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# INTRODUCTION OF NON-MANGROVE IN RAISED LAND-A WAY TO MAINTAIN SUSTAINABLE FOREST IN COASTAL BELT OF BANGLADESH

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## ABSTRACT

The coastal afforestation programme was started in the year 1966. Today, 1.3 million hectares of land have been planted with keora (*Sonneratia apetala*), baen (*Avicennia officinalis*) gewa (*Excoecaria agallocha*), Kankra (*Bruguiera sexangula*) and golpata (*Nipa fruticans*). Among them keora and baen are the major (80 and 20 percent, respectively) planting species. This established man-made mangrove forest along the coastal belt and off-shore islands face major problems viz. site suitability, regeneration for second rotation crop and insect infestation under present management system. Considering the sustainability of the existing plantation, research on mesophytic trees has been carried out. Eleven commercially important mesophytic trees species were tried in two locations (Rangabali and Kukri-mukri). The data on survival, height and diameter was recorded and statistically analysed. Out of eleven species jhaw (*Casuarina equisetifolia*), babla (*Acacia nilotica*), raintree (*Samanea saman*), payra (*Pithecellobium dulce*), sada koroi (*Albizia procera*) and soan boloi (*Hibiscus tiliaceus*) showed promising for Rangabali location. Where as in Kukri-mukri location the promising species were raintree (*S. saman*), pyra (*P. dulce*), kala koroi (*A. lebbek*), sissoo (*Dalbergia sissoo*), jam (*Syzygium cumini*) and babla (*A. nilotica*). These plantations of above mentioned species established in the coastal areas are likely to offer sustained yield and render a permanent forest cover in the coastal belt.

## INTRODUCTION

The coastal area of Bangladesh is facing devastating cyclones in almost every monsoon season. To protect lives and properties of the people living in the coastal area, the Forest Department

started coastal afforestation programme in the year 1966 (Das & Siddiqui, 1985). Until now they have planted 1.3 million hectares of coastal land and off-shore island areas (Dalmacio *et al.*, 1991). Along with the above objective, simultaneously other objectives of the coastal afforestation are included:- (i) Formation and stabilization of newly accreted char land (ii) Development of forest for timber and fire wood and (iii) Creation of employment opportunity for people living in the coastal area (Saenger, 1987).

Primarily the suitable species for planting in the newly accreted coastal char land were not known to planters. The species planted were mainly keora, baen, gewa, kankra and golpata. Among them keora and baen are the major planting species in the ratio of about 80% and 20% respectively of the existing plantation (Saenger, 1988). Keora and baen have shown good survival and growth in the newly accreted land. The coastal ecosystem is a highly dynamic ecosystem. McChonchie (1990) reported that keora and baen are the pioneer species in the succession. These species need regular inundation for their normal growth and maturity. Due to rapid rise in ground level of keora plantation, the forest floor became unsuitable for second rotation forest. This geomorphological change affected the regeneration, regular inundation in the forest floor and growth of the existing keora plantation. As a result, the growth of keora is stunted and finally gaps were created due to heavy mortality. Due to above causes the raised land became ecologically unsuitable for second rotation keora plantation (Siddiqui, 1986). Hasan (1986) reported that the soil texture varies from silty loam to silty clay loam. pH ranges between 7.5-8.2 and EC (Electric conductivity of soluble salts) varies from 2.5 to 12.00 mmhos/cm in dry season in the raised land of the coastal area. The raised land areas were occasionally inundated only by high tides during monsoon. This raised area was generally



covered with some herbs and shrubs like *Darris trifoliata*, *Dalbergia spinosa*, *Acanthus tilliaceus*, *Acrostichum aureum*, *Hibiscus tilliaceus* and *Imperata cylindrica*.

The raised lands are available in the existing keora plantation. Except in the monsoon these raised lands are not inundated by the tidal water. Siddiqi (1994) reported these raised land are submerged during the spring tide for a short period (2-4 hours). Due to lack of regular inundation the area lost the favourable condition for growth and yield of mangrove species. So it was necessary to cover the area by non mangrove species (Imam, 1982). Recently, large scale stem borer attack (about 52%) in keora plantation was observed which needs immediate control measures (Islam *et al.* 1989). Previously Forest Department planted seven non-mangrove species in the raised land but performance of the plantation was not satisfactory due to lack of proper experimental design, tending operations and protection from grazing (Siddiqi *et al.* 1993). Therefore, with suitable statistical design and good number of mesophytic species, a trial was conducted in the raised lands of the western zone of coastal area by Plantation Trial Unit, Bangladesh Forest Research Institute, Banglad, Bangladesh.

## MATERIALS AND METHODS

The mesophytic species namely raintree, jhaw, sada koroi, kala koroi, sissoo, pyra, ipil-ipil, jam, soan boloi, karanja, babla, mehagoni and jarul were included in the elimination trial in two locations (Table 1). These species are generally growing in the low lying area of the coastal village. Seeds were collected from phenotypically superior trees during January-April. The polybags of 15×23 cm were filled with a mixture of soil and cowdung in 3:1 ratio respectively. The polybags were arranged in a bed of size 1.2×12.0 m. To protect the seedlings from sun and heavy rain a thatched shed was provided on the nursery bed. Manuring and watering were done regularly. The seedlings were kept in the nursery before out planting in the field. The trials were located at Rangabali and Kukri-mukri Research

Ranges (Map-I). The site preparation was done by jungle cutting, burning and removal of debris. The planting pits were prepared and the experimental areas were fenced to protect the plants from grazing. The age of the seedlings was 10 months and height was 50 to 100 cm at the time of outplanting. The seedlings were transferred from nursery to planting sites by a country boat. The experiments were laid out in RCB design with three replications at two locations of Rangabali and Kukri-mukri Research Range. The seedlings were outplanted at 1.2×1.2 m spacing in an area of 40×128 m at each of the two locations during the month of July-August, 1991 and 1992. Stakes were provided to the seedlings to hold the plants in erect position. Scheduled weeding and cleaning, climber removal and fertilizer application was done. The experimental plots were visited two times in a year. The data on plant survival, height and diameter were recorded during 1996.

## RESULTS AND DISCUSSIONS

Elimination trials with eleven indigenous mesophytic species were carried out in Rangabali and Kukri-mukri island of Patuakhali and Bhola Coastal Afforestation Division during 1991 and 1992. But the experimental plots of 1991 were damaged by cyclone. However, the data on survival, height and diameter growth of the outplanted seedlings was collected from the experimental plot of 1992. Table 1, showed the survival percent, height and diameter growth of eleven mesophytic species viz. jhaw, babla, raintree, payra, sada koroi, soan boloi, kala koroi, jam, ipil-ipil, sissoo and karanja.

The results of height and diameter growth data revealed that jhaw and babla are the most promising species followed by raintree, sada koroi, soan boloi and payra. Whereas jam, kala koroi, ipil-ipil, sissoo and karanja showed poor performance in Rangabali location. Average survival, height and diameter growth of each species is also graphically represented in Fig.1, 2 & 3.

At kukri-mukri location, babla, raintree, payra, kala koroi, sissoo and jam showed the best performance. The remaining species showed poor



performance (Fig.4, 5 and 6).

Siddiqi (1994) reported that the deer was introduced in Kukri-mikri island. So deer browsing affected the natural growth of the experimental plot in Kukri-mukri-mukri location.

## CONCLUSIONS

Besides other objectives the main objective is the protection and maintenance of a permanent mangrove plantation along the coastal belt of Bangladesh. Creation of gap in the coastal plantation could be overcome by planting indigenous mesophytic species like jhaw, sada koroi, soan boloi, payra and jam. So, introduction of non-mangrove species is likely to offer sustained yield and a way to maintain sustainable forest in coastal belt of Bangladesh.

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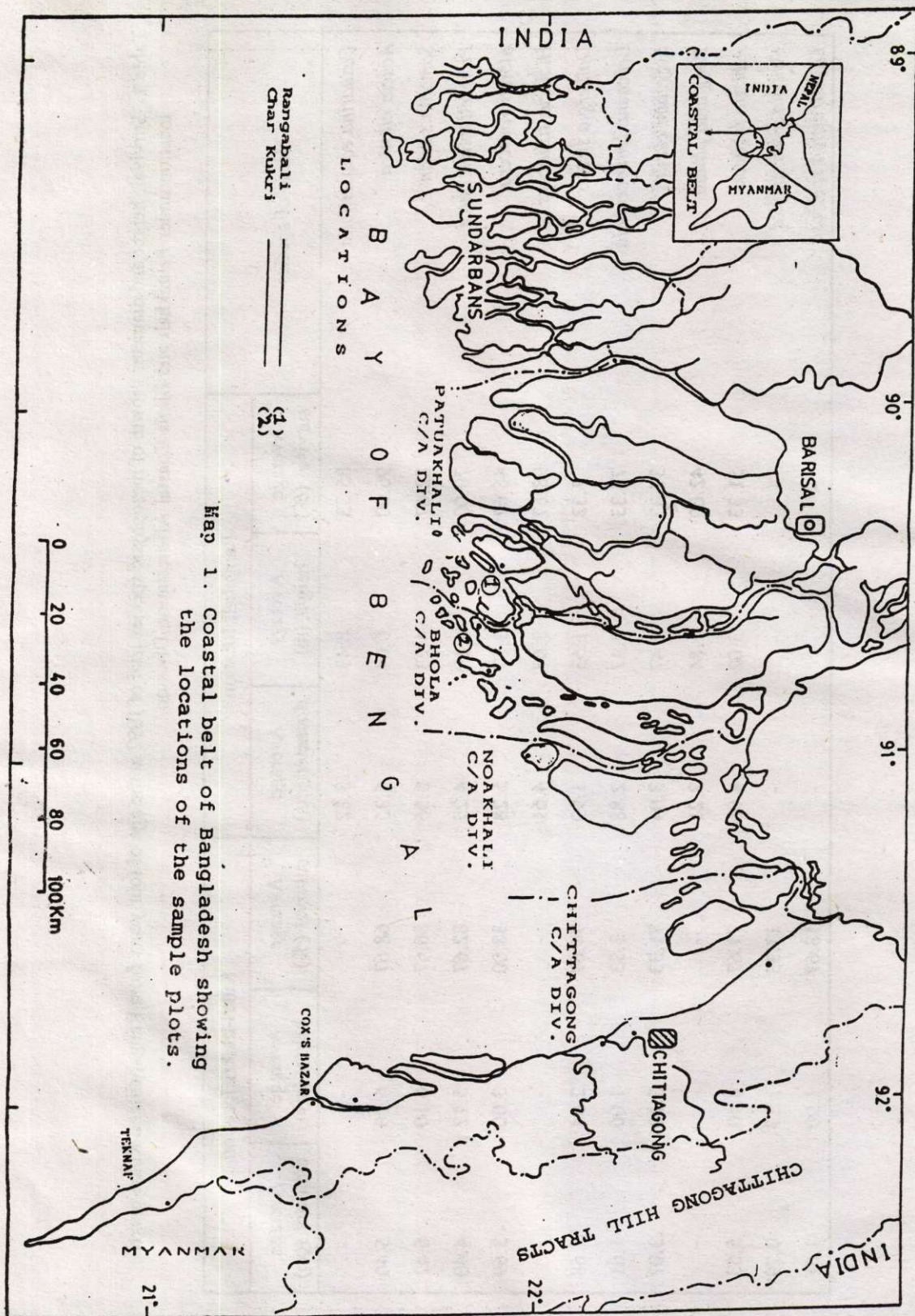
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Table 1. Survival, height and diameter growth of mesophytic species trial of 1992 at the age of four years from Rangabali and Kukri-mukri location under Patuakhali and Bhola Coastal Afforestation Division

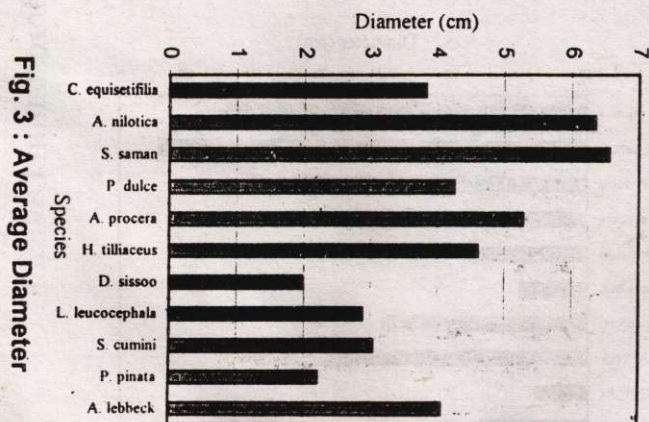
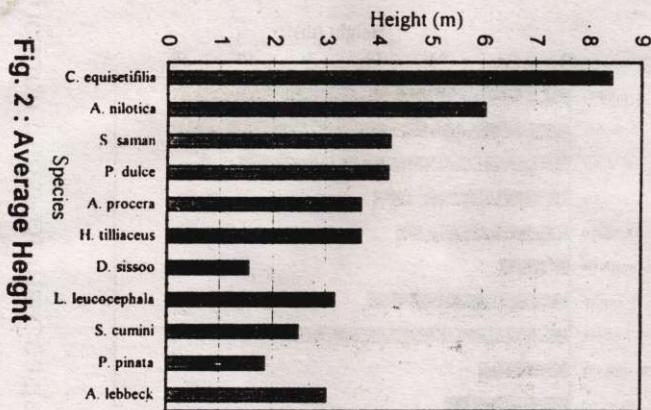
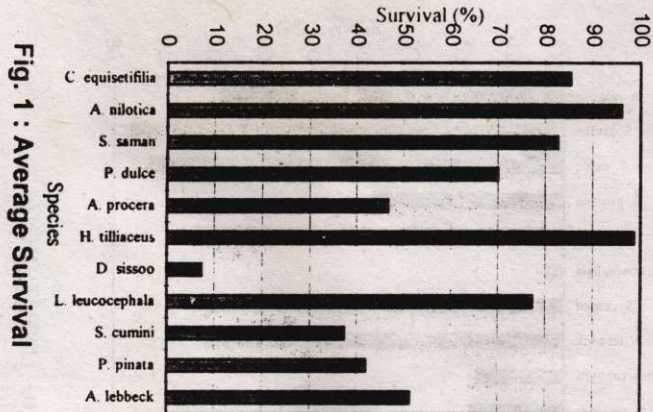
Name of species	Rangabali location			Kukri-mukri location		
	Average survival (%)	Average height (m)	Average diameter (cm)	Average survival (%)	Average height (m)	Average diameter (cm)
<i>Casuarina equisetifolia</i>	85.33	8.43	3.82	-	-	-
<i>Acacia nilotica</i>	96.00	6.04	6.35	68.67	6.10	5.40
<i>Samanea saman</i>	82.67	4.23	6.56	86.67	6.10	6.42
<i>Pineteclobium dulce</i>	70.00	4.19	4.25	82.67	5.12	4.40
<i>Albizia procera</i>	46.67	3.67	5.28	38.00	3.00	3.69
<i>Hibiscus tiliaceus</i>	98.67	3.67	4.61	-	-	-
<i>Dalbergia sissoo</i>	7.33	1.53	1.99	74.67	2.64	1.68
<i>Leucaena leucocephala</i>	77.33	3.17	2.88	3.33	1.06	1.01
<i>Syzygium cumini</i>	37.33	2.47	3.04	71.33	3.10	3.07
<i>Pongamia pinata</i>	42.00	1.84	2.21	-	-	-
<i>Albizia lebeck</i>	51.33	3.02	4.06	71.67	4.40	5.53
<i>Swietenia macrophylla</i>	-	-	-	17.33	1.37	0.79
<i>Lagerstroemia speciosa</i>	-	-	-	18.67	1.90	1.61







Survival, height and diameter growth of mesophytic species trial 1992 at the age of four years  
from Rangabali location under Patuakhali Coastal Afforestation Division





Survival, height and diameter growth of mesophytic species trial 1992 at the age of four years  
from Kukri-mukri location under Bhola Coastal Afforestation Division

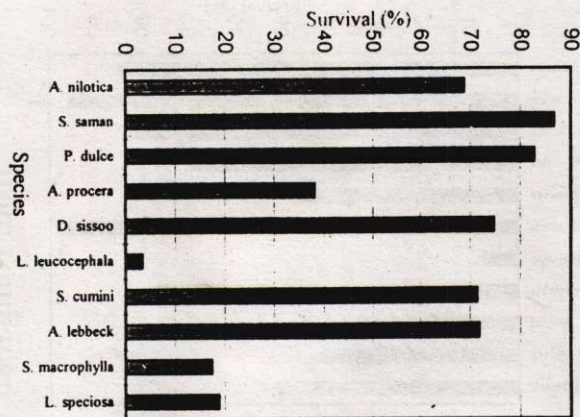


Fig. 4 : Average Survival

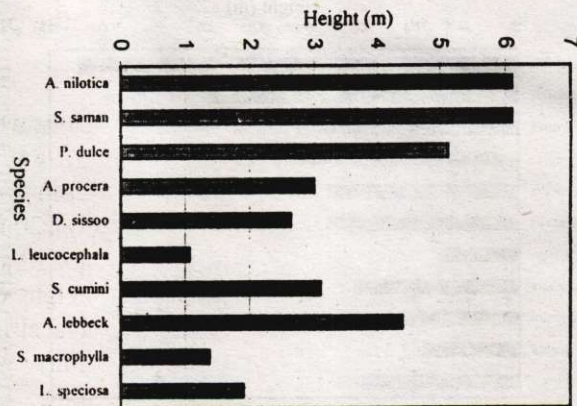


Fig. 5 : Average Height

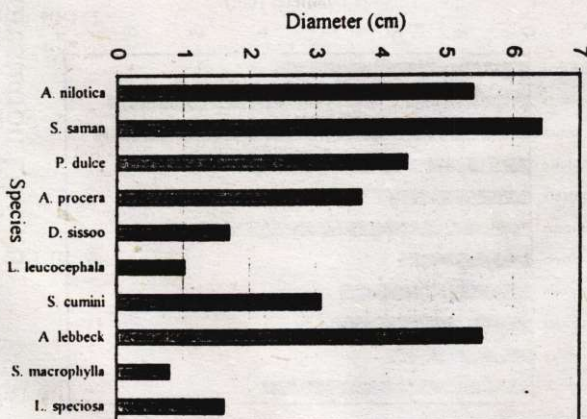


Fig. 6 : Average Daimeter