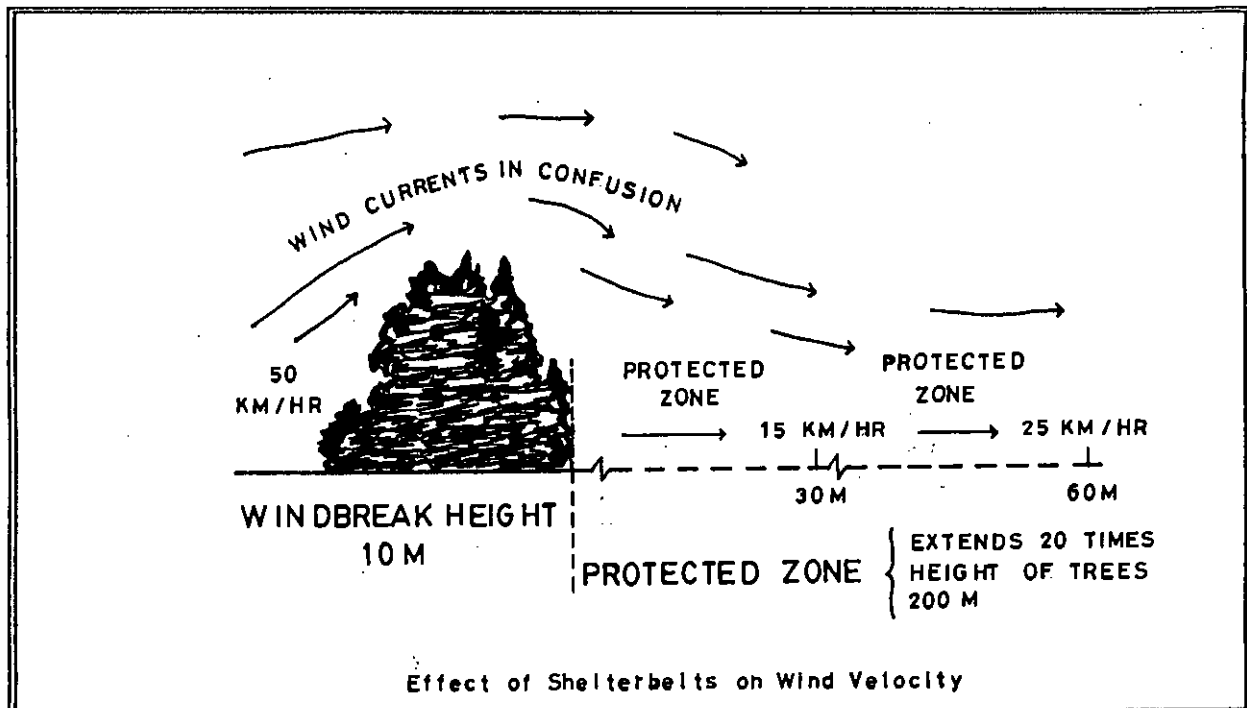
2.4 FUNCTIONING OF SHELTER-BELT

When wind approaches a shelter-belt, its velocity is moderated on both sides of the shelter. When the shelter-belt is dense and not very permeable to wind, most of the flow is deflected upward. Pressure on the down-wind side is reduced causing turbulence which greatly reduces velocity, but only for a relatively short distance down-wind of the shelter.

If a shelter is more permeable to wind, the wind flow is divided--part of the flow is deflected upward (as with the less permeable belt) and part penetrates through the belt. There is usually less turbulence and the reduction in velocity is felt a greater distance down-wind.

For both permeable and impermeable shelter-belts, the effect on wind velocity is related to the height(H) of the tallest trees in the belt and is expressed in multiples of this height. Normally, the effect is felt at distance of 20H to 40H, Therefore, shelter-belts should:

- * Be permeable with a vertical crown density of about 50 to 60 percent, but no greater than 80 percent.
- * Have the greatest height possible for tree species adaptable to the area.
- * Have a suitable width and structure.



Source: Fflliott and Thames, 1983.

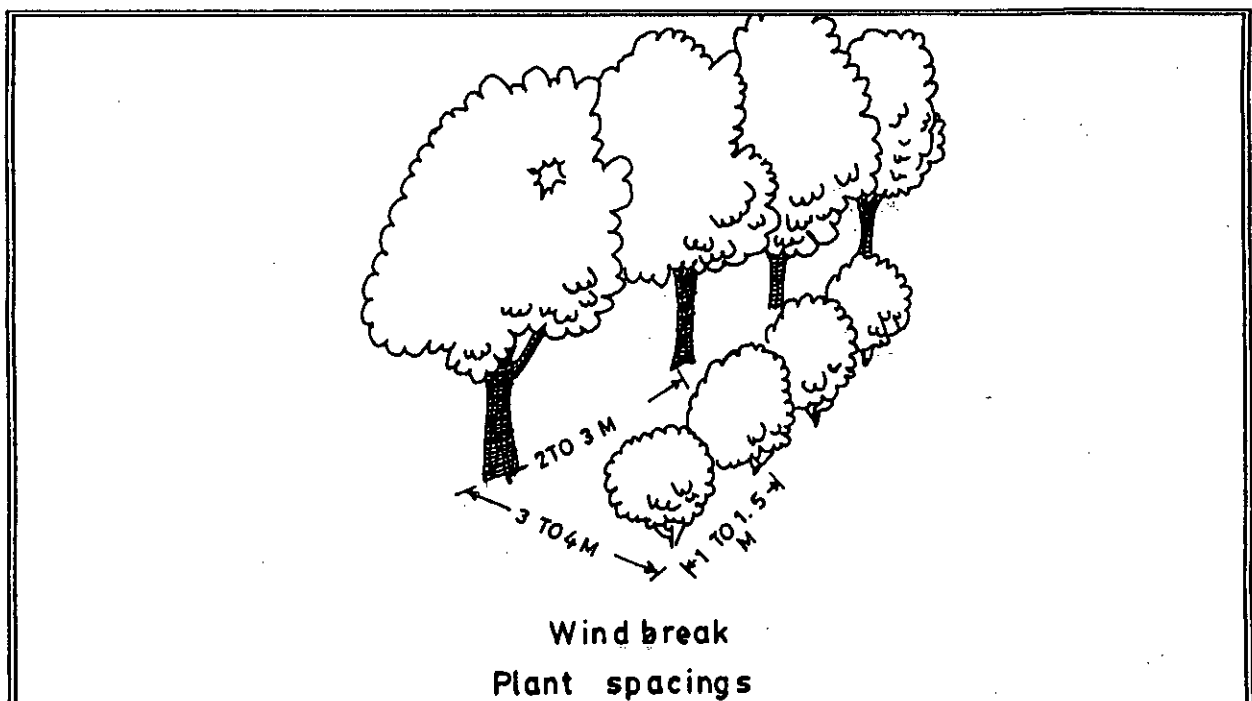
2.5 STRUCTURE OF SHELTER-BELTS

Shelter-belts are most often planned so that they will develop a triangular cross section, with the highest tree in the center flanked by shorter trees and shrubs on the edges. However, rectangular cross sections are of quite adequate for shelter-belts of two to four rows, provided that at least two of the rows have foliage down to the ground.

A decision on how wide a shelter-belt should depend upon the amount of land which can be economically devoted to planting, and the minimum number of the rows required to maintain the desired permeability. Actually, arrow shelter belts of moderate density are just as effective as wind belts.

Shelter-belts of five rows are generally efficient in both humid and dry climates and they are not difficult to maintain. However, in considering economic worth, account must be taken of possible multiple-use of the shelter belt. For example, wood products, shelter for animals and bees, food and cover for wild life, and fodder for livestock may be important considerations in addition to wind protection. For these consideration, shelter-belts of more than five rows may be desirable. One-row shelter-belts are risky since holes may develop and funnel the winds.

Spacing within rows depends in part upon the tree and shrubs species planted and the type of management to be followed once the plants mature. In general, seedling are planted close together to obtain early closure. As the plants mature, every other one is removed. Final spacing within rows should be from 1 to 1.5 meters for shrubs and 2 to 3 meters for trees. Spacing between rows should range from 3 to 4 meter to allow for subsequent cultivation.



Source: Ffilliott and Thames, 1983.

2.6 PATTERN OF SHELTER-BELTS

Design of shelter-belt systems largely depends upon the velocities and directions of local winds. If there are definite prevailing winds, a series of parallel shelter-belts should be established, preferably at right angles but no less than 45 degrees to the direction of the winds. More often winds blow from various directions which would require a checkerboard pattern. In some cases, dense shelter-belts may be planted across the major wind directions and less dense belts planted across minor directions.

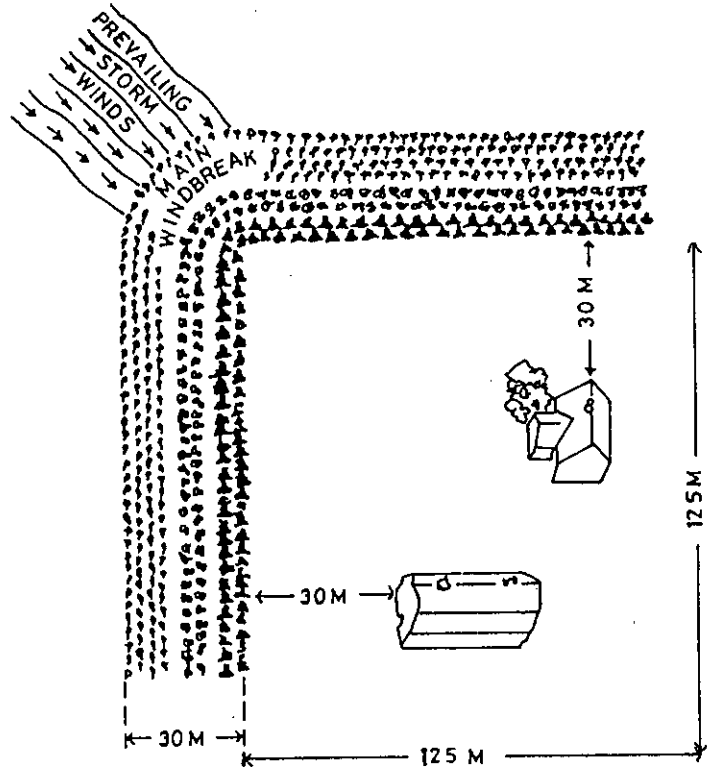
In irrigated areas, shelter-belts should be located mainly along irrigated channels. In rolling topography, shelter-belts are more effective if planted along ridgetops. Therefore, a compromise is sometimes necessary to take into account both the direction of winds and the cultural and physical characteristics of the area.

For sheltering livestock, a compact shelter-belt in a U, V, X or square configuration can be used. Shelter-belts around houses are after planted in L-shaped pattern across the prevailing winds.

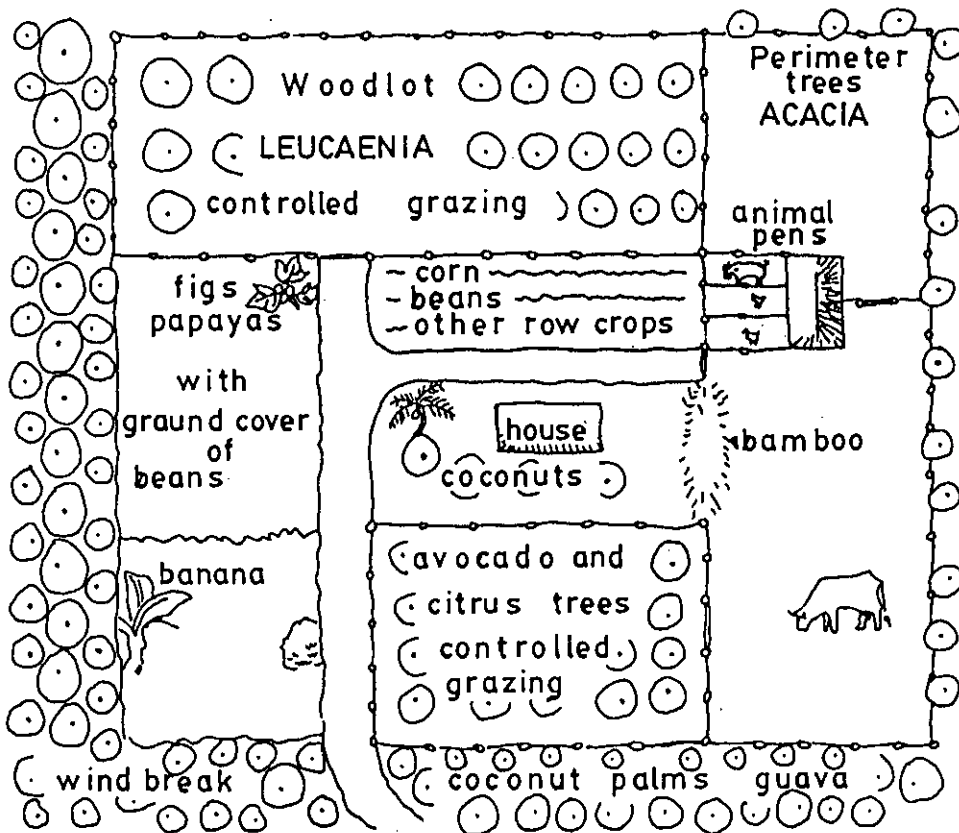
In hot and dry climates, dense shelter-belts placed too close to houses may result in oppressive heat. These belts should be permeable and located at least 30 to 45 meters (but no greater than 90 to 120 meters) from the houses.

2.7 SPACING BETWEEN SHELTER-BELTS

Planning the spacing of shelter-belts depends upon site factors, climatic patterns, and growth rates of the tree and shrub species. Normally shelter-belts should be spaced at about 20 times the height of the tallest trees, particularly across the major wind direction. If a checkerboard pattern is used, shelter-belts across minor wind directions may be spaced upto 60 times the height. Since height growth of species grown in the coastal area are not great the best that one can plan for in these areas is an average of 200 to 300 meters between major shelter-belts.



Shelterbelt Planting in an L-shaped Pattern



2.8 CHARACTERISTICS OF THE PLANTS

Native and introduced tree and shrubs species which have proven their adaptability to the soils and climate of the region should be used in shelter-belt plantings. Plant selected should have certain characteristics, including:

- * Resistance to the force of winds
- * Strong top roots. (Lateral rooted tree and shrub species will compete with fields and pastures they are supposed to protect).
- * Dense, uniform crowns, thrifty growth, perennial foliage, and adequate height.
- * Resistance to disease, and insects, and heat.
- * Value for wood or other products (such as forage).

Although use of a single tree or shrubs species simplifies management, it is not often that one plant will have all of the above attributes. Often two or more species will be required to develop a shelter-belt that will provide adequate protection. For example, the low growth form of acacia makes it useful for planting in the outer rows of shelter-belts in dry climates; the inner rows may consist of tamarisk, casvonia and eucalyptus. Single plant species, particularly those that sprout often cutting (such as eucalyptus), can sometimes be managed to provide full vertical shelter by alternative cutting the outer rows of trees and allowing the cut trees to complete the shelter.

2.9 MANAGEMENT OF SHELTER-BELTS

Properly managed shelter-belts can yield products from thinning, sanitation cuts, prunings, and rotational cuts without greatly reducing the barrier effects. Indeed, cuttings are often necessary to maintain the structure and vitality of the shelter-belt. For example, to stimulate height growth and the formation of straight stems, pruning of the lower branches early in the development of the belt is advisable. Coppicing trees will require the greatest amount of pruning. To stimulate diameter growth, thinning can be required. For some tree species, thinning could be started during

the fourth or fifth year. Sanitary cuts and thinning will occasionally be necessary during the life of the shelter-belt to remove dead, diseased, or insect-infected trees.

Rotational cuts will provide the greatest quantity of wood products. Each successive cutting can be done so that at last half of the rows are left standing. Therefore, half of a five-row shelter-belt can be cut; meanwhile, the other half should furnish the necessary protection until the regrowth of the first cut reaches the desired density. It should be planned that the first cut is done on the down-wind side at about half the normal rotational age. Starting with the second cut, a normal period of rotation could be followed. Replanting, of course, follows each cut. In the case of two-row shelter-belts, one row is cut and the second is left standing.

The cutting cycle for shelter-belts depends upon the growth rate of the tree and shrubs. However, a rough estimate for tree species used for wood products is 15 to 20 years (roughly the same as the rotation cycle).

2.10 ENVIRONMENTAL EFFECTS OF SHELTER-BELTS

The effect of shelter-belts are almost without exception beneficial to the environment. Major effects include:

- * Lessened evaporation and transpiration, increased water available for plant use, and reduced water stress.
- * Improved soil moisture relations
- * Decreased wind damage to plants & animals
- * Checked wind erosion and lessened sand movement and its abrasive action.
- * Controlled air temperature by leveling out extreme fluctuation.
- * Provision of organic material for soil handling and improvement.
- * Provision of an aesthetic value in areas where trees are scarce.

2.11 CONCLUSION

The occurrence of natural calamities can not be prevented but the devastation caused by them can be reduced upto a certain extent through the adoption of structural and non-structural measures. The structural measures involve huge capital investment, therefore, non-structural mitigation, like shelter belt creation is more emphasised now a days. Such approaches are not only viable from the ecological point of view but also beneficial from the socio-economic perspective. These projects provide employment opportunity for the low income people and motivate people to take active part in the development of greenery and indirectly in cyclone disaster management, therefore the cyclone prone areas of the country should establish such shelter belts along the coastal belt to protect land, people and other resources from the adverse effects of cyclone.

CHAPTER-3

SOCIAL FORESTRY THEORY AND CONCEPTS

3.1 DEFINITION AND MEANING

Throughout the developing world, an indefinite number of projects and programs are being implemented under the various names "social forestry", "community forestry", "village wood lot forestry" and others (Kirchhofer and Mercer 1984). They note that under these various titles, forestry - an approach that involves local participation in forestry related activities to meet local needs.

Noronha, (1982) as cited by Kirchhofer (1984), suggests that the social approach to forestry differs from traditional forestry in three ways (1) it is concerned with the nonmonetized sector of the economy, (2) it involves direct participation of the beneficiaries, and (3) it requires the forester change his role from that of "protector" of public forest to that of extension agent at the community level.

Social forestry can be broadly defined as "a people oriented forestry programme or activity". Sometimes it is simply described as "forestry for and by the people". Others define it as "any forestry activity aimed at providing goods and services for the benefit of rural communities".

Community or social forestry has been defined by UN/FAO as "Any situation which intimately involves local people in forestry activity. It embraces a spectrum of situations ranging from woodlots in areas which are short of wood and other forest products for local needs, through the growing of trees at the farm level to provide cash crops and the processing of forest products at the household, artisan or small industry level to generate income, to the activities of forest dwelling communities. It excludes large

scale industrial forestry and any other form of forestry which contributes to community development solely through employment and wages, but it dose include activities of forest industry enterprises and public forest services which encourage and assist forestry activities at the community level. The activities so encompassed are potentially compatible with all type of land ownership. While it thus provides only a partial view of the impact of forestry on rural development, it does embrace most of the ways in which forestry and the goods and services of forestry directly affect the lives of rural people "(FAO 1978).

Furthermore, Wiersum (1984) sums up social forestry in the following manner :

Social forestry-small scale forestry activities conceived and implemented largely through farmers initiatives for their own socioeconomic ecological benefits--is a radical departure from large scale industry oriented forestry and is progressively being regarded by land-use policy makers and rural development planners in developing tropical countries as an effective means for achieving multiple objectives .

These objectives include :

- * Generating income and stable employment opportunities for socio-economically disadvantaged rural populations;
- * Stabilizing and strengthening rural communities and institutions;
- * Producing, on a sustained basis, vital commodities such as fuelwood, construction wood, fodder, green manure, and food for local consumption; and
- * Minimizing local ecological degradation and maintaining the productive capacity of the site.

From the definitions and objectives of social forestry cited above it is not very difficult to answer the question of who should benefit from social forestry, The above statements obviously suggest that the beneficiaries are local populations, either rural populations or forest dwellers, In general, those who will benefit from social forestry are "the socio-economically disadvantaged rural populations". However, in light of the reality of the socioeconomic and political conditions of most developing countries, these objectives are not easy to achieve.

3.2 THE CHARACTERISTICS OF SOCIAL FORESTRY

The first unique characteristics of Social forestry is its small scale. Since it is a forest based undertaking by an individual or a household, or a group of households, or a community it is by necessity limited in scope and geographic extent as dictated by the dearth of production inputs in the hands of farmers. The small scale is especially noticeable when compared with corporate forestry activities.

The second characteristic relates to the nature and end use of the products. Unlike governmental or corporate bodies, individuals, households, or rural communities have relatively short time horizons and high propensities to consume, and therefore cannot afford to raise long term forest products. To minimize their waiting periods and maximize their yields per unit time, they normally use fast growing, early maturing multipurpose tree species and harvest a wide array of products mostly for local consumption.

A third feature has to do with the system of land use. Where conventional forestry plantation is often monoculture tree cropping for a single end use, social forestry may range from monocropping with multiple use goals on one end, to multiple or integrated cropping systems for a multiplicity of uses on the other.

The fourth characteristics refers to the degree of participation and involvement of the local people. In traditional forestry, local

people often only serve as hired workers of corporate bodies which plan, implement and manage the project. In social forestry, on the other hand, the local people takes the prime initiative of planning and managing their projects. Consequently they bear all the costs, take all the risks, and also reap all the benefits for themselves.

In fine, then social forestry is a small scale land use operation ranging from pure forestry to integrated agroforestry, and planned and implemented by individual farmers or communities to yield products and services for their primary use and benefits. The land used for social forestry projects could be sole owned, community or clan owned, or government controlled but made accessible to the people .

3.3 ROLES OF SOCIAL FORESTRY

Social forestry can become highly attractive and readily acceptable to farmers and could be highly favored by government because of the wide array of roles that it can play which yield direct and immediate micro-level benefits to the resource poor and economically disadvantaged rural dwellers, as well as bring forth long-term, macro-level, resource-conservating type advantages that government agencies try all the time to achieve. Social forestry can have positive as well as negative impacts in the areas of ecology, sociology and economics.

A. Ecological Impacts of social forestry

To be productive, land based systems , including social forestry, should be sited on the best lands available. Actually, the best and most accessible lands are usually and logically allocated to food production. The residual areas, normally the poorest, the least accessible and the least topographically favorable to cultivation, are assigned to forestry.

Thus, social forestry suffers right from the beginning by being relegated to poor sites. Ironically, it is at the same time expected to be productive in those less- desired areas and to perform the "miraculous" transformation of severely degraded sites into highly productive ones.

From available scientific evidence, tree plantations established through social forestry or other reforestation programs can improve and rehabilitate the area through substantial inputs of nutrients and organic matter into the soil. Besides improving the soil tilt, the accumulated organic matter improves the soil and increases the water retentive capacity of the soil to store sufficient moisture which nurtures the plants to ensure productivity and sustainability. Litter also serves as mulch and crowns serve as shade to minimize soil loss through evaporation. All these benefit the farmers get directly, in terms of higher productivity. On a macro-scale, the environmental benefits from social forestry which governments want to maximize are slope stabilization, erosion control, siltation of soil and wind breaking, especially in the coastal areas. Tree roots anchor, stabilize and hold together the soil, tree litter shields the soil surface from the erosive force of surges and raindrops ; tree crowns intercept and cushion the impact of winds and rainfall; and stems and surface roots reduce the velocity of winds and, the erosive force of surface runoff following heavy rains. All these impacts are not viewed by farmers as purely ecological but perceive them as economical in the sense that they positively influence productivity.

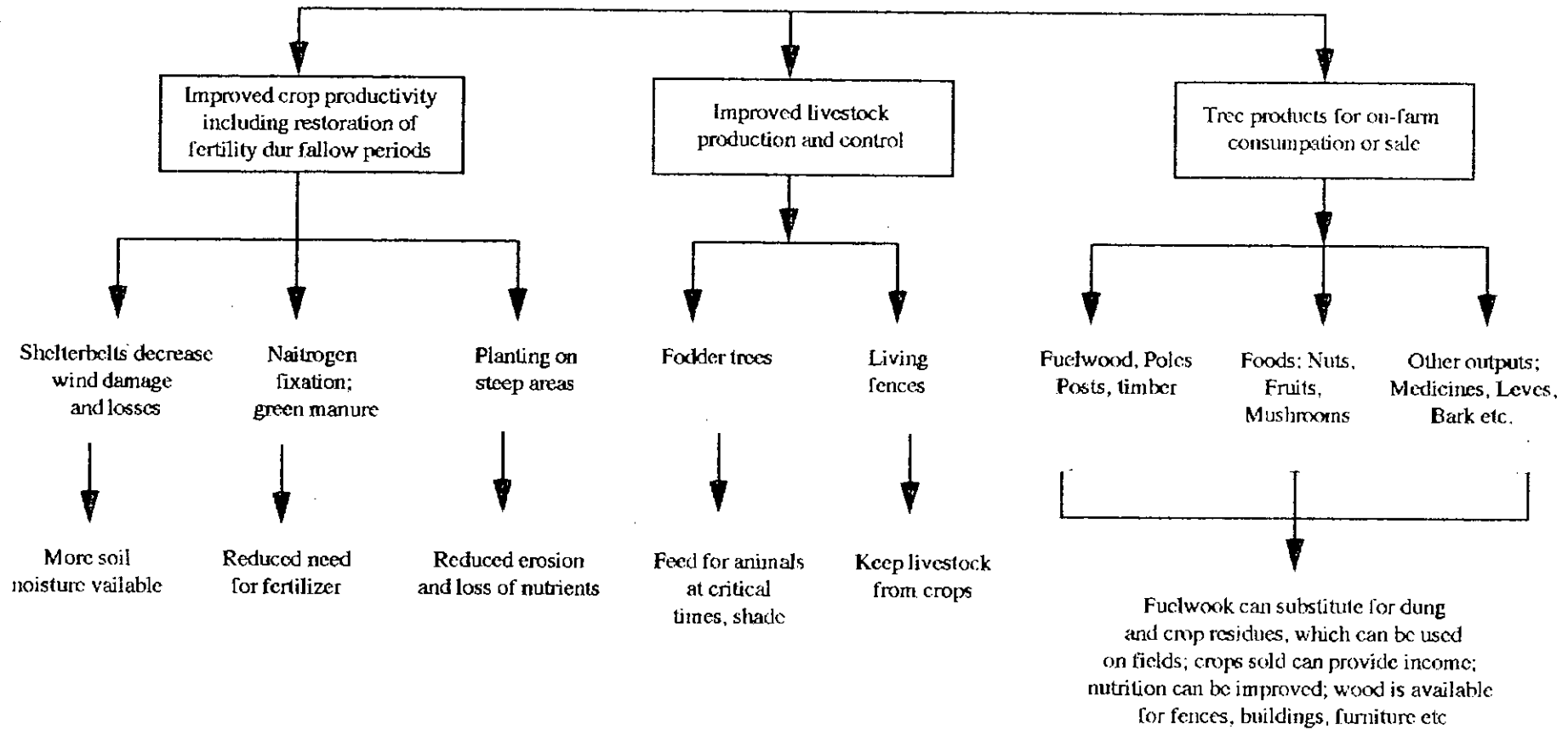
All social forestry impacts are not positive. Examples of negative effects are (i) the rapid nutrient uptake by fast-growing tree crops which, when harvested at very short intervals would result in increased nutrient exportation and site degradation; and (ii) the high rate of moisture loss through evaporation by trees, thereby reducing the quantity of water available in the ecosystem. Fortunately, the aggregate of these negative impacts seem to be outweighed by the positive ones, as demonstrated by the general increase in site quality and productivity upon conversion of degraded grasslands into forests.

B. Economic Benefits of social forestry

To the people engaged or about to become involved in social forestry, the perceived and anticipated economic benefits from this land use system are the most important attraction. These local people expect to be able to produce for their own use, without having to rely on external markets, such prime products as small timber for farm construction, fuelwood for home use and for local markets in the event of surplus outputs, fodder for draft animals or for livestock that serve as source of animal protein in the farmer's diet, green manure with which to substitute for expensive chemical fertilizers in improving productivity, and for mulching to minimize moisture loss from the farmers, and food products harvested from the intercrops. These various products are viewed as incomes -in-kind rather than cash incomes and are a direct economic benefit to the social forestry practitioners. Moreover, these incomes from the wide variety of crops become available year round rather than seasonal as in the case of monocultural annual food crops, thereby making social forestry beneficial to the economically disadvantaged farmers. Improvement of the ecological status of the farm sites, now make possible the sustained extraction of these economic benefits from the once-unproductive land.

All these outputs and benefits incurs costs. Planting trees means reduction of land available to food crops. More complex integrated cropping systems require more labour inputs and reduction of leisure. Generation of outputs in excess of consumption require market outlets and marketing efforts and skills. Reduced surface area for food crops are willingly accepted in exchange for sustainability of production that the presence of tree intercrops seem able to provide. Increased labour inputs are welcomed rather than abhorred because they represent an expansion in gainful employment and, therefore lead to greater incomes. Surplus outputs that require marketing are viewed as an important breakthrough in upward movement from subsistence situations to a market-oriented and more progressive existence. All these phenomena which could be triggered by social forestry indicate the possibility of a significant improvement in the socio-economic status of the rural populations.

Increased levels of tree planting and tree management on farms can result in:



C. Social Benefits of social forestry:

With the economic advantages of embarking on social forestry projects are the anticipated sociological benefits that could occur to the participants. Foremost among them is the creation of continuous employment opportunities which generate year-round income that now makes it possible for the rural poor to gain access to better nutrition, higher quality clothing and homes, more stable communities, improved education and better health etc.

One drawback from the sociological standpoint that may be recognized is the fact that year-round work by the people in social forestry farms would leave them practically no time for the traditional social events and cultural interactions among the rural people

3.4 SUITABILITY OF SOCIAL FORESTRY AS A DEVELOPMENT TOOL

In Bangladesh, where around 80 percent of the population live in rural areas as farmers live in subsistence or below subsistence level, and where substantial areas of degraded land await rehabilitation, social forestry, with roles as described earlier, appears to be a promising tool for socio-economic-ecological development. A few examples of the successful employment of this land use system may be follows:

In the Philippines, a group of farmers who once lived in abject poverty and who depended mostly on traditional shifting cultivation method switched farming to agroforestry system of land use with some drive from the private sector. The agricultural element of the new undertaking was designed to fill their food needs, while the forestry component was geared to raising fast-growing, Nitrogen - fixing "Albizia falcataria" pulpwood to be sold to a nearby pulp and paper mill. Management of the tree crops called for intermediate or thinning harvest at 4 years and final harvest at 8 years. To sustain yields and ensure annual harvests, farm lots were divided into 8 blocks, each of which was planted at succeeding years

such that from the 4th year, there is always at least one block of trees ready for thinning, and from the 8th year, there is a block ready for final harvest every year. The project significantly increased the income of the farmers. In addition, they found tree farming so much more profitable than food farming that they gave up the food cropping component and devoted their farms entirely to tree crops. Incomes from harvested pulpwood were then partly used for purchasing the necessary food, clothing, and other prime commodities. These farmers had finally broken away from the subsistence mold and entered the market economy (Domingo, 1981).

Another excellent example comes from India. The State of Gujarat has pioneered a social forestry project designed to remedy the fuelwood and small timber scarcity, to provide fodder sources for livestock, and to utilize and reclaim accessible but degraded lands. Multipurpose fast-growing trees were planted along roadsides and railroads, along irrigation canal embankments, and on lands rendered unusable by extreme salinity/alkalinity. Several species were tried but *Leucaena* and *Eucalyptus* were some of the more notable trees.

Today this project provides a significant amount of fuelwood for domestic use. Besides freeing the households from the worry about the availability of fuel for cooking. It has, to a certain extent, reduced the practice of drying and burning cattle dung for cooking, thereby making available these dung as organic matter recycled into the fields to maintain productivity. The saline/alkaline soils were found capable of growing trees and the trees in turn, through addition of organic matter, improve the soil and eventually make it suitable to other crops-possibly food crops. Fodder from the legume trees and from the grasses growing beneath the trees now supply the livestock needs. The roadside plantings, beside providing good shade to travellers, have an aesthetic benefit. Canalside plantings reinforce and strengthen the embankments. Gujarat may have created a model for the rest of India and South Asia (Karamchandani, 1981).

3.5 THE ADOPTABILITY OF SOCIAL FORESTRY

Nothing is more frustrating to planners than for them to design what they deem to be the best program for lifting the rural populations from the depths of poverty only to find that such program is rejected by the intended beneficiaries. This puzzling phenomenon has been occurring with increasing frequency, and some social forestry programs have been turned down by farmers in this manner, indicating that the adoptability rating of the program is very low.

There are two main issues related to the adoption/rejection of innovative land use, including social forestry: (1) whether the innovation truly benefits the farmers/practitioners; and (2) whether the new system or technology has been introduced or transferred to the farmers in a manner that enhances acceptance.

With regards to benefits from new technology, farmers usually readily recognize and take advantage of perceived economic benefits. They may implicitly take cognizance of ecological and social advantages as well, but these "intangibles" could be understood and best be handled in terms of economics. In short, farmers may be indifferent to an innovative land use system if proposed and justified merely on basis of soil conservation, but may be wholly receptive to one that demonstrates increased yields per hectare per year (Raintree, 1983).

Social forestry is capable of demonstrating direct economic benefits to farmers in the form of readily available small timber, fuelwood, food, fodder and fertilizer where there used to be serious scarcity. Thus, notwithstanding the nature of the other impacts of the project, people are very likely to accept it.

The other issue concerns the method of technology transfer. This has two phases : the first one relates to efforts to alter the farmers perception of the innovation being advanced. This is

largely informational, and while it may not result in a final adopt / reject decision on the part of the farmer, it would at least create enough interest preparatory to the next stage, which is demonstration of an actual or "real-life" project. Working under the "seeing -is -believing " principle, pilot demonstration plots to which farmers can be brought can go a long way in clinching the final adoption of the technology or system. The system of social forestry land use, and the physical products and benefits that they bring, lend themselves very well to pilot demonstrations. Thus, it is deemed relatively easy to induce adoption by the people.

These two phases may be combined under one whole process called " participatory approach" Under this scheme, the target people are involved all the way from problem identification, through plan formulation, to implementation. Their intimate participation at the inception of the project enables them to understand what project is being planned and, more importantly, why it is being planned. When the technology validation is reached, the participants are treated to a "grandstand view" of the pilot demonstration. Thus, when the time to widely disseminate the technology comes, the farmers will have reached a high state of receptivity that will be difficult to equal. Thus operates the "bottom up" or "participatory" approach towards a successful social forestry project.

In a setting where there is a loud cry for new land use initiatives to promote rural development and soften the harsh effects of overpopulation, underemployment and poverty, it is important that a development -triggering system like social forestry be well designed by planners and be fully accepted and implemented by the beneficiaries in order to be successful and effective.

3.6 CONCLUSION

Social forestry is a process where by forest coverage is gradually increased incorporating people's participation in all stage.

The varieties of trees in a social forestry programme are selected basing on local need and physical characteristics. It can have multi-dimensional effects i.e., economic, social, ecological etc. Social forestry programme can be of a major way for economic development of the low income people in the rural areas.

Social forestry is a people oriented, less extensive (than the natural forests), multiple use based programme. The successful implementation of such projects largely depend upon the national policy and local acceptance of the projects.

CHAPTER-4

SOCIAL FORESTRY EXPERIENCE IN SELECTED COUNTRIES

4.1 SOCIAL FORESTRY IN INDIA

India may be credited for popularizing if not coining the term social forestry. This was because in 1972 the phrase was used by the Indian National Commission on Agriculture, for the first time, to distinguish its tree planting activities from production forestry.

As stated by the Commission, the objectives of social forestry are the following :

- * To provide firewood to the rural areas and to replace cowdung being used as fuel;
- * To provide small timber and fodder; and
- * To provide recreational facilities.

However, the origin of modern-day social forestry programmes in India and elsewhere can be traced back to the first efforts made in the state of Gujarat. This was in 1969 when the Gujarat Forest Department (GFD) embarked on the establishment of fuelwood plantations along roadsides and canal banks.

As this early programme was a success, community forestry activities were expanded to include plantations outside forest reserves on public and private lands in rural areas. Consequently, there has been a rapid spread of social forestry

programmes in almost every State of India (notably Uttar Pradesh, Haryana, Punjab, Tamil Nadu, and West Bengal). By the end of 1980, some 80,000 hectares had been planted under social forestry projects.

Most of these programmes may be considered to have three major objectives, namely :

- * To intensify departmental efforts toward increasing the production of fuelwood, fodder and small timber primarily for rural communities.
- * To motivate individuals, farmers, institutions, village panchayats (councils) and other organizations for utilizing marginal and degraded lands for trees; and
- * To provide employment opportunities, skills and infrastructure for the accelerated development of rural areas.

The following are the various reforestation models or schemes that India uses to involve the people or rural communities in social forestry :

a. Village Woodlots

Under this scheme, each of the 18,000 villages of Gujarat would eventually have a 4 to 5 hectare woodlot to meet its fuelwood and fodder needs. Two types of systems are employed :

* Village self-help scheme.

The village panchayats bear the costs, raise and maintain the woodlots and all benefits accrue or go to the villagers only.

* Supervised village scheme.

The Gujarat Forest Department (GFD) incurs the expenditures and upon harvest all costs with 10% interest and management fee of 25% of direct costs would be recovered and the balance given to the panchayat (council).

b. Strip Plantation

Strips of land along roads, railway lines, canals are planted; the arrangements are approximately the same as for village woodlots. Villagers with strip plantations passing through their lands would be allowed minor products free of charge. Leaf fodder and fruit collection would be organized and supervised by the village panchayat under the guidance of GFD staff. All other products from the strip plantations would be the property of GFD, harvested and marketed by them. However, net profits from the sale of fuelwood, poles, bamboo, timber, etc, would be divided on a 50:50 basis between GFD and the group of villages close to the strips.

C. Social Security to Tribal Families

Under this scheme, identified landless tribal families are assigned forest lands of 2.5 hectares each for raising and maintaining plantations. All materials inputs are provided by the GFD. Each family contributes 25 days of labour a month and receives Rupees, (Rs.) 250 (1981 figure) subject to upward revision in price escalation as remuneration. A 25% share in net profits at plantation harvest time is promised.

Free housing materials, water facilities and the right to collect minor forest products for barter or sale from the adjoining forest is given to these tribal families.

D. Forestry on Private Lands

Under this scheme, the GFD provides free seedlings and technical assistance to private tree farmers. One private farm reported as gross profit close to Rs. 6,000/hectare in 1978 through harvesting a 7-year old eucalyptus hybrid plantation. The demonstration effect convinced several other people including small farmers to switch to tree farming. Eucalyptus is a good coppicer and can be harvested once every 6 to 7 years without replanting for 4 to 5 cuts. Thus it has a comparative advantage over agricultural crops especially where agricultural labour is not easily available or costly or difficult to manage.

E. Tree-farms on Marginal Lands

Farmers belonging to scheduled castes/tribes each owning not more than 3 hectares of degraded land are encouraged to raise small tree plots through a scheme with the following key features :

- * All costs of raising the plantation are borne by Government for farms of 0.5 to 1 hectare in size;
- * The owner maintains and protects the trees;
- * The owner receives Rs. 250 per year for 10 years as compensation for ensuring a 70% survival of plants;
- * Neither costs incurred or allowances paid would be recovered from the farmers and
- * the benefits go to the farmer.

The cost of the scheme to Government in 1980 was US\$ 90 per hectare towards establishing the plantation and US\$27 per year for 10 years as compensation to the farmer's family.

F. School Nurseries

The Government supplies materials (potting bags, seeds, manure, implements, etc.) to schools, trains children to raise nurseries in their spare time and eventually buys back the seedlings from the schools to be used in afforestation programmes.

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Some schools earned up to \$250 a year : useful cash for providing clothes and books free to needy children. Other benefits of this beautifully simple scheme are:

- * saving of Government overhead (i.e, expenditures) and bureaucratic machinery in raising seedlings in central nurseries;
- * dispersed village-level school nurseries closer to planting sites; and
- * growing numbers of self-confident resourceful children with a feel and concern for ecology and the environment.

An interesting programme in Gujarat State as well as other Indian States is social forestry through schools. In 1981, the school children planted 100,000 ipil-ipil (*Leucaena leucocephala*) seedlings 80% of which are doing well.

4.2 SOCIAL FORESTRY IN CHINA

There are many terms for describing forestry activities involving rural community such as social forestry, community forestry, farm forestry, agroforestry, forestry for local community development, upland forestry, rural forestry, etc. however, non of them has been accepted or recognized in China as a standard term. China has long been a country with relatively developed forestry activities in rural area. As early as the 1950's rural people had already started various forestry activities such as farmland shelterbelts, roadside planting, etc. Many foresters in China have shown their great concern over these activities.

China has no private land. In rural areas all land is owned by rural collectives (villagers' committees). But farmers have the right to use the land allocated to them. Therefore, Chinese foresters consider all forestry activities in rural areas excluding state owned forest, as community or social forestry. Furthermore, they divide community forestry into two categories, i.e., mountain forestry and plain forestry.

A. Mountain Forestry

China has 66 million ha of mountain area for forestry use. So to green mountains is a state strategy. Chinese Central Government (State Council) has promulgated many policies for community forestry. The following are the main points of these policies.

Forest Ownership Policy

China is a socialist country. In accordance with the Constitution all land is owned by state (governments at all levels) and collectives. In rural area farmers are given land for use. In 1981 the State Council urged local governments to define clearly boundaries of forestry land to be allocated to farmers with the aim of promoting forestry development. As of 1984, a total of 470 million ha of mountain area has been allocated to farmers as self-retained land.

Forestry Cooperatives

Besides forestry land, farmers are willing to cooperate in forestry activities. The total number of forest farm cooperatives amounted to 110,000 with an area of 11.33 million ha as of 1988. There are in China various forms of forestry cooperatives, which are mainly as follows :

Rural Forest Farm

Within the scope of a village and under the guidance of villagers' committee the farmers of the village are organized to establish forest farms. The farm have many components of activities such as timber forest, fuel woodlot, cash forest, etc. The land for the farm is owned by the villagers' committee and the benefits generated are distributed among farmers after deducting funds for reproduction and common accumulation (for education, welfare, medicinal care, etc.). The statistics for 1983 show that there are about 175,000 rural forest farms with a total area of 6.67 million ha.

Shareholders' Forest Farm

Farmers contribute their self-retained land to form a shareholders' forest farm on voluntary basis in the form of shares. Generally, this kind of farm is managed by a board of directors, who are elected by the session of all shareholders. The benefits are distributed based on shares. The shareholders'

forest farm is quite popular in Fujian province, especially in Sanming prefecture.

Mixed Forest Farm

In order to get a stable supply of wood, some state-owned enterprises are actively involved in the establishment of forest farms by providing funds and technology, while farmers join the farms by providing labor and land. According to an agreement signed, the benefits (timber) available for distribution are shared by the state enterprise and the farmers.

Households' Group

This is an organizationally loose cooperative group composed of a small number (4-30) of households. The farmers help each other on the basis of labor exchange. The products (timber, sideline products, etc.) are transported and sold by agreed-methods.

Funding Policy

Diversified Funding Sources

The government has its budget for forestry. However, it is very limited. In order to mobilize more funds for forestry, governments at all levels encourage any one to provide financial support to forestry. The government also issues policies which force some sectors to contribute funds to forestry. For instance, the coal mining industry must contribute funds in

accordance with the amount of coal produced, every water conservancy project must have funds for forestry, hydroelectric power stations should pay tow fens (1 yuan equals 100 fens) to the forestry sector for every KWH generated, the highway construction bureau has to pay approximately 5% of their income to the forestry sector for forestry development. The percentage of fees varies from place to place and there is no standard percentage for all China.

Forestry Loan Policy

Mountain farmers are given low interest loans for planting programmes. Since 1986 the government has applied a new loan policy in which farmers are requested to pay one third of the interest and the other two thirds are born by the government concerned. In some places government pays all interest to let farmers pay only the principal they borrowed. Our experience indicates that loans have a better on effect investment than grants, because farmers realize that they should repay the loan in due time. The government share-interest policy is welcome by farmers. Now the constrains are weakness in feasibility studies on project selection. A forestry bureau in a country, which does a feasibility study on selected forestry loan projects is a loan guarantor and thus assumes responsibility for loan repayment.

The period of loan repayment is 5-7 years, therefore farmers cannot use it for establishing long rotation forest plantations.

The best choice from the point of view of farmers, is to establish fruit orchards.

Diversified Social Forestry

There was an old tradition or model for community development in China in which foresters showed their concern for forestry only, and agronomists for agriculture, etc. This practice did not fit the natural and economic laws. Nowadays, Chinese foresters have put forward a new concept of diversified community development, so called "space forestry". The following is a typical case of such development.

"Space forestry" means multiple-use of the whole space where forests stand, including air, land, surface water and underground water as well. In Hanshou county of Human province there is a small watershed (2.5 ha) covered by a poplar plantation. Between the poplar trees palm seedlings are grown. At the foot of the hill, in a pond, carp, forgs, roach, eel and tortoise are farmed. Around the fish pond are planted citrus trees, water melon, medicinal herbs and ginger. Pheasant/rabbit/cow farming are managed also in the poplar plantation. The farmers got 112,000 yuan or US\$ 30,000 from this small watershed in 1988. This income is 10 times more than pure forestry production. However, space forestry needs highly qualified farmers. Therefore, this model cannot be applied in very poor areas where farmers are less knowledgeable.

B. Plain Forestry

The plains in China are the main agricultural base, with a dense population of 300 million and limited farmland of 40 million ha. Generally speaking, there is no large area for forestry use. However, in the last two decades fast development in forestry has taken place with rather good economic results. The Ministry of Forestry pays get attention to plain forestry. Since 1977 the ministry has conducted 6 conferences on plain forestry. Our conclusion is that plain forestry is one of the specific features of China's forestry.

Scope of Plain Forestry

In the 1950's the most activities in plain forestry were concentrated in sandy land afforestation. Later, it extended to cover "four side plantations". Four side plantations means tree planing on the side of roads, rivers, and around the house and village. The original objective of four side plantations was to meet farmers' demand for timber and fuel. In the 1970's, plain forestry activities further extended to cover farmland shelterbelts and intercropping.

Farmland Shelterbelts

In the first stage of a nation-wide campaign for shelterbelt construction, farmers were reluctant to plant trees on their land, since the shelterbelt occupied their farmland. Later, by good and successful demonstration the farmers were convinced to have shelterbelt networks. The area protected by shelterbelts has been increasing. By the end of 1988, 26.6 million ha of farmland had been protected by shelterbelts, which 53.7% of the total area of farmland. The economic benefits of shelterbelt networks has been recognized by rural people. For instance, the field tests done in Jiangsu and Henan provinces provided the following results :

Reduction of wind velocity	30-40 %
Increase of relative humidity in air	10-20 %
Increase of moisture content in soil	20-39 %
Increase of wheat production	15 %
Increase of cotton production	8-10 %
Increase of rice production	4-14 %

Intercropping with Trees

Trees of some species are planted in farmlands at very large spacing, say, 30-40 trees per ha. The species selected are paulownia, poplar, water larch (*Metasequoia glyptostroboides*), pond cypress (*Taxodium ascendence*), Chinaberry-tree (*Crataegus pinnatifida*), etc. The practical experience indicates that trees have no negative impact on agricultural crops. Paulownia is the best species adopted in central China. According to the

statistics for 7 provinces in 1985 the total area of paulownia-intercropping amounted to 3 million ha.

It is reported that every hectare of paulownia-in-tereropping can add a value of 750 to 1,050 yuan (equivalent to 200 to 280 USD) per year. The paulownia timber for export is obtained mainly from intercropped paulownia.

Round Village Forest

Round village forest is planted by village committees and managed by villagers. Such forest not only protects village environments, but also generates benefits in favour of village collectives and farmers themselves.

Research Initiatives on Social Forestry

The rural population constitutes 80% of the total population in China. Therefore, meeting social demand is the same as meeting demands of rural people. What is the demand of rural people? In China, as a developing country, rural people need 5 things, i.e., food; fuel, building material, forage and case income. Although not all farmers are aware of environmental importance, the Chinese government has been making emphasis on forestry as an important environmental factor. Chinese (Forest Law) reads : the forest functions are water conservancy, climatic adjustment, environmental protection and supplying forest products. The first three functions concern environmental protection.

It is known that since 1978 the State Council has launched an ambitious programme of "Three Norths" shelterbelt construction. The first phase of this programme was completed in 1987. Recently, the State Council has issued another programme of establishment of protection forest in the upper and middle reaches of the Yangtze River. The above-mentioned two programmes are linked directly with community forestry. The government urges foresters to conduct research work serving the programme implementation.

Chinese foresters have made a proposal of Plain Forestry standards. The Ministry of Forestry has accepted it and made decision on it. The decision says that in plain areas the tree coverage (including individually isolated trees) should be 10% and above. The Chinese forestry researchers concluded that regardless of whether it is mountain forestry or plain forestry, the environmental benefits and economic benefits should be stressed equally. They give the term "dual objective forestry." The main measures for realization of the objectives are:

- a) The forest type must be right, the species selected should meet rural needs and agriculture can benefit farm forests.
- b) The main means for achieving dual objectives is farmland shelterbelts.
- c) Intensive forest management.
- d) Priority should be given to raise high value seedlings.

- e) Forest product commodity bases have to be planned and set up.
- f) Services must be improved.

4.3 SOCIAL FORESTRY IN JAVA

With its population of about 175 million (1989) on 13,667 islands which cover a total land area of 192 million hectares, Indonesia has powerful human resources.

Java is the most populous island and it is the centre of the government. The population is about 65% of the total Indonesian population, while the island covers only 7% of the total land area.

The population growth in Java causes various problems which are very complicated and interrelated. These problems include the increasing need for jobs and the increasing pressure on natural resources. The land ownership is small (0.5 to 1.0 ha per household) and the demand for agricultural land is increasing rapidly. Many steep areas are used for seasonal farming and it has caused many kinds of damage such as erosion, flooding and decreasing productivity of the land. The "land-hunger" problems also causes forest encroachment. Many people use forest areas illegally to meet their needs for agricultural land. It is not surprising that there are many damaged forests in Java or in other densely populated areas.

In order to solve these problems, the Ministry of Forestry has tried to develop many programs in land rehabilitation through land management, crop management and the development of social forestry.

The objectives of social forestry development are :

- To control floods and erosion
- To rehabilitate land and to improve soil fertility
- To increase the income of the people

The History of Social Forestry Development in Java

The development of social forestry in Indonesia, especially in Java, has followed the development of re-greening or reforestation programs. The regreening, or reforestation, and marginal land rehabilitation programs started after a big flood in Bengawan Solo river in 1966, through the establishment of a regreening project of the Ministry of Agriculture named DEPTAN 001 in the Solohulu or Upper Solo/Surakarta Watershed. This was followed by the establishment of similar projects by the Ministry of Agriculture in other provinces. The Ministry of Agriculture provided seeds and/or seedlings for the farmers who could plant them on their own land to support terraces as well as to develop social forests. Ten years later (1976) this initial project was improved and developed as the Regreening and Reforestation "INPRES" (Presidential Instruction) Project.

This new project was better managed and organized. Its planning activity was separated from the implementation activities in the field. The activities in the field were more complete, with the

application of land management crop management, and social forestry.

Some Usaha Pelestarian Sumberdiya Alam (UPSA)/Natural Resource Conservation Efforts and Usaha Pertanian Menetap (UPM)/Permanent Agricultural Efforts demonstration plots have been established for extension facilities and tools.

Actually, the development of social forestry in Java has been carried out by many farmers on their relatively small land holdings. The main purpose of this activity was to meet their needs for fire wood and construction wood. Most of the farmers developed their social forests with simple and traditional techniques. In planting and managing their social forests, they fully relied on nature. Through the establishment of the Regreening/Reforestation Project of the Ministry of Agriculture and Regreening/Reforestation "INPRES" project, the government provided technical assistance and guidance for the farmers to develop their social forests.

Another project which encouraged the development of social forests was the Integrated Watershed Management Pilot Project at the Solohulu/Upper Solo Watershed. This pilot project has improved the knowledge and the skill of the farmers, especially in silvicultural techniques.

Through many extension programs on social forest, more farmers became involved in this activity. They developed mixed social

forests which are now known as community plantations/gardens or agroforestry.

It seems that community plantations/gardens or agroforestry is the suitable form of social forestry to be developed in Java, where the people only own small plots of land.

The Model of Social Forest Development

A social forest, as referred to here, is a forest which is planted and managed by people on their private land. The scope of the discussion in the paper focuses only on the community forests in Java. Due to the specific conditions in Java, such as a very high population density, rapid population growth rate, and small land holdings, the development of social forestry has been adapted to these conditions and to the need of the people.

Location Criteria for Social Forestry Development

The highest priority in developing social forestry is given to the private marginal land, community/village land, and mismanaged concession/estate land.

The governmental policy on land rehabilitation and soil conservation is also based on the slope and the depth of cultivatable soil :

- a) *Slope more than 50%*

Land rehabilitation is carried out by planting hardwoods or forest trees. This activity is known as a greening program, including community forestry.

b) *Slope less than 50%*

Land rehabilitation is carried out by establishing bench-terraces and planting seasonal food crops.

c) *The thickness of cultivable soil*

On land where the slope is less than 50% but the layer of cultivable soil is very shallow, land rehabilitation does not follow the above policy (point b). Special treatment should be given to this kind of area. Land rehabilitation should be done by planting hardwood or forest trees. The land can be used for planting food crops only when the cultivable soil deep enough, and with the establishment of bench-terraces.

Based on these criteria, the development of community forestry in Java is given priority on land with slope of more than 50% and shallow, cultivable soil.

Social Forestry Development Model

The targets of social forestry development are community/village land, mismanaged concession/estate land, and private marginal

land. based on these targets, the social forestry model can be described as follows.

a) *Social forestry with a density of 2,500 trees/hectare*

This model can be implemented on land which is not used for planting food crops, or other seasonal crops. InJava, lands which are suitable for this condition are : community/village lands and mismanaged concession or estate lands. On such lands, community forests can be fully managed with a density of 2,500 trees/ha, using tree species suited to the soil and which can improve soil fertility (such as pioneer and multipurpose species). If the soil is already fertile enough, the land can be used for planting more productive crops, such as fruit trees.

b) *Social Forests with a density of 500 trees/ha.*

This model can be implemented on private lands which are mostly very small (only 0.5 to 1.0 ha). These are the only lands to produce food and other daily family needs. If social forests with a density of 2,500 trees/ha are established on these lands, there is no space for the landowners to grow their food crops. In community forests with a density of 400 trees/hectare, the trees are planted spaciouly, at a distance of 5x5 m. Therefore, there is still space for the land-owners to plant their food crops,

grass, and so forth. This model is known as social plantation/garden or agroforestry.

This model is very ideal for developing in Java. Many social forestry programs using this model are now being implemented on private lands there, mainly on land with slopes of more than 50%.

The social forests which are commonly found in Java, are generally used to meet the needs for fruits, saps, firewood, and construction wood.

The tree species which are planted in these community forests include "kaliandra", *Albizia falcataria*, *Acacia auriculaeformis*, teak (*Tectona grandis*), pine (*Pinus merkusii*), mangoes (*Mangifera sp.*), cashew nut (*Anacardium occidentale*).

The Development Plan for Sengon Social Forests

The population growth in Java has caused increasing needs for firewood, construction wood, and raw materials for industry. At present, the demand for wood in Java is fulfilled by importing from other lands which makes the wood more expensive.

Marginal land still exists in Java. This kind of land is not productive and covers a total area of 1,279,128 ha consisting of

1,052,000 ha of critical land outside of forest areas, and 227,128 ha of critical land inside forest areas.

For the development of community forestry in Java fast-growing multipurpose species with high economic value, known and preferred by the local people, have been chosen. One of these species is *Perisierianthes falcataria*. It was formerly known as *Albizia falcacataria* Fosberb, and is locally called sengon or jeunjing. This species has the following characteristics :

- 88054
- a. It is a fast-growing species, which can be harvested in 5 to 7 years, and has a wood production potential of 10-40 m³/ha/yr.
 - b. It is capable of growing on various types of well drained soil and under various climatic conditions up to an altitude of 2,000 meters above sea level.
 - c. It can improve soil fertility.
 - d. It has pollen which is preferred by honey-bees.
 - e. The wood of this species can be used for construction, boxes, matches, pulp, firewood, jointed wood/wood working, joint mill and moulding.

Although the farmers in Java only use very simple techniques and rely mainly on nature, they have known and planted this species for a long time. Form planting this species and other food crops the farmers will be able to get additional income.

The objectives of the development of sengon Social forests are:

- To encourage land rehabilitation programs
- To improve the quality of the environment
- To provide raw material for wood and paper industries
- To create job opportunities
- To increase the income of the people

The target areas for silvicultural development of sengon are critical land, both outside and inside the forest areas. The target areas for this development during the first period of PELITA V is Java. This paper discusses the target areas, but only those located outside forest land, especially private lands. The latest data (1989) shows that marginal and unproductive lands cover a total area of about 1,279,128 hectares, consisting of about 277,128 hectares of forest land and about 1,502,000 hectares outside forest areas.

It is planned to establish 180,000 hectares of "sengon" community forests during PELITA V (1989-1993), on suitable sites. The farmers will manage their community forests under the guidance and assistance of the staff of the Ministry of Forestry. About 104 million seedlings will be needed. Nurseries which can be managed by private companies of the PERHUTANI State Forest Corporation will be established to meet this demand.

The sengon plantations on forest land will be established using the Tumpangsari (multiple cropping) system of the PERHUTANI State Forest Corporation. the farmers living around forest land

can be guided and assisted to work together in using this system.

The plantations on land outside forest land will be developed through the establishment of "PERUSAHAANINTI RAKYAT" (Nucleus Estate for Small Holder/NESH).

Farmers will be guided and gain knowledge and skill in planting the trees. They will be encouraged to establish farming cooperatives. "Perusahaan Inti Rakyat" will also give a guarantee or access to the farmers to markets for timber or other wood products from their plantations. It should provide seedlings, production facilities and equipment, and other needs of the farmers.

4.4 SOCIAL FORESTRY PROGRAMME IN THAILAND

A study conducted from 1978 to 1981 by FAO within the framework of the Global Environment Monitoring System reports on the forest resources of Tropical Asia. According to this report the most valuable forest formations in Tropical Asia are the 292 million ha of closed broad-leaved forests in Indonesia, India, Burma, Malaysia, Papua New Guinea, and the Philippines. These forests account for some 90% of the productive closed broad-leaved forests of the region.

Between 1976-1980, nine million hectare of closed forest was deforested, equivalent to some 1.8 million ha per year. If the current 0.6% average annual deforestation rate of closed forest continues, some 36 million ha of closed forest will have been converted to non-forest uses by the year 2000. Shifting cultivation, spontaneous forest encroachment, migration, settlement schemes, and illegal unregulated logging operations are the main causes of deforestation in Tropical Asia.

In the 1970's, governmental and other organizations in the region started to show great concern about the continuous destruction and future productivity of the forests. Serious efforts have been made to concurrently rehabilitate the degraded forests and land resources and to stop further destruction through national development plans. Foresters started to reason that more attention should be paid to the needs of the people living in and around the forests.

The new approach to forest use was discussed at the 1978 Eighth World Congress in Jakarta. The theme of the Congress was "forests for People". The areas of concern covered were : forestry for local community development, forestry for food, forestry for employment promotion, forestry for industrial development, and forestry for quality of life. The Congress extended support to forestry's new fields of activities : i.e., social forestry, community forestry and agroforestry. Agroforestry technologies are usually integrated in social forestry programs.

Pragtong (1987) reports on various forestry programs, later labeled as social forestry, of the Thai government, to cope with the degradation of the country's natural forest resources and overuse of forest products. The programs are carried out inside and outside forest land and are aimed at more involvement of people in forest management.

Earlier programs included the following arrangements :

- a. Logging was permitted for local wood fellers, starting in 1901 in the Pitsanuloke Regional Division, north Thailand. This was to allow, on a short term basis, local villagers to cut wood for personal use and to assist local professional wood cutters.
- b. Taungya system in forest plantations, starting 1906 in Phrae, north Thailand. In the taungya system landless farmers were allowed to intercrop in forest plantations.
- c. Woodlots for community use were started in 1956 with 20% of new reserved land allocated as common woodlots serving as a source of fuelwood for local communities.
- d. Integrated watershed development was initiated in 1964 with establishment of a committee on watershed conservation and development with the assignment of : (a) drafting work plans for watershed and sub-watershed management throughout the country and (b) identifying criteria for retarding sedimentation into the reservoir of Bhumipol dam.
- e. People's voluntary tree planting program began in 1978 with the purpose of making the country green by planting degraded forests, public lands, temple land and road sides as a community source of fuelwood, charcoal and environment protection.

These programs were later consolidated as social forestry programs and incorporated into the Fifth National Economic and Social Development Plan (1982-1986). Two programs relating to natural forest management are discussed below :

A. *Program for Granting Usufruct Certificates in the National Reserve Forest (Pragtong, 1987)*

This program was initiated in 1979 to cope with the problem of forest encroachment. Under the program each piece of land is divided into two zones, the upper watershed area and land that can be used for agriculture. The upper watershed area is restricted and kept as forests. The land suitable for agriculture and previously occupied by landless farmers is granted to the farmer under a usufruct certificate for areas not larger than 2.4 ha. The purpose of granting the usufruct certificate is to give incentive to invest in the land, making it more productive and to prevent encroachment into forest land.

By 1986, 600,126 landless farmers had been granted usufruct certificates.

B. *Thailand Forest Village Program (Pragtong, 1988)*

The forest village concept was first applied by the Forest Industry Organization (FIO) as part of its plantation program. In 1975 the forest village scheme was adopted by the Royal Forest Department (RFD) to solve problems of poverty among people who choose to stay in forest lands. Participants in the RFD managed villages are given the

option to work as casual wage earners in forest plantations and are allocated land for farming, housing and provision of living amenities.

When applied to areas with strong land use conflicts between farmers and government, the forest village scheme is seen as a practical deterrent to wanton deforestation and to socio-economic and political problems caused by the influx of people onto national forest land. Forest villages are, thus, envisioned to bring order among Thailand's multitude of forest dwellers (estimated to be about one million families in 1978), and to encourage people's participation both in protecting the country's forests and in rehabilitating deteriorated areas due to shifting cultivation. There are 98 existing forest villages in Thailand, well scattered throughout the Kingdom's forest zones.

The forest village program is guided by the following national guidelines :

- a. Forest encroaches will be resettled in groups in non-watershed areas, each with an elected leader and a committee for village self-administration.
- b. The government will allocate 2.4 hectares of land for farming to each family. No land title will be issued for such land, but user right permits will be given instead. The property is inheritable, but non-negotiable. This is to grievant buying-up by scheming landlords..

- c. In the village compound, the RFD and concerned authorities will provide appropriate housing, vocational training, water resources, feeder roads, schools, health center, agricultural credit, marketing service and housing sites.
- d. Priority for employment in government reforestation programs near the villages will be given to the village members.
- e. After the village is established, an agricultural cooperative will be set up under the aegis of the Cooperative Promotion Department. It shall have the same rights and privileges given to other cooperatives. The RFD will issue a longterm land lease to such cooperatives as required.

Problems Encountered

Since the RFD began its forest village program, problems have surfaced, which may be categorized as social, agrarian, RFD-related and project staff.

As the forest villages are established on deteriorated forest land already occupied by people, there is an obvious conflict of interest between the government and the villagers, and between old residents and newcomers. Among the more common sources of irritation is the 2.4 ha maximum limit of land legally allowed per family. Farmers occupying areas of more than 2.4 ha resent having to give up land. This disagreement with the land allocation policy becomes even more apparent if the excess land

is given to newcomers who cannot or do not use the land properly. To minimize such conflicts, the project had to make provision for immediate relatives, also staying in forest land, being given top priority on the list of eligible recipients for the excess land. Moreover, a system of compensating for past land clearing had to be arranged between the previous landholder and the next occupant.

Other sources of conflict are grouping villagers according to regions of origin and the holding of large sections of forest land by influential people using politicians to confuse villagers, e.g., by convincing them to ask for land titles instead of the restricted rights permits. Much delay in project implementation comes from overcoming policy misinterpretations and having to clearly explain the project's purpose.

A major issue is the inadequacy of the RFD to provide sufficient numbers of interdisciplinary staff for administering the forest villages. A forest village needs at least six personnel to implement the project : one will be project chief, one for secretarial work, two sociologically inclined officers for village establishment, and two bio-physical specialists for forest plantations. As more village projects emerged, the RFD found it difficult to provide the necessary personnel because of the limitation placed on the annual increase of employees.

Other problems arise, for example, with respect to mobile engineering for construction of roads and reservoirs. Due to lack of funds infrastructure goals are often not met on time. The lack of proper coordination between the cooperating agencies and RFD in developing the villages is also a major constraint.

Since the village sites are usually vital forest lands, the RFD feels they should be forested and not cleared of trees, but other authorities have other preferences.

As most RFD personnel manning forest villages projects have their backgrounds in forestry, they are not comfortable when working on projects using the integrated approach. For example, foresters with five years or more experience with RFD encounter difficulties in such tasks as community organizing, socio-economic analysis, and coordinating with other authorities associated with the project. In many forest villages there is an apparent imbalance between village establishment and forest plantation development.

4.5 CONCLUSION

The social forestry projects are being implemented successfully in different countries. Such projects are adopted to serve various purposes. It is learned from the discussion of this chapter the reasons of adoption of social forestry programmes are prevention of soil erosion, reduction of wind velocity, flood control, employment opportunity generation, increasing the supply of raw materials for different types of manufacturing and above all improvement of environmental quality.

Such multi-dimensional projects can reduce the vulnerability of a region to natural calamities upto a great extent.

CHAPTER - 5

FORESTRY EXPERIENCE IN BANGLADESH

5.1 FOREST CATEGORIES:

The forest land of Bangladesh can be grouped under three broad categories. These are:

A. FOREST DEPARTMENT CONTROLLED LAND:

These lands are administered by the Forest Department. Among these 1,461,558 ha of land comprised reserved forest, protected forests, unclassified state forests, acquired forests and newly accreted khas lands in the coastal belts. Assessment shows that less than half of this area is under tree cover. By major forest class, these are: Hill Forests 54% (including unclassified state forests), Sundarbans 9% and Sal Forests 32%.

B. LAND MINISTRY CONTROLLED LAND:

These are supervised by the land Ministry. These consisted of 663,968 ha of land. Much of this land fall in the Khagrachari, Rangamati and Bandarban Districts of Chittagong Hill Tracts. Most of these of these unclassified lands are now in deplorable conditions which is caused by unchecked extraction of wood through granting permits for a long time. This has created an opportunity for shifting cultivation. Some unclassified state forest lands are switched over to the Forest Department. The rest of the land is managed by the District Councils on behalf of the Land Ministry.

C. PRIVATE LANDS:

These lands composed of 270,000 ha of village woodlots, 30.4% under bamboo, 16.8% under non-fruit trees, 14% under mango, 12.1% under betelnut, 9.7% under coconut and 6.7% under jackfruit. The rest 50,000 ha of land is neglected and discarded tea-gardens.

Village forest contribute a significant amount of wood supply of the country. Some 10 million households annually provide five million m³ of wood (one million m³ consisting of logs and four million m³ of fuelwood) and 0.53 million dried up MT of bamboo. Homestead forests show efficiency more than 15 to 24 times of government forest performance (F.M.P. 1993). These homesteads implant trees and other crops by launching a comprehensive and efficient system of agroforestry, combining multipurpose trees, food and forage plants, bamboo, palms, medical plants and species. These homestead forests get financial support from the cashcrop for their existence. Today, homestead forests are the most important source of wood, bamboo and other non-wood forest products in the country.

Table: 5.1 Categories of Forests in Bangladesh

Category	Area in ha	Tenure
Classified State Forest land (Unclassified state forest land under control of Forest Department)	1,461,538	Govt. Forest land Managed by the Forest Department
Unclassified State Forest Land	663,968	Govt. Forest Land Controlled by Land Ministry
Private Forests, Village Woodlots and unused tea land	320,000	Privately owned
Total	2,445,506	

Source: Forestry Master Plan, 1992.

The Forest Department recently regulates more than five times the area under homestead/village forests, but one third to one fourth the production per annul generates from the homestead/village forests. This puts pressure on govt. sector management expertise which is now comparatively low than in homestead forest. It has become prominent that proficiency level in forestry that are accessible in the country favour government endeavour, at the same time the homestead owners scarcely get any fund or opportunity for research. Government is incapable to increase the production level under the traditional forestry.

5.2 TRADITIONAL FOREST MANAGEMENT IN BANGLADESH:

The forests of Bangladesh came under vocational management for more than hundred years. The first tract of land reserved were at Sitapahar and in Sundarbans. In 1875 under the Forest Act VII of 1855 these areas were proclaimed as reserves by the Government. From onward Government employed professional Forest Officers to control and administer the forests. The first decade of this century shows synoptical scanning and demarcation of the greater part of the forest areas.

The first operation came into effect in the Sundarbans during 1893 but it was placed under orderly arrangement from 1874. In that year, Schlich and Temple visited Sundarbans and expounded the minimum exploitable lands for Sundari.

The Forest Department took over teak plantations at Sitapahar under the instructions of Schlich in 1871. From henceforth, teak plantations went on consistently. However, excepting Sundarbans there was not any remarkable progress in forest management. In the remaining forest areas there was no imperative need for forest products and logging. Management of the greater part of Hill Forests was founded upon care and attention.

The Sal forest of the central Zone had private ownership upto 1950's. Government supervised them with the consent of the owners. Under the State Acquisition and Tenancy Act of 1950 the Government acquired a large region of waste lands and forests under it. The Department was effectively conducting over these lands under the Private Forest Act of 1949. In 1950 the Government took under it's control a greater part. Acquiring Sal Forest area of central and northern zones in large scales prevented the advantage.

Bangladesh Forest Department exercised control over most of the forest areas with their own plan and schemes. But the study of these outline in this region showed a variegated result. Predominantly they were too sophisticated and impracticable. They were succeeded by short term schemes. In some cases if the plan was carried out still it did not attain any fruitful results.

Curtis went through extensive care for devising and preparing a plan for the Sundarbans. But during the forest stage of execution of the plan, field personnel found it too extensive and unworkable. In 1962 a more practical scheme based on Forestall inventory was put into operation. After few years it was anticipated that there was not enough Gewa. The working plan was defective in as much as it had failed to make any provision for it's regeneration.

The problem of extinction of Sundari became apparent later. There was no definite process for cultivating improved plants or bringing about regrowth of the major species. These are essential to the existence for any forest under selection system. A new working plan has been totally absent after the 1985 device. For the time being the forests are now under temporary scheme.

The Department exercised control over the central zone in the Sal forests. For over 75 years some areas remained under working plan only. There were some reasons responsible for it's failure:

- a) The extent of the forest areas had no limits acquiring larger area went unrestrained.

- b) There was also no device to improve the condition of the crops which is regarded as it's failure.
- c) Sal's ability of undergrowing trees was vital for the success of the plan. But at present Sal's stock having lost it's power to copse, it has become essential to introduce forthwith some definite technique to increase plantation. The only way is replacing Sal by fast growing foreign plants covering large areas.
- d) Some other reasons also played a part in the failure of Hill Forestry. Natural regeneration was not certain.
- e) The management plans depended on artificial regeneration which proved to be a highly arduous programme.
- f) In the bygone days market facilities were restricted.
- g) Innovating new techniques for harvesting and planting was scarce.
- h) Moreover, necessary funds and personnel were not available.
- i) Another shortcoming in the management plan was insufficient checking as prerequisites. Thus implementation of management plans were at fault.
- j) Population pressure on the forest land being on the increase is one of the reason affecting it's growth. Trees are being out for human habitation. BFD totally overlooked these factors which could develop forestry.

All these factors were not conducive to forestry development. Currently situation has deteriorated. The annual fall rate over the past 20 years ending in the early 80's showed 2.1% on the average. From 1984-90 the fall rate was 2.7%. It is possible that by the year 2000 it will further go down to 3%. BFD's productive role has

been reduced to only police force protecting the forests. The condition of the forests is fast worsening though Bangladesh is not deficient in skilled professionals.

5.3. FORESTRY SECTOR POLICY:

A national forestry policy defines principles how to use nation's forest resources for achieving national objectives (Worrel, 1970). The forest policy includes utilizing lands where forest resources can be best developed. The varied concerns engaged in frictions at different levels influences potentialities and difficulties relevant to the uses of forest resources. The early forest policies contemplated timber production as a main contributor of forests. On the one hand the areas covering forest lands has been reducing gradually and on the other there is a growing demand for forest goods. Now a days people nurture a better understanding about the important roles of the forests. This has modified the images of forestry and in consequence has affected forest policy formulation and evaluation.

Forestry has developed into a network of correlated activities. It surpasses the limits of forest land and contributes to the economic and ecological welfare of everyman. A more realistic usage of forest resources would be how much goods and services can we achieve and how it can be done. Multiple roles such as production, protection and preservation of forests fall into the category of forest management. It has come into lime light as it's main objective. Consequently, the value of traditional type of forest policy is regarded as ill-defined and in-accurate. They are insufficient to the national economy and are thus outmoded. Today development in all sectors have become essential and forest policy should serve accordingly.

The forest policy has other functions to perform, such as:

- a) To serve as a basis for legislation.

- b) To promote private sector and encourage people's participation in forestry.
- c) Have a perpetual management system.
- d) Promote the flow of information and communication.
- e) To advance national development and welfare.

A national forest policy is a comprehensive statement providing a clear perspective and goal for promoting and implementing forestry development programmes. It determines standards for decision making and prevents intrigues. Policy development, implementation and evaluation process all are in close quarter with the whole planning process.

The process should take into account the facets and interests of all concerned both public and private within the proper bounds. It should generate effective participation of the local inhabitants in all phases of the process. Or else, it would end up in consequence as an irrelevant and ineffective process socially and politically. Keeping in pragmatic view the short and long term plans forest policies should meet all the imperative needs and demands. It should maintain far-sightedness and be reality oriented.

5.4 EVOLVING POLICY OBJECTIVES:

The current National Forestry Policy of Bangladesh was enunciated in Notification No. 1/FOR-1/77/345 dated 8th July, 1979, of the Ministry of Agriculture and Forests.

In 1855 the Government of British India felt the need of preserving forest areas in Bangladesh and thus promulgated the Charter of the Indian Forests. Before this the Government only passed regulations and notifications declaring certain tree species to be preserved

for royalty. The rest was left for the common use of the people. Various unchecked use of consuming trees such as fire, cultivation and internal combats called the demand of the organization of the Forest Conservancy in India. The first Reserved Forest of Bangladesh was announced in 1875 in the Mayani Headwaters in the Chittagong Hill Tracts.

5.4.1 Forest Policy of 1894:

The first formal Forestry Policy of the British India was published in 19th October, 1894, bearing circular No. 22 F. With the aid of Voeleker's Report on the Improvement of Indian Agriculture it specified some guidelines for administering government forests in the country.

The 1894 policy had the following characteristics:

- a) The main object of the state forests was to ensure public benefit. With this in view it keeps a balance between enjoying rights and restrictions over the advantages by the users in the forests.
- b) Forest should be classified as follows:
 - i) Hill forests/protection forests
 - ii) Economically important/production forest
 - iii) Minor forest
 - iv) Pasture land.
- c) Forests on the Hill Tracts are essential for the physiography of the country and at the same time for safeguarding the cultivated plains stretching below it from catastrophes of water coming from the hilly region.
- d) Forests that are stored for valuable timbers can be a profitable source of revenue income.

- e) Forest areas which can contribute to cultivable lands should be released on the basis of the following conditions:
- i) It is not desirable to honeycomb a valuable forest erratically.
 - ii) Cultivation should be on a regular basis without disturbing any areas that presents forest requirements and potentialities.
- f) Forests that produce low quality timber, fuelwood or fodder and are used for pasturing should be conducted for the advantage of local population and be a safeguard against their miseries.

The policy has come forward with the basic need to accelerate agricultural interests. The policy upholds much more the rights of cultivators than that of forest preservation.

5.4.1 Forest Policy of 1955:

In 1947 Bangladesh a part of erstwhile Pakistan adopted the forestry policy of undivided India upto 1955. In 1955 the Government of Pakistan declared it's first National Forestry Policy.

The principal characteristics of the policy were:

- a) Forests should be categorized in order of their usefulness.
- b) Forestry should get acknowledgement for it's undeniable benefits.
- c) Forests should be under scientifically managed programme.
- d) Forestry should be developed under thoroughly irrigation.

programme. For this purpose 10% of land and water in cultivation areas should be reserved.

- e) Timber and wood serving as fuel should get priority in increasing numbers along highways and canals.
- f) Private forests should get necessary support from Government sector.
- g) A correlated and systematic programme controlling land use and protection of soil from erosion should be carried out.

The policy also underlined the importance of using forest products. The policy did not facilitate the proper growth of forestry in Bangladesh. It was later amended in 1962 but still it proved to be insufficient. Moreover, population pressure and growing demand for food and other requisites came into full force on forest land destroying ecological balance. Although Bangladesh acquired independence in 1971 owing to other difficulties it's National Forest policy was not announced till 1979.

5.4.3 National Forest Policy of 1979:

The 1979 Bangladesh National Forest Policy was formulated based on the recommendations of the first Bangladesh National Conference on Forestry, held in 1977. It is a two page report which briefly explains the following points:

- A scientifically managed forest preserving programme to be adopted.
- Government forests shall not be used for any other purposes other than forestry.
- Timber plantation shall be adopted in large scale.

- Modern technology shall be employed for the best use of forest products.
- New scopes should be created to set up forest based industries and to fulfil the demands of raw materials.
- Extensive research and training in forestry shall be taken up to meet scientific, technological and administrative needs.
- A set of officers shall be appointed to deal with the forest sector.
- Forest sector should be constituted as a separate administrative unit of the Government performing forest policy.
- Measures shall be taken to maintain the forest and wildlife preservation programme and favourable conditions shall be created for their recreation.
- More entrepreneurship shall be encouraged for forestry development in mass scale.

The policy is very ill-defined and indefinite. Though forestry a part of economy is interpreted as a Government Department, still 60-70% of aggregated forest products generate from outside the control of the Forest Department.

The following key points are totally excluded in the report:

- Classification of forest land according to their usefulness.
- Continuously keeping up forest products and maintaining ecological balance.
- People taking part in forestry.

- Role of private sector.
- Utilization of forest products.
- Organization for the development of forests.
- Introducing entrepreneurship in forestry development.
- Fuelwood and rural energy.
- Initiating voluntary organization.
- Significance of low quality timber for forestry expansion.
- Steps for maintaining development related with production.
- Coordination with different sectors.

Discussion on more pressing problems, guiding principles, objectives and policy implementation procedure are absent in this policy.

On the basis of the national objectives in formulating National Forest Policy the following headings should get major attentions:

01. Promoting socio-economic development by increasing production.
02. Ensuring steady environmental growth.
03. Effective participation of people to enhance self-reliance.
04. Promoting human resource development.
05. Highlighting local communities.

Table 5.2 provides a list of objectives and strategies taken under different plans. There is barely a constant harmony and uniformity

Table 5.2 Objectives and Strategies of the Five Year Plans, Related to Forestry Development

	First Five Year Plan 1973/74-1977-78	Two Year Plan 1978/79-1979/80	Second Five Year Plan 1981/82-1984/85	Third Five Year Plan 1985/86-1989/90	Fourth Five Year Plan 1985/86-1990/91
Objectives	<ul style="list-style-type: none"> * Bring all forests under regular management of forest service. * Exploitation and conversion of low quality Hill Forests into economic plantations. * Obtain higher timber production. * Judicious management of mangrove forests of Sunderbans and extension of forest belt along the coast. * Tree planting in homesteads and waste lands. * Develop wild life management and recreational facilities. 	<ul style="list-style-type: none"> * Accelerate exploitation of existing high forests and convert them into plantations. * Promote tree planting in homestead lands and follow lands. * Utilize marginal lands for non-traditional crops like rubber, oil plum, jackfruit, cashew nut, pincapple etc. * Plantation in coastal areas and off-shore islands. * Reduce wood wastage. * Strengthen wild life management and recreational facilities. 	<ul style="list-style-type: none"> * Maximise production of forests produce from existing growing stock. * Develop forest resources in the government and private (Homestead) forests. * Provide protection against cyclones, tidal bore and soil erosion. * Contribute to the national food production goal. * Provide outdoor recreation. 	<ul style="list-style-type: none"> * Increased state and homestead forest production of both timber and non-timber crops. * Development of short cycle plants to conserve more valuable fruit and timber crops in rural areas. * Optimal exploitation of forest resources. 	<ul style="list-style-type: none"> * Rehabilitate denuded and degraded national forest land. * Bring all vacant public and private lands under tree cover. * Meet basic needs of all forest products. * Improve environment to support biological production. * Create employment opportunities. * Adopt wood conservation techniques.
Strategies	<p>Reservation of potential forest lands; multiple-use management of forests; execution of a plantation policy of fast growing local and exotic species; provide intensive extension service; provide adequate research and training facilities.</p>	<p>Raising of quick growing species and less emphasis on teak; strengthen extension efforts; promote treatment and seasoning of timber; involve local government institutions in forestry activities; adopt community forestry concept in USF of Chittagong Hill Tracts; goal-oriented research; training and education.</p>	<p>Multiple use of land in villages/homesteads; agroforestry development; expansion of industrial and fuelwood plantations; afforestation of marginal lands; acceleration of cutting in the high forests; reduction of wastage; promote use of panel products in preference to solid timber; develop wildlife management and outdoor recreation; optimum use of processing capacity; training, institutional restructuring; goal oriented research.</p>	<p>Afforestation, reforestation and social forestry; management of supply of timber, fuelwood, fodder, rubber and raw material for paper and other industries.</p>	<p>Improve institutional capabilities through training, research and extension; better management of existing forest lands; permanent green belt of tree in coastal areas; homestead forestry development; agroforestry development; plantations on sides of roads, canals, railways; provision of essential major and minor forest products; effective demand management; preservation of flora and fauna.</p>

in the objectives as well as fusion of strategies and objectives. These also exclude the vital points such as the system of incentives, decentralization of decision powers and autonomy for production units.

5.5 IMPLEMENTATION OF FIVE YEAR PLANS:

Bangladesh undertook three Five Year Plans under Pakistan which did not stress importance on forest resource development. It had optimum investment in wood-based processing industries and patronized the rubber plantation programme. A full-fledged forest research facility was inaugurated at Chittagong at that time.

5.5.1 Programme Structure:

Bangladesh launched its First Five Year Plan in 1973/74. Fund allocated for forestry in the First Five Year Plan (1973/74-1977/78) was inadequate amounting to Tk. 570 million at 1972/73 prices. It is raised to Tk. 8,450 million at 1989/90 prices for forestry in the current (4th) Five Year Plan.

There has been no uniformity in the structure of forestry programmes, under different plans. In the First FYP forestry undertook five programmes and 13 sub-programmes; in the two year plan of 1978-80 it contained seven programmes and 17 sub-programmes; in the Second FYP it took over ten programmes and 29 sub-programmes; in the Third FYP it included seven programmes and 22 sub-programmes and in the present Fourth FYP it has six programmes and 17 sub-programmes. The purpose of dividing a sector into different programmes is to ensure a cohesive framework for long term planning, monitoring and evaluation. This point has evidently got no attention in forming the programmes under different plans.

Re-evaluation of the programmes coming under different plans

reveals that from time to time programmes were disbanded and rearranged.

- a) Rubber plantation was taken up in the First FYP and in the Two Year Development Plan. In the Second FYP it came under the category of special plantations along with bamboo, mulberry and oil plum. In the Fourth FYP it merged with a new programme of "rubber and other plantation".
- b) Forest extension was graded in the First FYP, Two Year Development Plan and Second FYP. In the Fourth FYP it emerged under the Rural Plantations Programme. Similarly agroforestry which was a separate programme under Second FYP is now under Rural Plantations in the Fourth FYP.
- c) Forest inventory was adopted under Second FYP which was not followed up before or after that.
- d) Wild life and outdoor recreation was put under the Two Year Development Plan and the Second FYP. It was dissolved under the Third FYP and turned up under the Fourth FYP as nature conservation, wild life, parks etc.

Table-5.3: Programmes and Financial Outlay for Forestry

1st FYP 1973/74-1977/1978		Two Yr. Dev. Plan 1978/79-1979-80		2nd FYP 1980/81-1984/85		3rd FYP 1985/86-1989/90		4th FYP 1990/91-1994/95	
1. Mechanical Extraction (3 Programmes)	n.a	1. Mechanical Extraction (3 Programmes)	124	1. Forest Production (4 Sub- programmes)	600	1. Forest Land Plantation (4 Sub-programmes)	1,053	1. Forest Plantation (4 Sub- programmes)	3,022
2. Plantations (3 Programmes)	n.a	2. Plantation (2 Sub- Programmes)	125	2. Forest Plantation (4 Sub- Programmes)	970	2. Coastal Plantation (1 Sub-Programmes)	344	2. Rural Plantation (2 Sub- Programmes)	2,192
3. Extension (2 Sub- programmes)	n.a	3. Rubber Plantation (3 Sub- Programmes)	25	3. Special Plantation (4 Sub- Programmes)	500	3. Rubber Plantation (3 Sub-Programmes)	1,170	3. Rubber and Other Plan- tation (3 Sub- Programmes)	1,475
4. Rubber Plantation (2 Sub- Programmes)	n.a	4. Extension Service (2 Sub- Programmes)	20	4. Forest Extension (5 Sub- programmes)	420	4. Non-Timber Plantation (3 Sub-Programmes)	523	4. Education & Training (4 Sub- Programmes)	493
5. Education & Training (4 Sub- Programmes)	n.a	5. Research & Training (2 Sub- Programmes)	55	5. Agroforestry	10	5. Forest Extraction (4 Sub-Programmes)	390	5. Research & Studies (2 Sub- Programmes)	493
		6. Outdoor Recreation (2 Sub- programmes)	16.6	6. Forest Inventory	60	6. Education, Research and Training (5 Sub-programmes)	335	6. Nature Conservation, Wild life, Parks etc. (2 Sub- programmes)	550
		7. Survey and Demarcation (3 Sub- programmes)	14.5	7. Wildlife & outdoor Recreation (2 Sub- programmes)	100	7. Others (2 Sub-programmes)	105		
				8. Forestry Research	120				
				9. Education & Training (5 Sub- programmes)	200				
				10. Block allowance	120				
Total Outlay			380		3,100		3,920		8,450

Source : Forestry Master Plan, 1992.

Moreover, the list of projects under the FYPs are not systematized by the programme structure which impedes the proper evaluation of plan achievement.

Some conclusions that can be inferred from the plan programmes are:

01. Importance of maximizing forest products from existing stock by means of modern technology has receded.
02. Importance of forest and tree plantation of all types has increased.
03. The plantation programme enlists 80% of the Fourth FYP allocation for forestry.

Two prominent features of forestry have been blatantly ignored. They are:

01. Urban forestry and
02. NWFP conservation.

5.5.2 Quantitative Achievements:

In respect of the achievement of physical targets set for forestry, the performance has differed from plan to plan. The physical achievement of forest plantations and rubber plantations are shown in Table-5.4. Achievement of targets under the Third FYP was meagre. Total achievement under forest plantations was a low 46%. The achievement of afforesting newly procured land was 80% of the target. Degenerated and reserve forest areas were 7% for afforestation. Agroforestation of rural forest area containing wood amount to 35%.

Table-5.4 : physical performance of plantation programme

Details	First EYP 1973/74- 1977/78	Second Yr. Dev. Plan 1978/79- 1970/80	Second FYP 1980/81- 1984/85	Third FYP 1985/86- 1987/90
Forest Plantations				
----- Target (in hecto.)	51,134	20,316	133,737	151,623
Achievement(in hecto.)	63,158	41,295	100,112	69,223
Percentage of Achievement	124	157	75	46
Rubber Plantations (BFIDC)				
----- Target (in hector.)	2,429	1,619	4,372	6,749
Achievement(in hector)	2,429	810	2,757	4,236
Percentage of Achievement	100	50	63	63

Source : Forestry Master Plan, 1992.

In total financial achievement under the Third FYP mounted upto 52% of the allotted plan and 85% of ADP allocation. But actually if the financial achievement is rated at 1984-85 price the achievement will fall to 29% of the allotted plan (Table 5.5).

The failing points in rendering forestry sector plans identify the following reasons:

01. Faulty planning;
02. Inappropriate project design;
03. Lengthy procedure of submission and approval of PCPS;

04. Delay in sanctioning ADP funds;
05. Non-availability of funds;
06. Administrative blockages;
07. Inaccessible or delayed foreign aid;
08. Deficiency in organizational capabilities;
09. Not getting land for plantation; and
10. Unpredictable reasons.

Another important factor to be focussed on, is that, the selection and sanctioning of the projects are coupled with inadequate investment alternatives. Forest Department usually forwards the project proposals comprehending the need on common economic grounds. Planning Commission and External Resource Division approves the proposals contemplating the availability of funds and political factors that imposes a degree of priority upon policy implementation rather than on necessary national economic priority consequently it ends up in performance lapses.

5.5.3 Quality of Achievements:

Very little assessment of performance is being done relying on the quality of work and it's outcome. The Fourth FYP document refers to a limited inventory that is conducted in one plantation comprising 6,400 hectares raised during the First FYP. The outcome of the inventory presented that implantment is done only in 44% of the area of which survival rate is 65%. In the rest of the area the survival rate was below 40%. The plantation has been lodged with a combination of species paying no heed to changes in the quality of the plot across the whole plantation area. The effects of site, silvicultural differences among the species, lack of tending plants and also growing wrong kind of species on thickly covered areas are

accountable for low quality stocks. As forest plantation has become a foremost venture in the forestry sector of Bangladesh, it should be noted that they are properly validated on the basis of quality and productivity.

Table-5.5 : Over all FYP Financial Allocation and Achievements in Forestry.

PARTICULARS	First FYP	Second Yr. Dev. Plan	Second FYP	Third FYP
Total FYP allocation, in current (at the time of plan preparation) Tk. million	570.00	380.00	3100.00	3920.00
ADP allocation, in current (at the time ADP approval) Tk. million	463.30	322.40	1690.70	2305.00
Actual utilization, in current Tk. million	340.20	322.40	1503.00	2033.00
Utilization so percentage of FYP allocation at current prices	60.00	85.00	48.00	52.00
Utilization as percentage of ADP allocation at current prices	73.00	100.00	89.00	88.00

Source : Forestry Master Plan 1992.

5.6 CONCLUSION

At present 6 percent land of the country is under forestry although only 50 percent of such areas are under actual forest coverage.

Major share (986.9 percent) of the forest area of Bangladesh is owned by the government, the rest is privately owned, but the performance of the homestead forestry is better in terms of total output.

Under such circumstances, the government expertise can be used to develop homestead forestry. A dynamic policy is required to bridge these government and private approaches. The laws relating such efforts need to be revised accordingly for successful implementation and over all development.

There exist a wide gap between the plan and the actual implementation of forestry programmes. On the other hand, the foreign funds are not properly utilized either.

As such, the government should take immediate steps regarding effective utilization of the funds available for such projects and take elaborate measures to prevent failure of forestry projects and encourage people's participation in improving forestry situation through social forestry programmes.

CHAPTER-6

CASE STUDIES OF SOCIAL FORESTRY PROGRAMMES

6.1 BANGLADESH RURAL ADVANCEMENT COMMITTEE (BRAC)

BRAC is a national NGO that has been engaged in rural development for the last 21 years. Initially in 1970, BRAC worked as a relief organization for rehabilitating refugees in Salla Thana of Sunamgonj district. BRAC later evolved into a multifacet rural development organisation.

BRAC utilises 'target group' approach for intervention: the landless and marginal farmers having less than 0.50 acre of land and whose livelihood depends on selling at least 100 man-day of manual labour. It also includes fishermen, artisians and women lacking social and economic support. BRAC organises landless individuals to form groups called village organisations (VOs). The core development programme of BRAC is the Rural Development Programme (RDP) , which is currently spread in 17 thousand villages.

BRAC also has other programmes like Health Programme, Education Programme, Income Generation for Vulnerable Group Development Programme, Rural Enterprise Programme, Training Programme, Research Programme etc.

Social Forestry Programme:

BRAC's social forestry programme has two distinct approach: Environmental approach to restore ecological balance through afforestation and socio-economic approach to develop an avenue for increased awareness for tree plantation in rural areas as well as generating income and employment opportunities and thus improving the rural standard of living. To incorporate the disadvantaged

women into the rural labour force and increase employment and income generating opportunities for them, BRAC focused this programme at women.

Objectives of Social Forestry Programme:

The specific objectives of the social forestry programme of BRAC are-

- a. Ensure a sustainable income for the rural poor.
- b. Enhance employment opportunities.
- c. Increasing awareness for planting trees among the rural community
- d. Restore ecological balance
- e. Reduce soil erosion, land slides and mineral leaching, and
- f. Produce shelter belt against cyclone surge.

Programme Strategy and Implementation :

The social forestry programme is carried out by two methods.

- * Nursery and
- * Plantation

BRAC's Nursery Programme: The number of existing nursery run by the government and the Forest Department is inadequate, specially in Kutubdia. In order to meet the increasing requirement of seedlings under this programme, BRAC established its own nurseries by involving trained group members for growing and supplying seedlings. BRAC launched its nursery programme in 1992 and at present there are 20 village nurseries in Kutubdia. In each nursery 10-15 thousand seedlings are produced per annum.

Criteria for Selecting Nursery Worker :

The criteria for selection of nursery workers are :

- * must be a BRAC group member
- * must be active and interested in the programme
- * should be able to give time for work in the nursery
- * either posses 10 decimals of land or be able to take lease.

Training : A five day classroom and two day practical field-based training is provided to the nursery worker. This training is conducted by the Programme Organiser (Sericulture and Forestry). Followup and technical assistance is also provided, and there is one Forester and one Agriculturist for this purpose. In every three months a refresher's course of one day is held based on the problems encountered and future schedule.

Implementation : Once the nursery worker have been identified and trained, they go around their respective villages for an informal survey on demand for the seedlings and its marketability.

Then a season wise schedule is worked out with the Programme Organizer who assists them in all the stages of the programme. There are four cycles of plantation, based on the four seasons; therefore the nursery worker remain busy round the year and can have income throughout the season. Loan is provided to the nursery-raiser for procuring necessary inputs, and in turn sells the seedlings at a fixed price to BRAC. They work as extension worker of the afforestation programme.

Plantation Programme : This programme was launched initially after 1991 disaster relief programme. Under this programme, seedlings of different species of fruit trees and timber trees were supplied to

the villagers to plant in their homesteads. The seedlings were collected from Forest Department, Agricultural Extension and other nurseries

which were distributed free of cost to promote afforestation. Later on under this programme, the caretakers planted trees along embankments, roadsides, and social institutions at the Thana, Union and Village levels. Lands for this purpose are leased from respective local administrative authorities. The seedlings are supplied by BRAC to the caretakers to plant on the strips. Bamboo sticks were also provided to form cages for the young trees to protect them against cattle. At present there are 33 caretakers, all of them are women, working under this programme.

Criteria for Selecting the Caretaker :

The criteria for selecting the caretakers are:

- * Must be BRAC group member
- * Should be able to give time for the whole day to guard and care the trees
- * Must be living near the locality where the strip plantations are to be established.

Training : Selected women are given a five day training on plantation and aftercare. Every second month a two day refresher course is organised by the Programme Organizer (Sericulture and Forestry). The programme is being followed up. The Gram Sheboks/Shelikas (Village Workers) report on survival and maintenance of seedlings from time to time to the POs who randomly visits for spot check and verification.

Implementation: After the completion of training, the women are engaged as caretakers. They are expected to work in the site till evening and each of them takes care of about 500 trees per month. Their works include watering, weeding, fencing, supporting stick checking and guarding etc. Each caretaker has a register book and if they are not found in the site at the time, they are treated as absent for that day. And as penalty their salary is deducted. They work as extension worker of the afforestation programme. Generally

caretakers are given wheat at the end of the month according to the attendance and survival rate of trees, e.g.

For 90 % and above survival	:	3 kg
For 89 % - 75 % survival	:	2.5 kg
For 74 % - 50 % survival	:	2 kg
For Less than 50 % survival	:	No wheat

But in Kutubdia instead of wheat they are paid Tk. 15 per day as wages for above 90 percent survival.

6.2 BANGLADESH POUSH

POUSH is a voluntary national Non-government Organization (NGO). It has been working in the field of rural development since 1984. Its primary objective is to enable small farmers and landless families to generate more income for themselves from environmentally sound projects and programmes. POUSH has a strong interest in education through the operation of feeder schools, which it has undertaken in six Thanas. POUSH has also afforded free medical treatment to destitute and has engaged itself in relief work after the 1985 and 1991 cyclones and the 1987 and 1988 floods.

The major programmes undertaken by POUSH are social forestry, education development, health, sanitation, employment and income

generation activities, community services and also relief and rehabilitation after major natural calamities. POUSH also strongly supports programmes for rehabilitation of the environment and is active in promoting sustainable development. It participated in the assessment of the environment and natural resources of Bangladesh, by USAID/World Resource Institute in 1989.

Social Forestry Programme:

The social forestry activities of POUSH has its beginning in 1986 and gradually expanded by engaging mainly destitute women as beneficiaries. At present the major activity of POUSH is to encourage the planting of useful varieties of tree in homesteads, on common access lands and on denuded hillsides. This activity has been pursued in fourteen Thanas, mainly in Cox's Bazar and Banderban districts. Under the Eco-village concept the human and physical resources of selected villages or hamlets are developed comprehensively, so that they can continue to improve on a sustainable basis.

POUSH received generous assistance and guidance from the World Food Programme (WFP) and the Forest Department of Government of Bangladesh, which enabled it to develop the Harbang Model of Peoples Participatory Forestry, and extended the model to different working areas of POUSH in Bangladesh.

Harbang Model :

This model has been consonant with five major objectives of the Development Plan of Bangladesh :

1. By increasing the potential number of trees, it has contributed to the betterment of the environment.

2. By giving income to the destitute, it has contributed to the employment goal.
3. By mainly employing women, it has contributed to the development objective of having more women in development.
4. By planting many different species of trees, it has contributed to the preservation of Bio-diversity, which is one of the major objectives of the Bangladesh Environment Policy.
5. By confirming a sharing agreement with the long term maintenance workers POUSH has fulfilled one more development objective, namely that of increasing the assets of those below the poverty line through non-formal cooperation.

A special feature of the Harbang Model is the emphasis on planting as many different local and multipurpose species as would be justified by local usage, so as to get optimum benefit from the trees. This ensures that local species are not pushed out in favour of apparently faster growing newly introduced exotic species. This emphasis on local species also plays an important role in preserving bio-diversity.

Implementation Steps :

Before taking up any extension of the programme a socio-economic survey is carried out. Later, on the basis of outcome, decision is taken regarding the social forestry and other development programmes. Implementation of the social forestry programme requires six steps, as follows :

Land Selection : Selection of land and appropriate land-owner is an important task which is carried out by POUSH. Later on, an agreement for a lease period of 20 years is executed in between the land owner and POUSH, and another one for 15 years between POUSH and the beneficiaries, according to the guideline provided by WFP and Forest Department.

Seedling Raising : Depending on the probable project location nurseries were established as near as possible to the programme area. Seeds are collected from identified mother trees or purchased from the Forest Department or the Forest Research Institute. In some locations small number of seedlings are purchased from Forest Department nurseries but most of the seedlings are raised in own nurseries by the maintenance workers themselves.

Execution of Planting Operation : Planting operation generally starts at the beginning of the monsoon season (June). The guidelines of the Forest Department is followed for planting technique, spacing and species allocation etc.

Selection of Maintenance Workers : The maintenance workers are normally drawn from the lower income, disadvantaged or vulnerable socio-economic strata of the local area. POUH prefers involvement of unemployed, assetless, landless widowed/separated or destitute women in the social forestry programme. During the first quarter of 1993 POUH had 1038 members involved in this programme in Harbang. More than 85% of the total worker force involved in social forestry programme of POUH are destitute women. These maintenance workers are the beneficiaries of the programme and as beneficiary they get all the intermediate crops they grow and will 30 percent of the final tree harvesting. The caretakers/beneficiaries are responsible for the maintenance of the planted seedlings and according to WFP norm a caretaker is responsible for the maintenance of 550 seedlings. The caretakers receive about 5 kg of wheat per day for 3 years. Thereafter the trees are looked after by a reduced number of workers.

Group Formation of Beneficiaries : Social forestry programmes are expected not only to increase the forest area but also to have a positive impact on the socio-economic status of the poor, disadvantaged or vulnerable members of the community through their active participation, employment and eventually the marketing of

trees and tree-products. POUSH motivates the beneficiaries to form groups. Each group consists of 15 to 25 members and they have to meet twice a month; POUSH workers often attend these meetings.

Supervision : POUSH is responsible for implementation and supervision of all the activities involved in the programme. It also provides necessary inputs, such as seeds, nursery materials and planting equipments, fertilizer and insecticides to make the programme successful. Moreover monitoring and evaluation of the project is done by the Forest Department of the Bangladesh Government and also by the World Food Programme. POUSH itself also carries out monitoring and evaluation of the project.

Crop Sharing: There are three parties involved in this afforestation programme. These are the land owner, the maintenance workers (beneficiaries) and the NGO.

The species being grown are short, medium and long rotation. The lease agreement is done between the land-owner and the NGO for 20 years. Another agreement is done between the beneficiaries and the concerned NGO on final benefit distribution.

The return from the harvested crop will be shared in the following manner :

Land owned	50%
Beneficiaries	30%
NGOs	20%

The maintenance workers/beneficiaries have been organized into co-operative groups, who maintain and protect the trees upto harvesting because they periodically receive income from thinning and from cutting of fuelwood species. The beneficiaries of the afforestation programme under POUSH are guided and assisted in obtaining their due share under the agreement.

6.3 Policy Research for Development Alternative (UBINIG)

UBINIG is the abbreviated form of the Bengali name "Unnayan Bikalper Niti Nirdharoni Gobeshona". In English it means "Policy Research for Development Alternative". Its endeavor is to contribute to the evolving people's perspective on the wide range of policy issues that affect the lives of the community. It works with the community in their struggle against all forms of interventions and exploitation. Through the experience of this struggle they learn the tasks of reordering the material life and relations to create a world of global solidarity, interdependence and multiple cultural forms.

UBINIG originated in the form of a series of study circles in 1981 on the issues of development, environment and social change. These were experiences in critical reflections from class and gender perspective. In 1984, it formed into a research organisation through which it assumed to be more effective for the broad movement of Bangladesh society for social change and a new order of life. The formation of such an organization was also necessary, as termed by UBINIG, in order to constitute an institutional base and a team trained with progressive frame of mind. They work collectively, share their thoughts collectively and therefore both the accomplishments and failures are also shared in a collective

manner. At present UBINIG has a total of seven centres in Bangladesh.

UBINIG conducts action research programmes and learn from experiences of these programmes. Some of the projects they run are ecological agriculture and homestead forestry, handloom weaving as a means for rural reconstruction, regeneration of mangroves, trade union education and development, health programme, documentation centre, running womens informal meetings or discussions called

'Adda', educational programme for the poor children in rural and urban areas, networking, campaign and advocacy etc.

Social Forestry Programme:

UBINIG has been working in the coastal belt of Cox's Bazar at Badarkhali for a long time in cooperation with the local co-operative society. The project identified the target groups and took initiatives to support the development of these groups. After the devastating cyclone of 1991, UBINIG took up a massive programme aiming at integrated rural development programme. Afforestation programme of UBINIG started at that time which is considered to be a positive step towards building up balanced economy for the area.

As afforestation programme aims at preserving the soil of the char area, it has a direct bearing on economic condition of the people. This programme has already created a stir among the people and as a result of which the people are getting more and more inspired to plant trees.

Objectives of Social Forestry programme:

The main objectives of UBINIG's afforestation projects are:

- * To contribute to the stabilization of the ecological balance
- * Giving poor people, specially women opportunities for improving their social and economic position
- * Increase availability of fire wood, food and fodder
- * To raise consciousness among the people about the ecology
- * To support the national forest resources
- * To act as shelterbelt against cyclone and surges

Project Activities:

The main part of UBINIG's afforestation programme are the following:

- a. Homestead forestry
- b. Mangrove Regeneration programme and
- c. Nursery Raising programme

(a) Homestead Forestry : This is extensively practiced by organized groups of UBINIG. In this centre organized groups of 7-10 villagers undertake homestead forestry programme. Vegetables are grown on the homestead alongwith plantation of fruit and timber species suitable for the area. Good quality seedlings are provided by UBING at a subsidised rate. Necessary training is also provided by UBINIG and its field workers regularly monitor and follow-up the activities of the group members. About 564 members of 59 groups in this area are practicing improved homestead forestry programme.

b) Mangrove Regeneration Programme : As the lands of the coastal area are mostly sandy and silty, the trees hardly grow there. Bank erosion is also posing threat to nearby dwellers. UBINIG tried to seek a solution to this problem by regenerating mangrove species in the char land. Once there was a dense mangrove forest in Badarkhali under Chakoria thana, popularly known as Chakoria Sundarban, but the forest land gradually disappeared due to population pressure, increased farming, salt and shrimp cultivation etc. Eventually the occurrence of cyclone and its damage has also increased along with other ecological consequences. To reverse this situation and to create a balanced environment UBINIG initiated the Mangrove Regeneration Programme initially in 3 km area in the char land and plans to include another 5 km in the near future.

c) Nursery Raising Programme : To extend and implement the social forestry programme successfully, quality seeds and seedlings should be available in time in the project area. To ensure seedlings availability in time UBINIG undertook nursery project where they

raises various timber, fruit, firewood and other varieties of seedlings. At present the nursery is situated at the school premises, established by UBINIG. Other than the nursery, the students are also encouraged to participate in the afforestation programme by involving them in the nursery project. They work in the nursery in their leisure time and they are paid Tk. 5 for filling 100 poly bags. By this way a lot of village people learns the modern method of tree planting and other related activities, and at the same time a source of income is being created for the school as the money earned by selling seedlings are deposited in the school fund.

6.4 FINDINGS

6.4.1 Population Distribution by Age

The surveyed population has been classified into five age groups. It is found that 50.7 percent of the total population of the study area is in the economically inactive age group (0-15 and above 60

Table-6.1 : Sex and Age Group of Participants Family

NGOs	Sex	Total	0-15	15-30	30-45	45-60	60+
BRAC	Male	87	51	12	13	9	2
	Female	88	38	20	19	8	3
	Total	175	89	32	32	17	5
POUSH	Male	261	131	57	39	30	4
	Female	312	127	90	60	27	8
	Total	573	258	147	99	57	12
UNINIG	Male	198	103	41	34	14	6
	Female	183	96	46	33	5	3
	Total	381	199	87	67	19	9
	Grand Total	1129	546	266	198	93	26

Source: Field Survey, 1993.

years). In the study area there are 48.4 percent male and 51.6 percent female, the sex ratio of the study area is 93.6 males for 100 females were as the national ratio is 105.9 males for 100 females (1991 census). The age distribution of the study population is presented in Table-6.1.

It is found that the first age group i.e. (0-15) account for 48.4 percent of the total population. The concentration of population in the economically active group (15-60) is 49.3 percent. It is evident from the analysis that the dependency rate is 50.66 percent which is significantly lower than the national rate (59.2%). The

average family size is 5.8 which is slightly higher than the national average of 5.44 (BBS,1992).

6.4.2 Literacy Status

Education plays an important role in accelerating the development and it is one of the pre-requisites for the success of development programmes in Bangladesh. The people must have a general education which will enlighten them about the problems they face and the ways by which these can be resolved. This education will help immensely in building up a positive attitude towards social forestry.

Table-6.2: Level of Education

NGOs	Illiterate		Primary		Secondary		Higher Sec.		Graduate		Grand Total
	M	F	M	F	M	F	M	F	M	F	
BRAC	64 36.6	69 39.4	21 12.0	14 8.0	4 2.3	2 1.1	1 0.6	0	0	0	175
POUSH	197 34.4	259 45.2	53 9.2	52 9.1	11 1.9	1 0.2	0	0	0	0	573
UBINIG	98 25.7	131 34.1	78 20.5	40 10.5	18 4.7	11 2.9	3 0.8	1 0.3	1 0.3	0	381
TOTAL	359	459	152	106	33	14	4	1	1	0	1129
%	72.5		22.8		4.2		0.4		0.08		

Source: Field Survey,1993.

The level of education in three sites under three organisations are presented in Table 6.2. It appears from the table that the majority of the population of Kutubdia, Harbang and Badarkhali (76 percent, 79.6 percent and 60 percent respectively) did not have any education which accounted for 72.5 percent of the total surveyed population. It is also revealed that 22.8 percent of the total population received primary education and 4.1 percent attained upto

secondary level. And only 0.5 percent could reach the higher secondary level and more. The percentage of illiteracy amongst the females were more than that of males. The literacy rate being lower for the females is due to the negative attitude towards female education. The level of literacy seemed to be higher than that of the national level which was 23.8 percent (BBS 1992).

6.4.3 Occupation

The occupation of the surveyed population has been classified into nine major groups (Table-6.3).

Among the economically active population service is the dominant sector which incorporate the caretakers of the social forestry programmes too. The second important sector is non-agriculture labour (8.2 percent). Agriculture account for only 2.6 percent pouplation. Students and housewives account for 13 and 12.5 percent of the total population accordingly. The percentage of the dependent population is quite high (41 percent).

It is noticable that the contribution of agriculture sector in employment generation among the study population is quite low. The reason behind this situation is that the surveyed population mainly represent the family members of the caretakers of social forestry programmes of various NGOs who are mainly either landless or marginal farmers. As such people are diverged into various occupations other than agriculture.

Table-6.3 : Occupation of the Family Members.

Occupation	BRAC	POUSH	UBINIG	Total
Agriculture	6 (3.4%)	9 (1.6%)	14 (3.7%)	29 (2.6%)
Service	16 (9.1%)	95 (16.6%)	14 (3.7%)	125 (11.1%)
Business	6 (3.4%)	19 (3.3%)	22 (5.8%)	47 (4.2%)
Fishing	5 (2.9%)	10 (1.7%)	5 (1.3%)	20 (1.8%)
Agri. Labour	9 (5.1%)	29 (5.0%)	2 (1.3%)	43 (3.8%)
Non-Agri. Labour	14 (8.0%)	60 (10.0%)	19 (5.0%)	93 (8.2%)
Student	24 (13.7%)	68 (11.9%)	65 (17.0%)	157 (13.0%)
Housewife/ Household Work	23 (13.1%)	51 (8.9%)	67 (17.6%)	141 (12.5%)
Dependent	72 (41.7%)	232 (40.5%)	170 (47.6%)	474 (41.9%)
Total	175	573	381	1129 (100%)

Source : Field Survey, 1993.

Note : Parentheses indicate percentage.

6.4.4 Monthly Income

Information on monthly household income was collected. Household income has been classified into six groups. The highest amount of monthly income is Tk. 5500. About 65.1 percent of the total households earn Tk. 2000 or less per month. About 25.1 percent of the rest earn between Tk. 2001-3000. The number of families earning above this range is very few.

Table-6.4: Monthly Income of the Family (in Tk.)

NGOs	Monthly Income (in Tk.)					
	Upto 1000	1001-2000	2001-3000	3001-4000	4001-5000	5001 + Above
BRAC	8 (25.0%)	14 (43.7%)	7 (21.9%)	1 (3.1%)	0	2 6.25
POUSH	28 (26.67)	46 (43.8)	24 (22.8)	6 (5.7)	--	--
UBINIG	3 (5.2)	28 (48.2)	18 (32.0)	4 (7.0)	4 (7.0)	1 (1.7)
Total	39	88	49	11	4	3
%	20.1	45.1	25.1	5.6	2.0	1.5

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

The people of the study families were found to belong to below the poverty line. This low level of income with respect to their number of dependents was a great challenge to their survival and prohibits the assurance of minimum subsistence level.

6.4.5 Land Holdings of the Family

The target population of the social forestry programmes are generally low-income, marginal farmers or of landless laborers. Therefore pattern of land ownership is obviously low. The highest amount of land owned is 1 hectare or less. The survey results shows that 54.3 percent respondents have 0 to 0.2 Hectare of land and according to the Forestry Master Plan all the respondents can be defined as small land holders (Table 6.5).

The distribution of sample households into different sub groups shows the similar tendency of decreasing in number with increasing amount of land holding. The social forestry programmes of the country aims at improving their mode of life by introducing some income generating activities and at the same time increasing general awareness about the environmental conservation.

Table-6.5: Land Holding of the Family

NGOs	Land Area			
	Landless 0-0.2 Hect.	Marginal 0.2-0.4 Hect.	Land poor 0.4-0.6 Hect.	Small 0.6-1.0 Hec.
BRAC	21 (65.6)	5 (15.6)	5 (15.6)	1 (3.1)
POUSH	57 (54.3)	26 (24.8)	15 (14.2)	7 (6.7)
UBINIG	28 (48.2)	9 (15.5)	11 (18.9)	10 (17.2)
TOTAL	106	40	31	18
%	54.3	20.5	15.9	9.2

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

6.4.6 House Hold Ownership Pattern

Rural households usually live in own house which they inherit from their parents. Tenant households are generally fewer in number. The collected information shows that 91.3% population was living in their own houses. Families living in own houses mainly (78%) inherited these homesteads, the rest of the families bought their own homesteads (Table 6.6). A few households live in the rental households (7.2%). Some households involved in the forestry programme of BRAC live in the houses of other people free of cost.

Table-6.6: House Hold Ownership Pattern

NGOs	Own	Tenant	Dependent
BRAC	25 (78.1)	4 (12.5)	3 (9.4)
POUSH	95 (91.4)	10 (9.6)	--
UBINIG	58 (100)	--	--
TOTAL	178	14	3
%	91.3	7.2	1.5

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

6.4.7 Housing Materials

The following table illustrates the materials used for constructing houses in the project area. On the basis of information collected from the field survey, the house construction materials have been divided into four groups, such as bamboo, tin, mud and thatch grass. It has also been observed that none of the respondents possess any permanent house since cannot afford such houses. This is also the reason for mass destruction of houses, properties and human lives during cyclones. From the table 6.7 it is depicted that thatch grass is mostly used as roofing material (78.1% in Kutubdia, 81% in Harbang and 60.3% in Badarkhali). Bamboo is widely used for making the side walls, (65.6%, 69.5% and 67.2% respectively in Kutubdia,

Table-6.7: Housing Materials

NGOs	Materials	Bamboo	Tin	Mud	Thatchgrass
BRAC	Roof	1 (3.1)	5 (15.6)	1 (3.1)	25 (78.1)
	Wall	21 (65.6)	0	10 (31.2)	1 (3.1)
	Floor	0	0	32 (100)	0
POUSH	Roof	6 (5.7)	14 (13.3)	0	85 (81)
	Wall	73 (69.5)	1 (0.9)	26 (24.7)	5 (4.7)
	Floor	10 (9.6)	0	95 (90.4)	0
UBINIG	Roof	0	23 (39.6)	0	35 (60.3)
	Wall	39 (67.2)	1 (1.7)	18 (31)	0
	Floor	1 (1.7)	0	57 (98.3)	0

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

Harbang and Badarkhali). More than 90% of the floor of the houses are made of mud. This situation also demonstrate the economic condition of the surveyed families participating in the social forestry programmes.

Cement and iron, substitute of timber and bamboo in house construction are not within the economic reach of the most of the rural population. Therefore the demand for such materials will remain constant in future if not the economic condition of the general population changes dramatically. Social forestry programmes can use this situation for further expansion and development of the related projects.

6.4.8 Types of Fuel Used for Domestic Purpose

The energy consumption is an important issue of household economy, and the plant biomass play the most significant part in it. Per capita annual consumption of fuelwood is only 0.07 cu. m in Bangladesh (Byron, 1984). Rice straw, jute sticks, other crop residues, leaves and twigs, wood and branches, husks and brans, cowdung etc. are common materials used as fuel by rural households (Table 6.8). There are wide variation among areas in the relative contribution of these materials to total fuel use. Regardless of the location and size of land holdings, fuelwood, cowdung, jute stick, bamboo and branches of trees are the preferred fuel material (Abedin and Quddus, 1990). The survey revealed that 14.9 percent of the total fuel comes from household source, 63.1 percent was collected from neighbouring sources and 22 percent was purchased. The supply of fuel is not consistent throughout the year. In general households suffer from shortage of fuel during the monsoon season. Heavy rainfall inhibit use of tree products as fuel. As a consequence households have to rely on other fuel sources during this period.

Table-6.8: Types of Fuel used for Cooking (Multiple Response)

NGOs	Type of Fuel			
	Fire wood	Branches/Twigs	Agri. Residues	Cowdung
BRAC	32 (100)	31 (96.8)	25 (78.1)	4 (12.5)
POUSH	102 (97.1)	100 (95.2)	18 (17.1)	2 (1.9)
UBINIG	56 (96.5)	55 (94.8)	52 (89.6)	4 (6.9)
TOTAL	190	186	95	10
%	97.4	95.3	48.7	5.1

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

It is evident from the Table 6.8 that the rate of fuelwood use is very high in Harbang and Badarkhali . The reason behind this situation is that these two areas still have forest area in and around them. This opportunity facilitates personal collection of firewood from the forest areas. On the other hand the use of agricultural residues is quite low in Harbang area. This area is primarily a hilly region and the surveyed households are mainly landless or marginal farmers. Therefore the availability of agricultural residues is relatively limited in this area.

6.4.9 Mode of Fuel Acquisition and Collector

In rural areas fuel acquisition is an important factor and it is revealed from the survey that in most cases fuels are collected free of cost (63.1 percentage on an average from the three study area). Fuel collectors are divided into three groups, such as male, female and children (Table 6.9).

Table-6.9 : Collector of Fuel

NGOs	Male	Female	Children
BRAC	7 (21.9)	17 (53.1)	8 (25)
POUSH	15 (14.3)	64 (61)	26 (24.7)
UBINIG	21 (36.2)	21 (36.2)	16 (27.6)
TOTAL	43 (21.1)	102 (52.3)	50 (25.6)

Source: Field Survey, 1993.
Note: Parentheses indicate percentage.

Fuel gathering and cooking are almost exclusively the domains of women and children, including other household activities. From the Table 6.10 it is depicted that on an average 52.3% women in the three study area collect fuels (53.1% in Kutubdia, 61% in Harbang and 36.2% in Badarkhali). The children (25.6%) are the second important group in this respect. Adult male respondents are mainly engaged in income earning activities, therefore their contribution in collection of fuel wood is relatively low, excepting the area under UBINIG. It has been learned from the previous discussion that firewood is the main component of fuel used by the households and major part of this is collected from the surrounding areas. In Badarkhali area, people generally collect firewood from the forest areas of Maheshkhali island which is quite away from the main land, that is why the involvement of the male members is relatively high in this area than other two project areas.

Table-6.10 : Mode of Collection of Fuels

NGOs	Mode of Collection		
	Purchased	Collection	Own farm
BRAC	11 (34.4)	15 (46.9)	6 (18.7)
POUSH	10 (9.5)	92 (87.6)	3 (2.8)
UBINIG	22 (38.0)	16 (27.6)	20 (34.5)
TOTAL	43	123	29
%	22.0	63.1	14.9

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

6.4.10 Time Spent Per Day for Fuel Collection

The following table shows the time spent per day to collect fuels for everyday cooking. Three groups are made to illustrate the time spent for fuel collection, they are 1-2 hrs, 2-4 hrs and 4-6 hrs.

From table 6.11 it is evident that most of the families (55.4%) spent 2-4 hrs. per day to collect fuels for cooking and 28.7% spends 4-6 hrs. per day for the same purpose. This hampers their other household activities. Eventually, if more trees are grown through social forestry programmes, dependency on public forest lands for fuels and wood will substantially reduce. Moreover, the time spent on collecting fuels will be reduced, leaving times for other livelihood activities and leisure. Thus, easy accessibility of fuelwood and the subsequent decrease in collection time can be used as incentives for people to get involved with social forestry programmes.

Table-6.11 : Time Spent for Fuel Collection

NGOs	Hours		
	1-2	2-4	4-6
BRAC	5 (15.6)	18 (56.2)	9 (28.1)
POUSH	17 (16.2)	52 (49.5)	36 (34.3)
UBINIG	9 (15.5)	38 (65.5)	11 (19)
TOTAL	31	108	56
%	15.9	55.4	28.7

Source:Field Survey,1993.

Note: Parentheses indicate percentage.

6.4.11 Monthly Expenditure on Fuels

Table 6.12 illustrates monthly expenditure on fuels by the families. Five groups have been made to show their expenditure pattern in the following table:

Table-6.12: Monthly Expenditure on Fuel

NGOs	Expenditure (in Tk.)				
	upto 100	101-200	201-300	301-400	401-500
BRAC	11 (34.3)	8 (25)	3 (9.3)	8 (25)	2 (6.25)
POUSH	640 (60.9)	25 (23.8)	11 (10.5)	4 (3.8)	1 (0.9)
UBINIG	9 (15.5)	13 (22.4)	8 (13.8)	13 (22.4)	15 (26)

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

The monthly expenditure of the families range between Tk. 100-500. Majority of the respondents (66.6%) spent Tk. 200 or less. This amount of expenditure is relatively low in comparison to the family size of the surveyed households. The reason behind this is, the amount of fuels they purchase is only a part of their total consumption. Moreover, only those families purchase fuels whose income is relatively high and also the families where family members are few in number to collect fuels. Another important point is that, though the families spent less on fuels but compared to their total family income it covers a considerable portion of it.

6.4. 12 Types of trees Grown around the Homestead and in the Project Area.

Growing trees around the homestead is a common practice in rural areas of Bangladesh. It gives easy access to fuelwood, fodder, fruit, cash income and various other products to the people. Tree varieties found in the homestead and in the project area are listed in table 6.13 and 6.14 respectively. The most prevalent tree in the homestead are horticultural crops like Mango, Jackfruit, Coconut, Guava etc.

Other tree species include Akashmoni, Acacia, Babla, Gamar, Ipil Ipil, Raintree, Minjiri, Koroi etc. There are more diversity of variety in the homesteads than in the project areas. The reason for this can be attributed to the freedom of plant selection by the individual homesteads. In the project areas plant types are selected by the authorities, which result in plantation of same kind of trees over a relatively larger area instead of numerous varieties on a smaller area.

A number of shrubs and small trees were found in use as living fence. Among them Jiga, Bhadi, Kanta mendi and dhol kolmi are important.

Technical support and assistance provided through provision of free input mostly encouraged people to take part in social forestry programmes. Almost all households have a small area of dense multi-storied trees and shrubs clustered around the houses. These are multi-purpose tree gardens developed mainly for domestic consumption and marginally or periodically for market.

It is evident from Table 6.13 and 6.14 that fruit bearing trees get preference in homestead forestry while multipurpose varieties (supplying timber, fodder, firewood) get privilege in strip/block forestry programmes.

Farmers are of the opinion that the fruit trees provide maximum return compared to other tree crops. In practice, fruit trees produce fruit after 8-10 years, while fuelwood trees can be harvested after 7-8 years. This demand a systematic economic study to find out actual return from fuelwood trees vis-a-vis fruit trees.

It may be mentioned here that palm tree has been found relatively more storm resistant and economic return is quite high. But this variety did not get any preference in the project areas.

Table-6.13 : Variety-wise Tree Plantation Around the Homestead.

Type Area	Wood Species	Multi- Purpose Species	Horti- culture Species	Fuel Wood Species	Total No.of Trees	Averag e Number / Househ old
KUTUBDIA (BRAC)	2 (0.5)	159 (36.7)	267 (61.7)	5 (1.1)	433 (100)	13.5
HARBANG (POUSH)	155 (8.8)	274 (15.5)	1336 (75.6)	2 (0.1)	1767 (100)	16.8
BADARKHALI (UBINIG)	48 (3.5)	499 (36.8)	774 (56.9)	38 (2.8)	1359 (100)	23.4

* For species name, see Appendix-B.

Source : Field Survey, 1993.

Note : Paranthesis indicate percentage.

Table-6.14 : Number of Different Trees Grown in the Project.

AREA/ NGO*	Tree Type				Total No.of Trees	Average number/ House- hold
	Wood	Multi- purpose	Horti- culture	Fuel- wood		
KUTUBDIA (BRAC)	348 (7.7)	2754 (61.2)	370 (8.2)	1026 (22.9)	4500 (100)	250
HARBANG (POUSH)	15200 (36.8)	20600 (49.9)	3200 (7.7)	2300 (5.6)	41300 (100)	393.3

* UBINIG is not included here as the organisation is involved in homestead forestry only.

Source : Field Survey, 1993.

Note : Paranthesis indicate Percentage.

6.4.13 The Survival Rate of Different Types of Trees

The survival rate of different types of trees are presented in Table 6.15. The study population suggested different survival rate for each type of tree and their average rate has been calculated.

This survival rate is important for any forestry project because this gives an indication of selection of tree type for a particular area.

The trees are classified into four groups on the basis of their final use. It is found that in the first group (Horticulture), coconut, date palm, jam, betal nut and palmyr palm are the varieties with higher survival rate (81 -100 percent).

For the second group (Multipurpose), akshmoni, babla, babul, chatim, minjiri, neem, raintree, hijal and sisoo showed higher survival rate (61 - 100 percent).

Gorjan, koroi, champa and mahogony showed higher survival rate (61 - 100 percent). Jhau and mandar also showed higher survival rate (81 - 100 percent)

The withstanding capacity of adverse effects of cyclone and storm surge is higher among these trees. It is revealed from this table that the survival rate of local species which are adopted to local climatic and soil condition show better performance than the exotic varieties.

Table-6.15 : Survival Rate of Different Types of Trees in Percentage.

Type	Name	Kutubdia (BRAC)	Harbang (POUSH)	Badarkhali (UBINIG)	Average
Horticulture Species	Mango	48	64	55	55.67
	Amra	38	35	30	34.33
	Ata	12	15	16	14.33
	Bamboo	75	88	70	77.67
	Bhadi	98	88	75	87.00
	Coconut	86	82	90	86.00
	Dalim	25	30	38	31.00
	Datepalm	80	90	85	85.00
	Olive	48	60	56	54.66
	Kul	28	30	32	30.00
	Jackfruit	25	40	28	31.00
	Lemon	48	44	52	48.00
	Guava	32	45	30	35.66
	Battle Nut	88	85	90	87.67
Tal	92	95	94	93.67	
Multipurpose and Timber Species	Acasia	56	62	54	57.33
	Akashmoni	84	94	90	89.33
	Arjun	68	65	70	67.67
	Aust Acasia	56	64	50	56.67
	Babla	90	82	92	88.00
	Chatim	64	66	70	66.67
	Eucalyptus	46	54	52	50.67

Contd.....

Type	Name	Kutubdia (BRAC)	Harbang (POUSH)	Badarkhali (UBINIG)	Average
	Hijal	92	95	88	91.67
	Ipilipil	60	52	48	53.33
	Jam	85	88	90	87.67
	Manjium	48	54	55	52.33
	Minjiri	68	66	70	68.00
	Neem	72	70	75	72.33
	Raintree	78	88	90	85.33
	Sisoo	65	70	68	67.67
	Shimul	50	55	45	50.00
	Champa	65	72	68	68.33
	Gamar	50	60	54	54.66
	Gorjan	80	90	92	87.33
	Kadam	55	50	54	53.00
	Korai	90	92	85	89.00
	Mehagoni	92	95	85	87.33
	Babul	74	72	70	72.00
	Jhau	86	84	90	86.67
	Mander	92	85	94	90.33

Source : Field Survey, 1993.

Note : Trees with frequencies less than 5 were not included here.

Locational variation of survival rate is evident which has resulted from the interaction of different physical and social factors. Average survival rate of horticulture, timber and multipurpose trees is higher in Harbang-project area of POUSH. The soil of other two areas are relatively more sandy and influence of salinity is also higher. Therefore, Harbang is in a better condition for tree

growing. In the fuel wood group, lowest survival rate is evident in Harbang area. The reason can be attributed to availability of fuel wood from naturally grown forest areas. As such, less attention is paid to these types of trees, compared to other varieties.

It should be mentioned here that 90 percent survival rate is required to be ensured by the caretakers of social forestry programmes in order to receive the full payment from the organization. This measure exerts a positive influence on survival rate of trees.

6.4.14 Tree Species Selection

In our country almost half of the population are woman, but men are dominating everywhere, specially in the rural areas. And primarily men takes all the decisions. An attempt has been made to change this situation in social forestry programme by involving the females as main participants. The following table illustrates the role of different gender in selecting tree species around the homestead.

Table-6.16 : Decision maker of Plant Selection

NGOs	Chooser of Tree Types			
	Male only	Female only	Children	All
BRAC	9 (28.1)	17 (53.1)	2 (6.2)	4 (12.5)
POUSH	31 (29.5)	48 (45.7)	9 (8.5)	17 (16.2)
UBINIG	41 (70.7)	9 (15.5)	1 (1.7)	7 (12)
TOTAL	81 (41.5)	74 (37.9)	12 (6.1)	28 (14.3)

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

It is revealed from the table 6.16 that in total 41.5% males alone decide the type of trees to be planted as against 37.9% by females, 6.1% by children, and in 14.3% cases by all the family members. In Badarkhali the dominance of male was greater (70.7%) than the other two places. The reason behind this, is the families in Badarkhali are relatively better off and the female members do not require to come out to get involved with income earning activities. Therefore in relatively low income families female members play an important role in decision making process when they are engaged in income earning activities.

6.4.15 Sapling Collection

Table 6.17 shows the role of different family members in sapling collection. It reveals that in this activity the role of women is relatively greater (37.5%). The reason behind this may be attributed their involvement in the social forestry projects initiated by the NGOs, which is also the main source of saplings in the area. Other sources of saplings/seedlings are very limited or absent in the study area as well as in most of the rural areas of the country since the capacity of government. Nurseries to supply seedlings is very limited. Besides the saplings from the NGOs are generally distributed free of cost which is readily availed by the female members of the low income families. Saplings from the local market or govt. nurseries have to be bought at a fixed price. The NGOs are establishing small village based nurseries to meet the local demand of seedlings.

Table-6.17 : Sapling Collection

NGOs	Collector			
	Male only	Female only	Children	All
BRAC	10 (31.2)	15 (46.8)	5 (15.6)	2 (6.2)
POUSH	30 (28.5)	42 (40.0)	9 (8.5)	24 (23.0)
UBINIG	8 (13.0)	16 (27.5)	1 (1.7)	33 (56.8)
TOTAL	48 (24.6)	73 (37.5)	15 (7.7)	59 (30.2)

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

6.4.16 Sapling Maintenance

The maintenance of the trees after plantation determine the survival rate of trees. This plantation and maintenance works of the trees are generally done by the household members in low income earning families. And in such cases female members play the most important role which is also revealed from the analysis of table 6.18 and 6.19. This maintenance work is regarded as a part of domestic activities. Besides, male members are involved in major income earning activities; therefore it is difficult for them to spare time for this purpose.

Table-6.18 : People Involved in Sapling Maintaining

NGOs	People Involved			
	Male only	Female only	Children	All
BRAC	1 (3.1)	23 (71.8)	5 (15.6)	3 (9.4)
POUSH	9 (8.5)	56 (53.3)	10 (9.5)	30 (28.6)
UBINIG	2 (3.4)	12 (20.8)	14 (24.1)	30 (51.7)
TOTAL	12 (6.1)	91 (46.7)	29 (14.9)	63 (32.3)

Source:Field Survey,1993.

Note: Parentheses indicate percentage.

Table-6.19: People Involved in Sapling Planting

NGOs	People Involved			
	Male only	Female only	Children	All
BRAC	6 (18.7)	20 (62.5)	4 (12.5)	2 (6.2)
POUSH	24 (23.0)	58 (55.2)	9 (8.5)	14 (13.3)
UBINIG	23 (39.6)	27 (46.5)	0	8 (13.8)
TOTAL	53 (27.1)	105 (53.9)	13 (6.7)	24 (12.3)

Source:Field Survey,1993.

Note: Parentheses indicate percentage.

6.4.17 Marketing of Output

Gender involvement is an important issue when marketing of trees and tree products are considered . This determines the final destination of benefits acquired from homestead plantation (Table 6.20). It is depicted from the table that in this situation the role of male is greater, which is 62.5% in Kutubdia, 41% in Harbang and 75.8% in Badarkhali. The reason behind this is that, most of

the families are headed by males and they are the decision makers of all domestic matters. Moreover, social norms restricts women to go to the market place to sell the products and retain the income that is earned.

Table-6.20 : Product Marketing by Sex

NGOs	Product Marketing			
	Male only	Female only	Children	All
BRAC	20 (62.5)	8 (25)	4 (12.5)	0
POUSH	43 (41)	36 (34.2)	9 (8.5)	17 (16.1)
UBINIG	44 (75.8)	2 (3.4)	10 (1.7)	2 (3.4)
TOTAL	107 54.8	46 23.6	23 11.8	19 39.5

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

But in some cases women sell the products to the neighbors and sometimes children takes the products to the market for selling (11.8%) and thereby get access to the income earned from it.

6.4.18 Purpose of Planting Trees

Villagers in Bangladesh have been traditionally growing trees in homesteads, but planting and managing trees in the strip is relatively new. In this survey respondents indicated various reasons for growing trees. The responses include a wide range of uses and benefits which contribute to meeting various needs on the families and the society as well (Table 6.21).

It is evident from table 6.21 that the respondents grow trees as it provides employment opportunity (79.5%), supply building materials (62.61), increase food production (32.8%), protection

against storms (87.7%) and a beneficial project (77.4). From trees they get products like fruits, date juice and also cash. Other reasons for growing trees are cash earning during emergencies, stabilisation of roads and embankments, controlling soil erosion etc. Some respondents even mentioned the usefulness of tree in environmental balance. The objectives of the respondents for growing and managing trees can also be classified according to short-term and long-term needs.

Table-6.21 : Purpose of Planting Trees(Multiple Response)

Reasons	BRAC	POUSH	UBINIG	Total	%
Balancing the environment	40.6	87.6	94.8	160	82.0
Solve local fuelwood shortage	15.6	61.9	77.5	115	58.9
Availability of fodder	3.1	2.8	1.72	5	2.6
Increasing food production	3.1	6.6	96.5	64	32.8
Beneficial project	6.2	87.6	98.2	151	77.4
Supply of building materials	6.2	87.6	48.2	122	62.6
Employment opportunity	56.2	98.1	58.6	155	79.5
Provide cash during emergencies	3.1	51.4	75.8	99	50.7
Act as shelterbelt & windbreaker	53.1	93.3	96.5	171	87.7
Improving soil fertility	37.5	49.5	56.9	97	49.7
Supply raw materials for cottage industries	3.1	26.6	10.3	35	17.9
Stabilising the roads and embankments	50.0	84.7	96.5	161	82.5
Others	3.1	2.8	1.7	5	2.6

Source:Field Survey,1993.

Short-term objectives are to get fruit, vegetable, fuel and cash and long term objectives include harvesting of trees for household construction material and timber and generating cash. Creation of shelterbelts and environmental balance are also thought to be long term objectives of growing trees.

6.4.19 Reason for Selecting Varieties of Tree

The respondents indicated various reasons for selecting variety of tree species. These reasons are grouped under ten major headings as shown in table 6.22.

Table-6.22 : Reason for Selecting the Tree Varieties (Multiple Response)

SL. No.	Reasons	BARC	POUSH	UBINIG	TOTAL	%
1.	Market Demand	16	37	23	76	38.9
2.	Good for the Soil	27	98	55	180	92.3
3.	Fast Growth	17	73	43	133	68.2
4.	Suitable for Intercrop	5	33	16	54	27.6
5.	Value of Product High	7	44	22	73	37.4
6.	Family need	22	74	40	136	69.7
7.	Availability of Seedlings	25	68	39	132	67.7
8.	Multipurpose	28	101	57	186	95.3
9.	Easy to Protect	14	50	28	92	47.1
10.	Others	2	1	1	4	2.0

Source:Field Survey,1993.

It is revealed from the table that the main reasons for selecting various species are for their multipurpose use (95.3%), good for the soil (92.3%), family need (69.7%), fast growth (68.2%), availability of seedlings (67.7%) etc. The respondents ranked fruit and timber above fuelwood, although they had to buy or collect fuelwood. They see fuelwood and other fuels such as twigs and leaves, as a by product from all trees. So the trees they own and plant are timber or fruit trees. They do not plant trees specifically for fuelwood or for increasing soil fertility. Therefore, it is important that tree species planted are multipurpose. There are two distinct strategies which should be defined here. According to the first strategy, multipurpose trees can be grown in order to obtain different types of products from mixed culture of one variety

(horticulture). Secondly, there can be different types of trees from one variety (timber).

The economic benefit from the trees can be obtained from the timber, firewood or fruit produced from them. The importance of timber and fruit is obviously higher to the people. On the otherhand there are certain trees which help in retaining the soil fertility by fixing the nitrogen in the soil. Root decomposition also helps in soil fertility improvement.

6.4.20 Assistance

The NGOs are organizing the rural poor for implementing the social forestry programme in the study areas. A comprehensive package of incentives is being given to encourage people to grow and maintain trees. Table 6.23 illustrates the nature of incentives and assistance provided by the NGOs.

Table-6.23: Assistance Received for Tree Plantation (Multiple Response)

SL. No.	Assistance	BARC	POUSH	UBINIG	TOTAL	%
1.	Free Seedlings	32	105	58	195	100
2.	Free Tools	17	105	--	122	62.6
3.	Credit Facility	15	--	--	15	7.7
4.	Training	32	105	58	195	100
5.	Monitoring	32	105	58	195	100
6.	Wage Employment	17	--	--	17	8.71
7.	Food Aid	--	105	--	105	53.8
8.	Promotion of Cottage Industry	--	34	34	68	34.9
9.	Product Marketing Facility	15	--	--	15	7.7
10.	Others	10	32	31	73	37.4

Source:Field Survey,1993.

It is depicted from the table that the most attractive incentive for local participation in the social forestry project is the opportunity for employment. A significant number of employment opportunities has been generated through the projects to employ unskilled people as caretakers and nursers it i.e. mostly rural women. Provision of direct cash incentive by BRAC and food aid by POUSH for planting and maintenance also attract people to take part in social forestry programme. In the case of very poor class, the immediate cash return from plantation of trees act as an important incentive. Another motivation for the people's participation in social forestry programmes is the distribution of seedling free of cost or at a subsidised price. This seedlings distribution policy considerably encourages people to plant more trees. Moreover, under the scheme the NGOs provide technical assistance, follow-up facility, fencing and other necessary inputs like manure, pesticides, tools etc. In Kutubdia BRAC is providing credit facility to the participants for raising nursery and marketing the seedlings.

6.4.21 Plant Protection

Plant Protection is a major concern in social forestry. The survivality of seedlings are influenced by (a) brousing by domestic animals and (b) damage by local people owing to the belief that these trees will have negative effect on the crop fields when grow older. Besides this, majority of the caretakers are female and the existing social values in the rural areas do not provide for women to work in the fields. As such, trees that are grown and supervised by women suffer more from the non-cooperation of other people. Therefore, continious guarding and fencing of trees become necessary. The situation is relatively worse in Kutubdia (Table 6.24).

Table-6.24 : Nature of Plant Protection

NGOs	Nature		
	Mainly Fencing	Mainly Guarding	Both
BARC	5 (15.6)	11 (34.3)	16 (50.0)
POUSH	6 (5.7)	73 (69.5)	26 (24.7)
UBINIG	28 (48.2)	15 (25.8)	15 (25.8)
TOTAL	39	99	57
%	20.0	51.1	28.9

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

The plants remain unprotected at night during when most of the destructions are caused by the local people.

As the forestry project of UBINIG mainly concentrated in the homestead, therefore, the problems mentioned earlier is relatively less in this area. Majority of the plants can be protected here by fencing only.

6.4.22 Constraints

There are a number of reasons that hinder effective and spontaneous participation of people in social forestry programme. These problems are shown in Table 6.25.

Table-6.25 : Constraints (Multiple Response)

SL. No.	Assistance	BARC	POUSH	UBINIG	TOTAL	%
1.	Resistance by neighbours	10	2	21	36	18.46
2.	Security of land tenure	18	--	--	18	8.71
3.	Lack of technical training	3	12	37	52	26.6
4.	Problem of Protection	14	42	54	110	56.4
5.	Lack of good seed/seedlings	12	20	37	69	35.3
6.	Unsuitable soil	11	10	56	77	39.4
7.	Damage caused by local people	18	35	38	91	46.6
8.	Rural power structure	21	22	20	63	32.3
9.	Delay in obtaining benefits	11	40	32	83	42.5
10.	Attack of insects/disease	13	46	51	110	56.4
11.	Difference in choice of species	20	32	16	68	34.6

Source: Field Survey, 1993.

The major problem in tree establishment were problem of protection (89.4%), attack of insects & disease (89.2%), damage caused by local people (70.5%), problem of land tenure (8.7%) and unsuitability soil condition (54.5%).

People and children who pass along the strip sometimes breaks or uproots the plants carelessly. Draught animals also eat up leaves and branches of trees, and trample on the seedlings and young trees.

Conditions of land tenure greatly affect social forestry programme. This is specially evident in Kutubdia, since the caretakers are uncertain about their right on the land as well as on the trees as there is no legal contract between the NGO and the caretakers. Individuals cannot be expected to respond positively to tree growing programmes without reliable assurance that they will ultimately obtain the benefits of the trees they plant.

Tree husbandry is a long term process. Many of the difficulties involved in tree growing are compounded by this fact. This is particularly true for the poorer sections of the community who are least able to invest efforts and resources in long term concerns. The time elapses between planting trees and obtaining their benefits is therefore often indicated as an important constraint.

Some of these constraints are relatively easy to overcome, using readily available measures. Others may be of a much more critical in nature, requiring changes in land tenure arrangements, local power structure, or other basic characteristics of rural society. The table 6.25 illustrate some of the reasons why people may be unwilling or unable to grow more trees. But no listing of this kind can be complete.

6.4.23 Human Sheltering During Cyclone in 1991 and Suggested Plantation Area

The coastal belt of Bangladesh is about 750 Km long, and the occurrence of cyclone along with tidal surge is a common phenomena. There are very few cyclone shelters where people can take shelter during the cyclone. Moreover, the houses they live in are temporary structures, mostly made of bamboo and thatch-grass. As a result, each year, this area experience extensive loss of lives, homesteads and other properties. Apart from other uses, trees play a vital role in saving human lives. The survey confirmed that 36.0 percent of the total respondents took shelter on trees and thereby saved their lives (Table 6.26).

Moreover, trees reduce the intensity of wind speed and can provide food and water to the people (e.g. coconut tree), during post cyclone period.

From these instances people are becoming aware about the importance of planting trees along the coastline. The respondents also opined that trees should be planted both inside the embankment and on the

foreland (62.1%) (Table 6.27). About 32 percent respondents suggested for planting inside the embankment. However it would be more effective to establish green shelter belts on both the sides of the embankment.

Table 6.26 : Shelter Availed During 1991 Cyclone

NGOs	Tree	Own House	Embankment	Cyclone Shelter	Neigh. House	Hill
BRAC	18 (56.2)	6 (18.7)	3 (9.3)	3 (9.3)	2 6.2	- (0)
POUSH	17 (16.2)	34 (32.3)	1 (0.9)	16 (15.2)	33 (31.4)	4 (3.8)
UBINIG	35 (60.3)	3 (5.1)	- (0)	10 (1.7)	10 (1.7)	- (0)
TOTAL	70 (36.0)	43 (22.0)	4 (2.1)	29 (14.8)	45 (23.0)	4 (2.1)

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

Table 6.27 : Suggested Area for Afforestation

NGOs	Inside Embankment	Outside Embankment	Both
BRAC	16 (50.0)	3 (9.3)	13 (40.6)
POUSH	29 (27.6)	5	71
UBINIG	18 (31.0)	3 (3.1)	37 (63.8)
TOTAL	63 (32.3)	11 (5.6)	121 (62.1)

Source: Field Survey, 1993.

Note: Parentheses indicate percentage.

6.5 Cost Benefit Analysis of Afforestation Programme of POUSH:

Estimating cost and benefit of afforestation programme is difficult since there are some components which cannot be easily evaluated in monetary terms.

The components considered for cost determination of afforestation programme are:

- * Nursery Rasing
- * Planting
- * Fencing and Gabion Protection (Optional)
- * Maintenance
- * Supervision

In the following section a case study on cost of afforestation programme of POUSH is presented:

Nursery Raising:

Gardening tools, bamboo, manure, chemical, fertilizer, polybags etc. are required for nursery raising. It has been estimated that a nursery producing 60,000 seedlings, the average material cost per seedling is Tk. 0.46, labour cost Tk. 1.28 and supervision cost Tk. 0.20. There would be insignificant positive or negative change as long as the nursery size confine upto 150,000 seedlings. Beyond that size, the total cost may rise due to supervision needs.

Planting:

Average labour cost associated with planting each seedling is Tk. 1.44. Fencing and gabion are essential for plant protection but increase the cost to a considerable extent. The cost of gabion depends on availability of bamboo and thus the price of gabion ranges from Tk. 6 in Chittagong region to as much as Tk. 30 in parts of Rajshahi.

Maintenance:

Generally poor, destitute women are involved in taking care of nurseries and plantations. These caretakers are hired for three years and are paid in terms of wheat. According to WFP norm, payment is made for 360 days, which brings the total amount of wheat received by a caretaker (for the contract period) to 5.046 tons. The cost of each ton of wheat is calculated to be US\$ 245 which includes actual cost of wheat (US\$ 150/ton), (US\$ 50/ton) international transportation cost/ton (US\$ 45/ton) internal transportation cost, handling and losses. Which brings the price of wheat to Tk. 9.80/kg in the local market. The total cost of wheat received by each caretaker during the three year period is US\$ 1,234.45.

Supervision:

Supervision cost is calculated to be Tk. 54,000 per year for 100,000 seedlings, thus the supervision cost per seedling/saplings comes to Tk. 1.62 during a three year period. This supervision cost mainly depend upon the total number of sapling/seedling maintained by each caretaker. If 150 saplings are supervised by each caretaker during the contract period, then the supervision cost comes to Tk. 303.28. On the otherhand if the nursery size is 600 saplings, the maintenance cost comes down to Tk. 82.43 only during the contact period. This difference is significant for the NGOs who are involved in small scale nurseries which is apparently very much uneconomic. Type of tree or in other words duration of the tree also affect the supervision cost. If short duration trees are planted, supervision cost will incur for one to four years beyond the initial period. For the medium duration trees (e.g. kadam, raintree, chatian), this supervision cost will continue upto 15th year and for long-duration trees, some costs will continue upto year 30. An estimated maintenance and supervision cost is presented

in table-6.28, assuming that this cost would reduce by two thirds beyond the third year, where each worker will look after about 1,800 trees.

Table-6.28 : Social Forestry Costs upto Harvesting per Seedling/Sapling (in Taka)

Name	Short-Duration	Medium-Duration	Long-Duration
Nursery	1.74	1.74	1.74
Planting	1.44	1.44	1.44
3-Year Maintenance	82.43	82.43	82.43
Maintenance upto Harvesting	27.47	109.90	247.27
3-Year Supervision	1.62	1.62	1.62
Supervision upto Harvesting	1.62	6.48	14.58
Total :	115.02 (US\$ 2.87)	203.61 (US\$ 5.09)	349.08 (US\$ 8.73)
Note : US Dollar cost has been calculated at the rate of US\$ 1.00 = Tk. 40.00			

It is revealed from the table that plantation of medium term plants in strips or blocks with each caretaker looking after 600 saplings is most economic. Short duration plantation can be encouraged if plant types area properly selected and optimal growth of trees is ensured.

It should be mentioned here that the social discount rate has not been considered here. If the social benefits are included, all types of social forestry programmes will be found highly profitable.

6.5.1 Cost Benefit Calculation:

Social forestry programmes are operated on a non-commercial basis, as such the following cost benefit analysis gives us a view of the costs and benefits of social forestry programme operated by POUSH.

Following factors have been considered for the calculation of the cost-benefit of this programme for one hectare:

- a) The initial spacing of the tree species is 1.828 metres by 1.828 metres (i.e. 6'x6') and the total number of seedlings is 2990 (on an average) per hectare of land.
- b) Short and medium rotations only are considered in this calculation. There is a few percentage of long rotation species but in this calculation the long rotation species is considered as medium rotation.
- c) The harvesting time for the short rotation species is the 7th year and for medium rotation is the 15th year of the plantation age.
- d) The survival percentage of the seedlings (on an average) is, after vacancy filling, 90%. The number of surviving plants/hectare is 2691.
- e) On the basis of the planting design the ratio of the short and medium (considering long as medium) rotation is 75:25.
- f) The cost for seedling raising, planting and maintenance of the plantation for 3 years is calculated on the basis of the wheat price because the labour wages of these activities are provided under wheat assistance of WFP.

- g) The cost of seedling raising, planting, maintenance etc. is converted in terms money based on the following pricing factor of wheat. The cost of a ton wheat is calculated to average US\$ 150.00 FOB plus US\$ 50.00 international transportation cost plus US\$ 45.00 internal handling and transportation cost, landing and losses. The total cost of US\$245.00 per ton means Tk. 9.80 per kg. This is higher than the usual market price.
- h) The cost for supervision is calculated on the basis of 3 supervisors for 100,000 seedlings. The supervision cost is Tk. 2,152/hectare on the basis of Tk. 2,000/month as salary per supervisor.
- i) From the 4th year of the plantation if one maintenance worker looks after 1800 trees, up to the harvesting of the medium rotation crop, the cost per hectare (on the basis of the high wheat price) will be Tk. 27,370/hectare/year.
- j) The cost for fertilizer is calculated on the basis of 50 gm/sapling for 1st year and 75 gm/sapling for 2nd and 3rd year.
- k) The cost for insecticide is calculated on the basis of 3 time applications in a year.
- l) The volume of yield from tree species is on the basis of an average, taking into consideration different site qualities.
- m) Fuel wood from the pruning materials (Koroi, Sisso, Raintree etc.) is expected from the 6th year of plantation age and the return as fuel wood from pruning material will be 112 kg/tree/year (which is equivalent to more or less 3 mound/tree/year) and the price is considered as 85 Tk. 100 kg for this calculation.

- n) The volume of the final product of short rotation crop (fuel wood and poles) is estimated at 10 cft/tree and in case of medium rotation (timber/saw logs) crop at 12 cft/tree.
- o) The price of the final product of short rotation (fuel wood) and medium rotation (furniture timber) is Tk. 30/cft and Tk. 350/cft respectively.
- p) The expected yield from the short rotation species is 10 cft per tree which has been costed at fuel wood price. But some of the return from short rotation crop can be used as pole for house and construction purposes which will give more value than the considered value in this calculation.
- q) The value of the agriculture crops introduced in Agro-forestry practices is not considered in this calculation as it has not spread to all project areas.

COST CALCULATION FOR ONE HECTARE

Cost Item	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Seedlings Rasing	5202.60															
Planting	4305.60															
Maintenance as Wheat Cost	82155.23	82155.23	82155.23													
Supervision	2152	2152	2152	2152	2152	2152	2152	2152	2152	2152	2152	2152	2152	2152	2152	2152
Maintenance (after 3 years)				27370	27370	27370	27370	27370	27370	27370	27370	27370	27370	27370	27370	27370
Fertilizer	1121	1682	1682													
Medicine/Insecticide	1500	1500	1500	1500												
Harvesting of Final Product							201800									100912
Total:	96435	61490	87499	31022	29522	29522	231322	29522	29522	29522	29522	29522	29522	29522	29522	130434

Present Net Worth at 13% = $96435 + (87489 \times 0.88496) + (87489 \times 0.78315) + (31022 \times 0.69305) + 29522 \times 0.61332 + (29522 \times 0.54276) + (231322 \times 0.48032) + (29522 \times 0.42506) + (29522 \times 0.37616) + 29522 + (29522 \times 0.33288) + (29522 \times 0.29456) + (29522 \times 0.26079) + (29522 \times 0.23070) + (29522 \times 0.20416) + (29522 \times 0.18068) + (130434 \times 0.15989)$
 $= 96435 + 77427 + 68517 + 21468 + 18103 + 16023 + 111774 + 12548 + 11104 + 9827 + 8696 + 7696 + 6811 + 6027 + 5334 + 20855 = 498,645$

BENEFIT CALCULATION FOR ONE HECTARE

Cost Item	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fuel Wood from Pruning Materials							60211	60211	60211	60211	60211	60211	60211	60211	60211	60211
Final Product of Short Rotation								605400								
Final Product of Medium Rotation																228050
Total:							60211	665611	60211	60211	60211	60211	60211	60211	60211	288261

$$\begin{aligned}
 \text{Present Net Worth at 13\%} &= (60211 \times 4803) + (665611 \times 42506) + 60211 \times 37616 + (60211 \times 33288) + 60211 \times 29459 \\
 &+ (60211 \times 26070) + (60211 \times 23073) + (60211 \times 20416) + (60211 \times 18068) + (288261 \times 15989) \\
 &= (28919 + 282924 + 22648 + 28043 + 17737 + 15697 + 13891 + 12292 + 10878 + 460900) \\
 &= 8,85,929
 \end{aligned}$$

$$\begin{aligned}
 \text{Present Net Worth of Social Forestry Programme of POUSH at 13\%} &= \\
 885929 - 498645 &= 387284
 \end{aligned}$$

$$\text{Cost Benefit ratio at 13\%} = \frac{885929}{498645} = 1.776$$

$$\text{IRR (Internal rate of return)} = 22.50\%$$

The GOB considers 13% rate of return as the minimum required for any economically viable project. The IRR (internal Rate of Return) of the Social Forestry Programme of POUSH is much higher.

6.6 CONCLUSION

Afforestation through social forestry programme is becoming a popular component of NGO activities, especially for those who are working in the coastal belt.

Several NGOs have taken separate programme for social forestry in the country. Among them POUISH, BRAC and UBINIG are noteworthy. These three NGOs are working in the Cox's Bazar district. Poush started its operation in this field in 1988 while the other two started such programme after 1991 cyclone.

The participants of such programme constitute the lowest segment of the rural society who are either landless or marginal land owners. Emphasis is generally given on female participation. Such programmes provide ample employment opportunity for the local community and at the same time meet up the demand for fuelwood of the family to a great extent. The concerned NGOs provide necessary inputs for the proper development of trees. The beneficiaries are expected to receive a considerable part of the final output (i.e. timber) of strip/block forestry programme. But unfortunately it has been learned through the survey that no such contract exist between BRAC and its beneficiaries. This aspect certainly has some bearing on the beneficiaries personal interest towards proper maintenance of trees. It is evident that till now there is no direct impact on this absence of legal contact between the beneficiaries and BRAC on rate of tree survival since some negative control measures (i.e. payment system depending on rate of tree survival) have been adopted by BRAC authority. Needless to say that this has some psychological effect on the beneficiaries which was indicated by their dissatisfaction with the present management system regarding the benefit sharing issue.

The green belt produced by such social forestry programme not only facilitate protection of houses and property in the vulnerable areas but also serve as a major media in saving human lives during severe cyclones and storm surges. As such, initiatives should be

taken by the government to develop a policy framework to guide the spatial extension and popular participation in the programme.

There should be a general guideline for the adoption and implementation of social forestry programmes which must be followed by the organisations who are already working in this field and also for those who will get involved in this sector in future.

CHAPTER-7

CONCLUSION AND RECOMMENDATION

There is no other way through which the effects of vegetation coverage on the environment can be replicated or substituted. The proportion of forest area is gradually decreasing in most of the countries and Bangladesh is no exception. At present, the rate of deforestation is 2.7 percent per annum (Forestry Master Plan, 1993) in Bangladesh. The Government alone cannot prevent this deforestation nor it is desirable to leave the population aside from taking part into such resource building activity. In this respect, social forestry programme can be effectively and successfully adopted as an alternative way to restore the forestry in the country.

The social forestry programme can exert different kind of influence on the habitat. They can have social, economic and ecological impacts. Social forestry programme can generate employment opportunity for the lowest stratum of the rural mass, especially for the rural women. Employment opportunity for rural women is very scarce. Home based cottage industry or poultry farming are only fields where they can be involved but these sectors demand substantial amount of investment and inputs.

The families which require employment opportunity for the female members, in order to generate some extra income for the family to survive, inevitably constitute a major part of the poorest section of the rural society. They can neither avail themselves of any employment opportunity in the backward society they live in, nor

can they accumulate any savings to invest in any home based income earning activity. Apart from this, institutional support to generate capital for such families is still very limited in the rural areas of our country. Under such circumstances, social forestry programme can provide a major share of employment opportunity for poor rural women and at the same time can generate employment opportunity for the male who would not otherwise get any job.

If such programmes are successfully implemented and supervised, they can largely contribute in preventing the environmental degradation in general. The specific implication of such programmes is that, they can effectively reduce the threat of cyclone and storm surge in the coastal areas and can be highly contributive in saving human lives during cyclone disaster.

The multidimensional impact of such programmes cannot be evaluated or expressed on simple monetary terms. It can also contribute in improving the GNP of a country. Various types of small and cottage industries can be developed basing on the product of such programmes.

These are all direct usefulness of social forestry programmes. Social forestry can also contribute in resisting large scale soil erosion and protection of coastal embankments. Therefore, government and non-government organizations should come forward in accomplishing social forestry programmes incorporating local people in the process. Exchange of views at the international, national and local levels is essential for effective completion of social forestry programmes. Considering the present trend of development of this concept and trend of execution of such programmes in the country following recommendations are made which can facilitate more effective and beneficial implementation of social forestry programmes in Bangladesh.

RECOMMENDATION :

1. It is found that the percentage of illiterate population is quite high in the study area (72.5 percent) (Table 6.2). It is necessary for the population to become more educated specially to be able to operate and participate in such programmes more effectively. Literacy rate among the female members is relatively much lower. The population should be provided with special educational facility through non-formal and adult education programmes. This will increase general awareness about the benefits of such projects and at the same time would help in protecting the interest of the beneficiaries.

2. The occupational structure of the population shows (Table 6.3) that 17.27 percent population are engaged in income earning activities through the social forestry programmes, which finally reduce the dependency ratio from 1 : 3.7 to 1 : 1.6. Besides, majority (95 percent) (Table 6.3) of these people who are engaged in income earning activities through social forestry programmes are female. Therefore, it is recommended that such social forestry programmes should be expanded gradually in other parts of the country which would facilitate provision of employment opportunity for women. It would also increase the income level of the family.

3. It is evident from Table 6.3 that a large section of the study population are students. This population can play an important role in social forestry programmes. School Nursery Projects can offer practical knowledge for the students about tree plantation and at the same time can also provide for extra income. The non-formal education programmes operated through the NGOs can incorporate such social forestry programmes within their regular activities and encourage the students to participate in increasing forest resource of the country and at the same time to contribute in the family income.

4. Most of the respondents are small land owners (Table 6.5). Therefore the scope for increasing income from the agricultural sector is very narrow. As such, social forestry programmes in the Government khas land, on embankments and along roads can offer some extra income earning opportunity for these low income people. Therefore it is recommended that priority should be given to the small land holders in implementing social forestry programmes in government khas lands.

5. It is found that majority of the households (91.3 percent) own their homestead (Table 6.5) along with the surrounding land. Which means there is a relationship between the land and the occupants. These people plant trees around their homesteads, but the extent of external technical or financial assistance is almost nil in this sector. Besides, such homestead plantation programmes are operated according to traditional method, i.e., nonscientific method is followed in tree plantation and maintenance system which can increase the productivity and at the same time serve as wind breaker. Therefore it is recommended that the Government and the NGOs should also concentrate on this potential sector of social forestry which can increase the income level of the households and at the same time contribute in saving lives and properties during cyclones and storm surges.

6. Homesteads of the study population are made of tree bases materials (Table 6.7). Therefore forest resources should be increased through the social forestry programmes in order to ensure affordable and regular supply of housing materials for low income rural people.

7. Fuels used for domestic purpose come from forest resources. Therefore social forestry programmes should be expanded gradually to maintain a steady and less costly supply of fuel. In this regard, government and NGOs publicity for the use of scientific earthen cooker should be carried out in order to save fuel consumption.

8. The study reveals that there is a difference between the variety of trees planted around the homesteads and project areas (Table 6.13 and 6.14). But till now, no study has been conducted on the economic profitability of different varieties of trees. As such it is recommended that research should be done on this issue.

9. The survival rate of different types of trees varies greatly (Table 6.15). Therefore careful consideration should be given during tree species selection for social forestry programmes. Two aspects should be considered during the selection of tree variety - i.e., wind resistance capacity and branching pattern. Palm variety is wind resistant and they can provide drinking water and nourishment under emergency situation. On the other hand the branching varieties like Koroi, Raintree etc. are helpful in giving shelter to the people, they still can provide a safe place even if they are uprooted.

10. The number of government and NGO nurseries are very limited in the rural areas (Table 6.16). And 90 percent saplings used for homestead plantation are collected from the community. As such, this facility should be increased rapidly in order to ensure adequate and less expensive sapling supply for the rural households. Credit facility to develop nursery at the household level is emphasised here. This can reduce the institutional responsibility and increase people's participation in the programme.

11. The saplings are distributed free of charge among the people. There are two contradictory arguments in favour and against such free distribution. It is argued that such free distribution fails to establish a bond between the tree and the planter. On the other hand, such free distribution is carried out on the basis of foreign donation mainly. The long term sustainability of these projects may be threatened if funds are withdrawn from this sector by the donor agencies.

The counter argument in favour of free distribution is that, NGOs are voluntary organisation, they can not be encouraged to become a profit making concern by introducing financial transaction system for sapling distribution. As such it is recommended that a minimum price level should be gradually introduced. This would help in sustaining such projects in the long run. The income earned through such schemes can be utilised among the beneficiaries in order to supply other inputs.

12. Technical support is provided to the participants (Table 6.23). But such assistance should not be imposed upon them. Rather, attempts should be taken to explore the indigenous technical knowhow in order to increase people's participation and to avoid conflict of interest between the organisation and beneficiaries.

Initiatives should also be taken to provide short training on technical aspect of tree plantation and maintenance for the beneficiaries.

13. At present the saplings produced by the nursery workers are totally absorbed by the concerned NGOs at a minimum price. Government initiatives should be taken to increase the scope of entering such individual grower of saplings in to the open market. Marketing facility for the saplings and the products should be made easier.

14. It is essential to devise marketing mechanisms to enable villagers to sell surplus products at competitive prices.

15. The promotion of cottage industries agriculture, and sericulture which are linked to tree farming, are some other areas wherein specific programmes can be combined to increase the rural income and employment opportunities.

16. Rural infrastructures are necessary to help tree growers living in areas far away from usual village environment. Construction of village roads, irrigation facility, schools, cooperatives, and dispensaries are some of the items which can be listed under this category.

17. It is found that in many cases there do not exist any legal contract between the institution and the participants. The participants or the beneficiaries must have adequate benefit sharing arrangements in order to have access to the land or at least to the trees that they plant, specially at the time when the trees are ready for cutting. Without this assurance, social forestry programmes will only serve to worsen social problems instead of helping to solve them.

18. Till now, people's participation is limited only at the implementation stage. It is recommended that steps should be taken to facilitate people's participation from the design and planning stage.

19. The economic return from such -projects depend upon the variety of trees that are planted on the project area or around the homesteads. Horticulture varieties bring financial return to the beneficiaries much earlier than the timber varieties. Therefore, if only the timber varieties are planted, Some economic incentives (in the form of wage or food aid) should be given to the involved people.

On the other hand, mixed plantation of horticulture and timber variety can be encouraged to ensure quick financial return for the participants.

20. It is found from the study that many people (36 percent) saved their lives by taking shelter on trees (Table 6.26). The mass destruction of trees during 1991 cyclone has left many areas almost barren. It is therefore necessary to plant large

number of trees in the coastal areas. Suggestions have been made by the respondents on the selection of sites for tree plantation (Table 6.27). Majority (62.1 percent) have suggested to plant trees on both sides of embankment. This would save the embankment from the direct attack of the sea waves. At the same time, provide shelter and wind breaking facility for the people who are living inside the embankment.

Protection of embankment against cyclone and cyclone surge through planting should be done in such a way that the plantation profile can effectively break the waves and currents before they can touch the bottom of the embankment. For this, the profile should be fairly thick and start with short plants or shrubs in front and gradually higher trees at the back. The chosen plants should be able to stand adverse situations, like salinity, strong wind, water stagnation etc.

21. Different types of trees are suggested for the afforestation of either side of embankments. For the seaward side "mainland" species and, at the outer extreme, mangrove species are recommended. Additional success would come from afforestation on the landward side of the coastal embankment with shelter belt plantations of coconut palms, date palms and other trees that will also attenuate winds and storm surge and provide vertical life saving facility from the storm surge and flood waters as well as providing useful products.

The coastal region of the world, specially the area along the Indian ocean is gradually becoming more vulnerable to air and water borne disasters due to global warming and rising sea level. These areas need special planning and attention. Appropriate infrastructural development is one of the ways to minimise the effects of such disasters. Shelter belt creation is a rather new concept but it is gaining popularity due to its multi dimensional impacts on environment, economy and people. The final outcome of such programmes rests upon the government policy and people's participation.

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2. TOTAL LAND HOLDINGS

CATEGORY	OWNED	TENANT	LEASE	OTHERS
Homestead				
Agriculture				
Strip forests				
Ponds				
Others				

3. How did you own this homestead ?

i) Purchased in 19_____

ii) Inherited in 19_____

iii) Others (specify) :

4. HOUSING STATUS :

House	Walling material	Roofing materials	floor
1			
2			
3			

5. ANIMAL RESOURCES IN THE HOMESTEAD :

Types	Own	Tenants	
		Taken	Given
COW			
BULL/BUFFALO			
GOAT/SHEEP			
CHICKEN/DUCK			
OTHERS			

6. a) Source of Labour for animal resource management :

- i) Completely household
- ii) Household and hired
- iii) Completely hired

b) Type of fodder fed to the animals :

c) Source of fodder:

d) Availability sufficient ? Yes No

e) Purpose of Rearing Animals in the Homestead :

i) Home consumption = %

ii) Sale = %

f) Total income from animal resources :Tk.

7. How do you meet your following needs :

Product	Source of Procurement	Price (if purchased)
Rice		
Wheat		
Fruit		
Firewood		
Fodder		
Timber		
Vegetables		
Meat/Fish		
Salt		

8. SOURCE OF ENERGY FOR COOKING IN THE HOUSEHOLD

TYPES	SOURCE	COLLECTOR	HOURS/DAY	PRICE (if purchased)
Feed Wood				
Branches, Twings and Leaves				
Agri Residues				
Jute stick				
Cowdung				
Saw Dust				
Bamboo				
Kerosine				
Others				

FOR HOME STEAD FORESTRY

9. No of species planted in east 3 years and persons involved:

Name of species	No	Surviving Rate %	Person Selecting	Who collects Seedlings	Planting	Marketing out-put

10. Source of seedling collection and Method of collection

Source	Method			
	Purchased	Free	Subsidised	Others
Govt.Nursery				
NGO "				
Private"				
Others				

11. Reasons behind selecting the upper mentioned species :

1. Market demand
2. Family needs / choice
3. Land and soil type
4. Availability of seedlings
5. Fast growth
6. Multipurpose
7. Suitable for intercrop
8. Easy of protect
9. Values of product
10. Others (specify)

12. Assistance provided for planting trees in the Homestead

Assistance	Source		
	Govt.	NGO.	Others.
Free seedling			
Free tools			
Credit facility			
Training			
Monitoring			
Wage employment			
Food aid			
Promotion of cottage industry			
Others			

FOR STRIP PLANTATION

14. Name of the Group (if ??)

15. Total number of group member :

Male	Female

16. Who organised the group :

17. Total land area of the strip (km or Area) :

18. No of Trees :

19. Leasing authority

20. Leasing arrangement :

21. Leasing period :

22. Nature of benefit distribution :

Land owner	-	%
Benefeciaries	-	%
NGO	-	%
Others (specify)		%

23. Why you have planted trees in the strip ?

24. Nature of strip & specis planted

Species Name	Rural Rd.	Embankment	No: Planted	Year Planted	No : Sarvived	Preference (Rank)

25. Who selected the species : a. Land owner b. NGO
 c. Beneficiaries d. others (Specify)

26. Reason for selecting the upper mentioned species :

- 1.
- 2.
- 3.
- 4.

27. , Source of seeling colletion of method of collectio

Source	Method			
	Purcased	Free	Subsichd??	Others
Govt. Nersery				
Ngo ''				
Private ''				
Other				

28. Assistance provided & nature of assitance

Assistance	Source		
	Govt	NGO	Others

29. Expenditure /km Tk

Sedlings	
Planting	
Maintenance	
Fertilizer	
Insesticide	
Watering	
Others	
Total	

30. PROBLEM FACED :

(RANK TOP 3)

- a. Adjecent land owner
- b. Lease arrangment
- c. Lack of tecnical know how
- d. Protection
- e. Demand of seedlings
- f. Rural power structure
- g. Local administraction
- h. Others (specify)

31. How did you overcome the problems ?

- a.
- b.
- c.
- d.

32. Total Yield

Species	Yield		Qty Consumed	Sold		Place sold	
	Green	Dry		Qty	Price	Village	Market

FOR NURSERY COMPONENT

33. Management Pattern

- a. Individual Effort
- b. Joint / Collective Effort

34. SEX & NATURE OF INVOLVEMENT :

No. of persone involved		Time spent	Nation of involvenet	
Sex		Hours/ Day	Volanteer	Paid
Female				
Male				

35. Type of species raised and their demand

Name of species	No. of seedling	Servival Rate	Cost	Selling Price	Preference (Rank)

36. Reason for establishing the Nursery :

- a.
- b.
- c.

37. Nature of assistance received & source

	Govt.	NGO.	Others
Supply of seeds			
Training			
Tools			
Credit			
Monitoring			
Marketing			
Others (specify)			

38. Problems you have faced :

- a. Lack of technical know-how
- b. Supply of seeds
- c. Lack of fund
- d. Space problem
- e. Marketing
- f. Attack of insects
- g. Others (Specify)

39. How did you overcome the problems ?

- 1.
- 2.
- 3.
- 4.
- 5.

FOR ALL

40. Do you need to irrigate your plants ? Yes No

(if yes, which season and how ?)

Month	Mode	Source

41. Information on fertilizer use for the plants

Type	Source	Quantity	Price (if purchased)
Cow Dung			
Composed			
Chemical fertilizer			
Others			

42. Did you use pesticides ? Yes No

(if yes mention amount used and price)

43. How many seedlings can you plant in a day ? -----

44. How many trees can you take care of perday ? -----

45. What measure you take to protect the plants ?

a. Putting fences

b. Guarding ----- hrs/day and ----- persons

c. Both

46. Extent of damage caused by cyclone / tidal surge during 1991

	None	Light	Moderate	Heavy
Homestead				
Agri crops				
Livestock				
Plantations				
others (specify)				

OPENION QUESTIONS

47. Area you satisfied with the current afforestation programme in your locality ? Yes No
48. Do you want afforestation along the embankment/river or sea face ? Yes No
49. Should the afforestation be :
- a. Outside the embankment
 - b. Inside the embankment
 - c. Both inside and outside the embankments.
50. In addition to new cyclone shelters do you consider afforestation along the embankment, river or sea face necessary ? Yes No
51. Is there adequate embankment against storm surges in your locality ? Yes No

52. Where did you take shelter during 1991 cyclone ?

1.

2.

3.

53. What type of trees were least affected during the cyclone of 1991 ? Name them --

1.

2.

3.

4.

5.

54. Is it necessary to plant more such type of trees to minimise the extent of damage in the future ? Yes No

LIST OF TREE SPECIES WITH SCIENTIFIC AND LOCAL NAMES

Amlaki	-	<i>Phyllanthus embelica</i>	Kathal	-	<i>Artocarpus heterophyllus</i>
Am	-	<i>Mangifera indica</i>	Khair	-	<i>A. catechu</i>
Amra	-	<i>Spondias mangifera</i>	Khejur	-	<i>Phonix sylvestris</i>
Australian Acacia	-	<i>A. auriculiformis</i>	Koroi	-	<i>Albizia procera</i>
Babul	-	<i>A. nilotica</i>	Kul	-	<i>Zizyphus jujuba</i>
Bakphul	-	<i>Sesbania grandiflora</i>	Lebu	-	<i>Citrus species</i>
Bamboo	-	<i>Bambusa species</i>	Litchu	-	<i>Litchi chenensis</i>
Bel	-	<i>Aegle marmelos</i>	Malakana	-	<i>Paraserianthes falcataria</i>
Bhadi	-	<i>Lanuca grandis</i>	Mandar	-	<i>Erythrina suberosa</i>
Chalmugra	-	<i>Taractogenos kurzii</i>	Mangium	-	<i>Acacia mangium</i>
Chalta	-	<i>Dillenia pentagyna</i>	Mehagoni	-	<i>Swietenia macrophyld</i>
Champa	-	<i>Michelia champaca</i>	Minjuri	-	<i>Cassia siamea</i>
Chapalish	-	<i>Artocarpus chaplasha</i>	Narikel	-	<i>Cocos nucifera</i>
Chatian'	-	<i>Alstonia scholaris</i>	Neem	-	<i>Azadirachta indica</i>
Chikrassi	-	<i>Chikrassia tabularis</i>	Pyara	-	<i>Psidium guayana</i>
Debdaru	-	<i>Polyalthia longifolia</i>	Pine	-	<i>Pinus spp.</i>
Dhakijam	-	<i>Eugenia grandis</i>	Pitali	-	<i>Trewia nudiflora</i>
Dumur	-	<i>Ficus esculenta</i>	Poplar	-	<i>Populus euphratica</i>
Eucalyptus	-	<i>Eucalyptus spp</i>	Pynkado	-	<i>Xylia dolabriformis</i>
Gab	-	<i>Diospros embryopteris</i>	Raintree	-	<i>Samanea saman</i>
Gamar	-	<i>Gmelina arborea</i>	Rubber	-	<i>Havea brasiliensis</i>
Garjan	-	<i>Dipterocarpus turbinatus</i>	Sal	-	<i>Shorea robusta</i>
Goranim	-	<i>Melia azaderach</i>	Simul	-	<i>Salmalia malabarica</i>
Hijal	-	<i>Barringtonia acutangula</i>	Sissoo	-	<i>Dalbergia sissoo</i>
Ipil-Ipil	-	<i>Leucaena leucocephala</i>	Sonalu	-	<i>Cassia fistula</i>
Jalpai	-	<i>Eleaocarpus spp.(robustus)</i>	Supari	-	<i>Areca catechu</i>
Jam	-	<i>Syzygium Jambolana</i>	Tal	-	<i>Borassus flabilifera</i>
Jambura	-	<i>Citrus spp.</i>	Teak	-	<i>Tectona grandis</i>
jarul	-	<i>Lagerstomia flosreginae</i>	Telsur	-	<i>Hopea odorata</i>
Jhau	-	<i>Casuarina equisetifolia</i>	Tetul	-	<i>Tamarindus indica</i>
Kadam	-	<i>Autocephalus chinensis</i>	Toon	-	<i>Cedrella toona</i>
Kamranga	-	Star fruit			

Choice of Species

<p>Coastal Accretions</p> <p>Keora (<i>Sonneratia apetala</i>) Baen (<i>Avicennia officinalis</i>) Gewa (<i>Excoecaria agallocha</i>) Kankra (<i>Bruguiera gymnorrhiza</i>) Goran (<i>Ceriops decandra</i>) Golpata (<i>Nypa fruticans</i>) (on river and stream banks where sweet water flows)</p>	<p>Homesteads</p> <p><u>Timber trees</u> Raintree (<i>Samanea saman</i>) Koroī (<i>Albizzia spp.</i>) Mahogany (<i>Swietenia spp.</i>) (In mainland of Patuakhali, Bhola and Noakhali)</p> <p>Sisoo (<i>Dalbergia sisoo</i>) (In mainland of Patuakhali, Bhola and Noakhali)</p>	<p>Cyclone Shelters</p> <p>Coconut (<i>Cocos nucifera</i>) Jhau (<i>Casuarina equisetifolia</i>)</p>
<p>Sandy Beach</p> <p>Jhau (<i>Casuarina equisetifolia</i>) Coconut (<i>Cocos nucifera</i>)</p>	<p>Shon boloi (<i>Thespesia populnea</i>) Shimul (<i>Bombax ceiba</i>)</p>	<p>Killas</p> <p><u>Shrubs</u> (For the edge of the killa) Dhol Kalmi (<i>Ipomoea fistulosa</i>) (on extreme sites) Keya (<i>Pandanus odoratissimus</i>) Hoglapata (<i>Typha angustata</i>)</p> <p><u>Trees</u> Khaiya babla (<i>Pithecolobium dulce</i>) Shon boloi (<i>Thespesia populnea</i>) Akashmoni (<i>Acacia auriculiformis</i>) Sisoo (<i>Dalbergia sisoo</i>) (For non saline, and neutral to alkaline soils) Ipil-ipil (<i>Leucaena leucocephala</i>) (Not in acid soil) Coconut (<i>Cocos nucifera</i>)</p>
<p>Coastal Embankment</p> <p><u>Shrubs</u> Dhol Kalmi (<i>Ipomoea fistulosa</i>) Shada Akanda (<i>Calotropis procera</i>)</p> <p>Keya (<i>Pandanus odoratissimus</i>) Hoglapata (<i>Typha angustata</i>)</p> <p><u>Trees</u> Babla (<i>Acacia nilotica</i>) Akasmoni (<i>Acacia auriculiformis</i>) Jhau (<i>Casuarina equisetifolia</i>) Shon boloi (<i>Thespesia populnea</i>) Ipil-ipil (<i>Leucaena leucocephala</i>) (Not in acid soil) Khaiya Babla (<i>Pithecolobium dulce</i>) (Not in acid soil) Sisoo (<i>Dalbergia sisoo</i>) (For non-saline and neutral to alkaline soil only) Sonalu (<i>Cassia fistula</i>) Date palm (<i>Phoenix sylvestris</i>) Coconut (<i>Cocos nucifera</i>) (where protection is assured)</p>	<p><u>Fuelwood and Fodder</u> Akasmoni (<i>Acacia auriculiformis</i>) Babla (<i>Acacia nilotica</i>) Jhau (<i>Casuarina equisetifolia</i>) Ipil-ipil (<i>Leucaena leucocephala</i>) (Not in acid soil)</p> <p>Khaiya babla (<i>Pithecolobium dulce</i>)</p> <p><u>Horticultural Species</u> Coconut (<i>Cocos nucifera</i>) Date palm (<i>Phoenix sylvestris</i>) Palmyra palm (<i>Borassus flabellifer</i>) Jam (<i>Syzygium cumini</i>) Tetul (<i>Tamarindus indica</i>) Am (<i>Mangifera indica</i>) Payara (<i>Psidium guajava</i>) Chalta (<i>Dillenia indica</i>) Bel (<i>Aegle marmelos</i>) Amra (<i>Spondius pinnata</i>) Lebu (<i>Citrus spp.</i>) Bamboo (<i>Bambusa spp.</i>) (Baijja bansh)</p>	<p>Educational and Religious Institutions</p> <p>Coconut (<i>Cocos nucifera</i>) Jhau (<i>Casuarina equisetifolia</i>) Mahogany (<i>Swietenia spp.</i>) (In mainland of Patuakhali, Bhola and Noakhali) Koroī (<i>Albizzia spp.</i>)</p>
		<p>Road and Canals</p> <p>Mahogany (<i>Swietenia spp.</i>) Sisoo (<i>Dalbergia sisoo</i>) Koroī (<i>Albizzia spp.</i>) Raintree (<i>Samanea saman</i>) Coconut (<i>Cocos nucifera</i>) Date palm (<i>Phoenix sylvestris</i>) Golpata (<i>Nypa fruticans</i>) (where sweet water flows)</p>

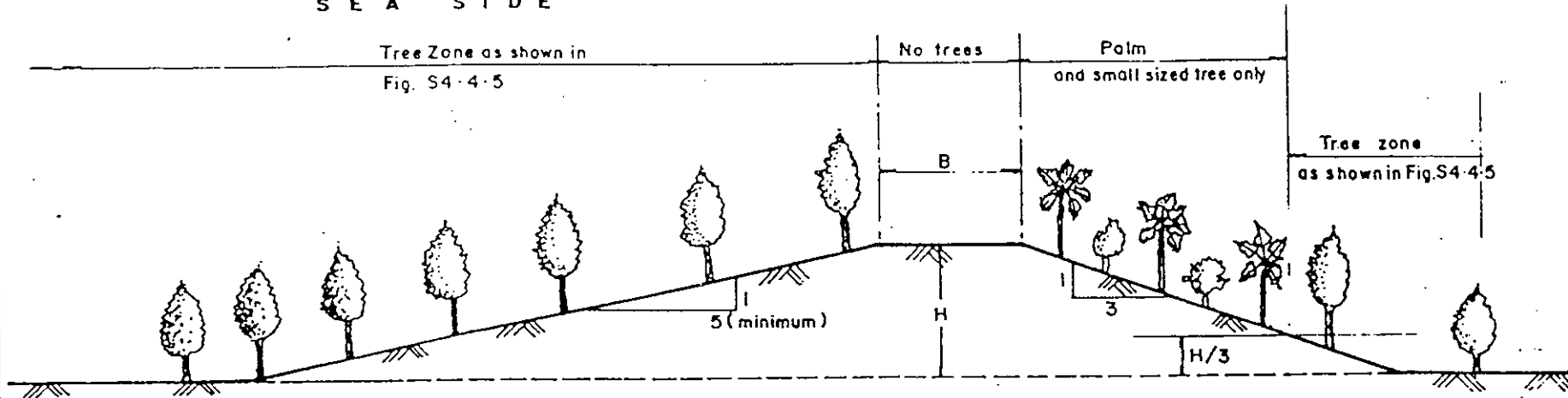
S E A S I D E

Tree Zone as shown in
Fig. S4-4-5

No trees

Palm
and small sized tree only

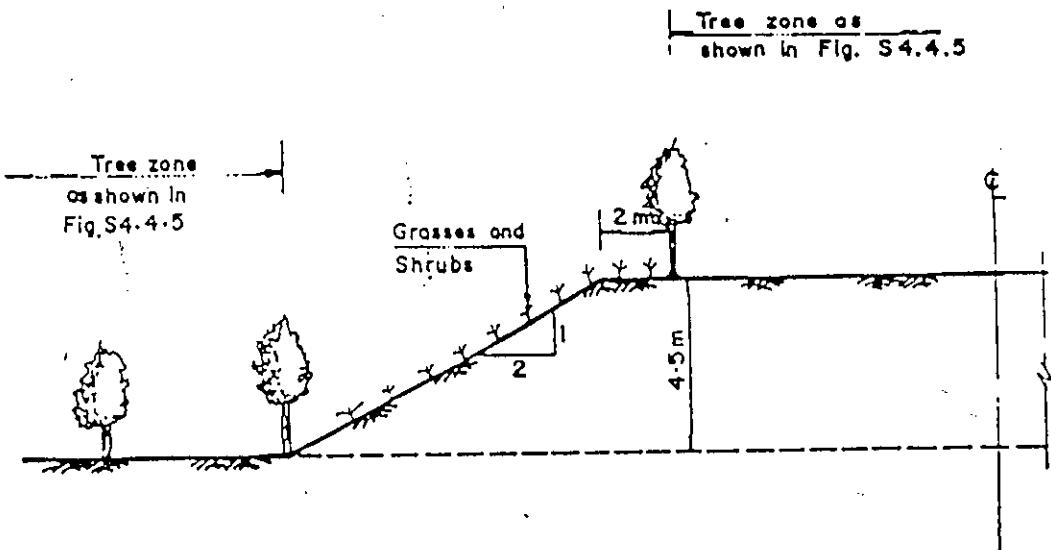
Tree zone
as shown in Fig.S4-4-5



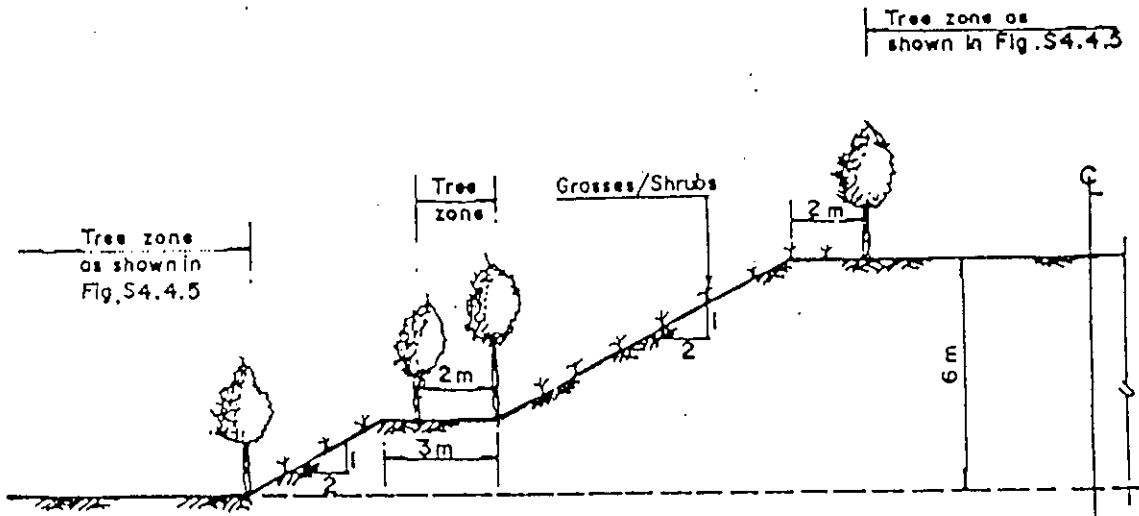
H = Height of Embankment

B = Top width of Embankment

Schematic Diagram of Afforestation on Seafacing Coastal Embankments



(a) KILLA HEIGHT : ≤ 4.5 m



(b) KILLA HEIGHT : > 4.5 m, UP TO 6 m

Schematic Diagram for Afforestation in Killas

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