

# PRELIMINARY TRIAL OF MANGROVE AND MAINLAND SPECIES IN THE SUNDARBAN HIGHLANDS

N. A. Siddiqi

## ABSTRACT

A trial with five mangrove species namely, *Heritiera fomes*, *Excoecaria agallocha*, *Sonneratia apetala*, *Avicennia officinalis* and *Bruguiera gymnorrhiza* and six mainland species namely, *Albizia lebbeck*, *Samanea saman*, *Swietenia macrophylla*, *Leucaena leucocephala*, *Cassia siamea* and *Acacia nilotica* was carried out in a raised non-commercial cover area of the sundarbans to observe their survival and growth performance. The mangrove species were found to be unsuitable. Animal damage was substantial to mainland species and fencing had significant impact on survivality, except for *A. nilotica*. *C. siamea*, *S. saman* and *A. nilotica* showed better performance than other species.

## INTRODUCTION

The Sundarbans mangrove forest within Bangladesh territory is managed under selection system with natural regeneration (Chowdhury 1968; Khattak 1979). A large part of the forest is unproductive. There are non-commercial cover (N. C. C.) as well as barren areas. Seven percent of the area was devoid of forest cover (Anon. 1960). Another report (Anon. 1985), however, states this figure to be 2%.

N. C. C. areas are composed of raised lands or depressions which have become unsuitable for natural regeneration with mangrove species. Consequently, there are potentialities for improvement of the land

area by raising plantations (Imam 1982). About 825 ha of N. C. C. land was planted with mangrove and mainland species during 1975-1980 (Habib 1982). Survival performance of the species was generally unsatisfactory. However, some Babla, Mahagony and Koroi plants along the raised banks of the canal survived and in some places showed satisfactory growth performance. The project was subsequently dropped.

The Mangrove Silviculture Division of the Bangladesh Forest Research Institute started raising plantations on experimental

---

N. A. Siddiqi, Senior Research Officer, Mangrove Silviculture Division, Khulna, Bangladesh

basis with mainland and mangrove species since 1980. As regards mainland trees, a good number of exotic (*Eucalyptus* and *Casuarina* Spp.) and indigenous species were tried but with poor results. Plantations were raised in areas without fencing. The main cause of plantation failure was due to browsing by deer.

The present paper deals with a trial conducted in 1982 with five mangrove and six mainland species to observe their survival and growth performances in fenced and unfenced areas at Marabogi of compartment No. 1 in the north eastern part of the Sundarbans.

## MATERIALS AND METHODS

The site selected was a relatively raised land in the slightly saline zone of the Sundarbans. In the rainy season, it remained inundated during high tides but in the dry season, it remained above the high tide level. The site was located beside the Baleswar river. The soil was silty-clay-loam in the surface, pH varying between 7 and 8 (Davidson 1985a). Maximum salinity during the dry season was 2 m mhos/cm (Hassan 1984).

The mangrove species tried were Sundri, (*Heritiera fomes* Buch-Ham.), Gewa (*Excoecaria agallocha* Linn.), Keora (*Sonneratia apetala* Buch.-Ham.), Baen (*Avicennia officinalis* Linn.) and Kankra (*Bruguiera gymnorrhiza* (L.) Lamk.). The mainland species included Koroi (*Albizia lebbeck* (Linn.) Benth.), Raintree (*Samanea saman* (Jacq.) Merr.), Mahagony (*Swietenia macrophylla* King.), Ipil Ipil (*Lecaena leucocephala* (Lamk.) deWit), Minjiri (*Cassia siamea* Lamk.) and Babla (*Acacia nilotica* (Linn.) Willd. ex Del.)

The site was burnt and cleared before planting. The experiment was independently laid out for mangrove and mainland species in fence and unfenced areas in Randomised Complete Block Design. For mangrove species there were four blocks with five treatments (species) in 20 plots. For mainland species there were three blocks with six treatments in 18 plots. In both the cases block-I was the nearest to and block-III or IV was the farthest from the canal bank. The size of the plots for fenced areas was 16.5 m x 40.25 m. Each of these was planted with 2000 seedlings at 1.8 m x 1.8 m spacing. Mangrove seedlings were raised in nursery beds while mainland seedlings were raised in polybags. The size of the plots in the unfenced areas was smaller with 100 seedlings per plot.

Planting was carried out during August, 1982. Three weedings were done in the first year and two weedings subsequently. Data on survival and growth were collected at three month intervals. Final collection of data on survival, height growth and diameter increment of mainland species was made at the age of 39 months.

## RESULTS AND DISCUSSION

### Mangrove Species

Initially, the mangrove species showed good survivality. Data recorded after three months showed mean survival of 39.7% for Sundri, 52.8% for Gewa, 73.8% for Kankra, 62.4% for Baen and 0% for Keora in fenced area. The survivality in unfenced was 40.7, 39.6, 65.2, 26.4 and 0% respectively. However, during the next six months, i. e., between January and June, all the seedlings died naturally. A probable

cause may be that the land was not ecologically suitable for these species.

#### Mainland Species :

Most of the plants in unfenced areas were destroyed by browsing mainly by deer. Only 1% of Koroi, 2% Raintree, 17% Minjiri and 23% Babla survived at the time of final recording of data (Table 1). Survival performance of plants in fenced area was better. The difference between fenced and unfenced areas in respect of survivality was highly significant for Koroi, Raintree and Minjiri. However, this difference for Babla was insignificant.

In the fenced areas, the survivality of Koroi, Raintree, Mahagony, Ipil-Ipil, Minjiri and Babla was 33, 53, 23, 18, 58 and 37 per cent respectively (Table 1). The difference was found to be insignificant (Table 3). Mean heights of Koroi, Raintree, Mahagony, Ipil Ipil, Minjiri and Babla were 4.59, 5.74, 2.47, 5.18, 6.42 and 4.31 m respectively (Table 2). The difference was found

to be insignificant (Table 3). The difference among the blocks was significant. Mean height of the trees in the block by the side of the canal was higher. The diameters at breast height (1.3 m from ground) for Koroi, Raintree, Mahagony, Ipil-Ipil, Minjiri and Babla were 5.8, 9.2, 2.8, 6.0, 11.6 and 6.1 cm respectively (Table 2). The difference was insignificant (Table 3).

It is apparent from the data that Minjiri marked best performance in respect of survival, height growth and diameter increment followed by Raintree and Babla. However, this could not be established statistically, because these parameters for different plots of individual treatment were highly variable, apparently due to physical differences between the sites. All plots were not identical in site conditions.

Mangrove species proved unsuitable for raised N. C. C. areas. From the trial no mainland species can yet be recommended for large scale plantation. Slight variations in sites are influencing the

Table 1. Survival percentage of mainland species at Morabogi, compartment 1 in the Sundarbans

Species	Fenced area				Unfenced area				
	I	II	III	Mean	I	II	III	Mean	
Koroi	48	22	30	33	3	0	0	1	
Raintree	63	56	42	53	5	0	0	2	
Mahagony	21	30	18	23	0	0	0	0	
Ipil Ipil	43	9	2	18	0	0	0	0	
Minjiri	81	38	55	58	50	2	0	17	
Babla	15	66	25	37	27	13	30	23	

Table 2. Height growth and diameter increments of 39 months old mainland plantation at Morabogi, compartment 1 in the Sundarbans

Species	Height (m)				Diameter (cm)			
	I	II	Block III	Mean	I	II	Block III	Mean
Koroi	5.92	3.20	4.66	4.59	6.9	4.6	6.0	5.8
Raintree	7.81	6.03	3.67	5.74	11.2	10.6	6.0	9.2
Mahagony	3.56	2.67	1.19	2.47	4.1	3.0	1.3	2.8
Ipil Ipil	8.19	4.40	2.95	5.18	11.8	3.0	3.3	6.0
Minjiri	8.89	3.29	7.09	6.42	14.7	5.3	14.9	11.6
Babla	3.81	5.18	3.94	4.31	5.4	7.0	6.0	6.1

survivality and growth performances of trees. The experiment should, therefore, be conducted at different places in order to select species which have got higher tolerance limits in the prevailing ecological conditions of the Sundarbans.

Of the six species planted, Minjiri, Raintree and Babla deserve further investigation. Minjiri showed best survival and growth performance followed by Raintree and Babla. Further trials with these and other species need to be conducted at various sites to bring the N. C. C. area under forest cover by mainland species. Sundri and Gewa attained a mean height of 55 cm and 23 cm respectively in 42 months in the vicinity of mainland plantation (Siddiqi unpub. data). Against this Minjiri, Raintree and Babla attained a mean height of 6.42, 5.73 and 4.31 m respectively in 39 months.

The main problems, among others, for raising mainland species in the N. C. C. area of the Sundarbans are water logging and animal attack. All the species planted were damaged by animals mainly deer, to

varying extent. Deer sometimes managed entrance even in the fenced areas. Rodents caused considerable damage to Koroi by cutting the collar of the seedlings.

Porcupine caused a lot of damage to Koroi. Monkeys were found to damage shoot portion of the seedlings. Davidson (1985b) reported shoot-tip borer damage of Mahagony. It is, fortunate that a significant difference in respect of survivality of Babla was not found between fenced and unfenced areas.

Fencing is expensive and therefore un-economic. Besides, fencing also could not protect the trees from attack of various animals. All the species were sensitive to water logging which is indicated by their better growth performance with increasing elevation of the ground (Fig. 1). It is, therefore, imperative to carry out research for finding out economic species which are considerably immune to animal attacks and can withstand water logging, at least, during the rainy season.

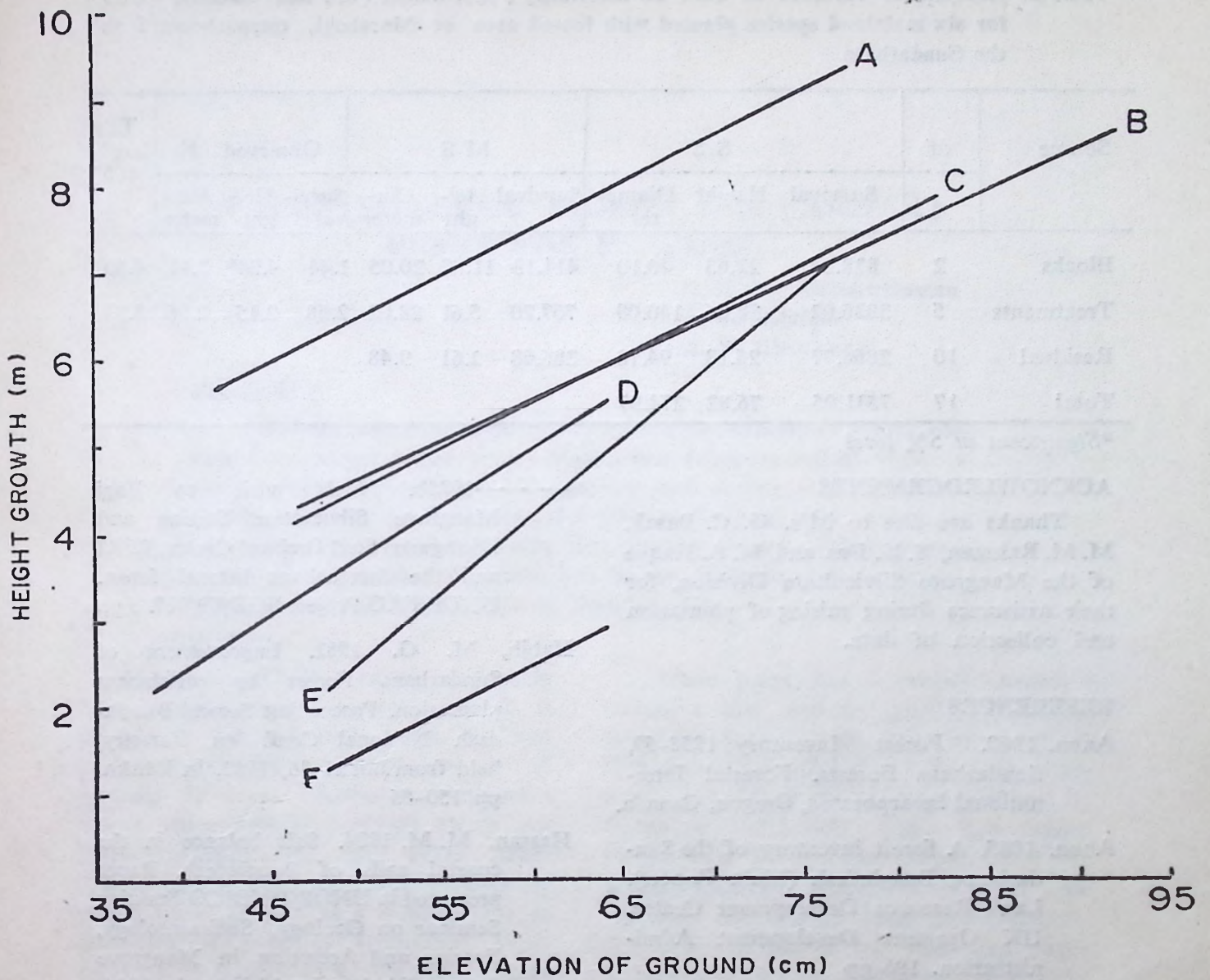


Fig-1. Relationship between height growth and elevation of ground in relation to water level of river during high tide in winter for six mainland species planted at Morabogi, compartment 1 in the sunderbans.

A-Minjiri ; B-Ipil Ipil ; C-Raintree ; D-Babla ;  
E-Koroi ; F-Mahagony

**Table 3. Analysis of variance of data on survivality (%), height (m) and diameter (cm) for six mainland species planted with fenced area at Morabogi, compartment 1 in the Sundarbans**

Source	df	S S			M S			Observed F			Tabulated F at 5%
		Survival	Height	Diameter	Survival	Height	Diameter	Survival	Height	Diameter	
Blocks	2	828.26	22.63	40.10	414.13	11.32	20.05	1.44	4.34*	2.11	4.10
Treatments	5	3836.02	28.06	140.09	767.20	5.61	28.02	2.68	2.15	2.96	3.33
Residual	10	2866.77	26.13	94.78	286.68	2.61	9.48				
Total	17	7531.05	76.82	274.97							

\*Significant at 5% level

#### ACKNOWLEDGEMENTS

Thanks are due to M/s. G. C. Basak, M. M. Rahman, S. K. Das and M. A. Haque of the Mangrove Silviculture Division, for their assistance during raising of plantation and collection of data.

#### REFERENCES

- Anon. 1960. Forest Inventory 1958-59, Sundarbans Forests. Forestal International Incorporated, Oregon, Canada.
- Anon. 1985. A forest inventory of the Sundarbans, Bangladesh (Main Report). Land Resource Development Centre. UK Overseas Development Administration. 196 pp
- Choudhury, A. M. 1968. Working Plan of the Sundarbans Forest Division for the period 1960-61 to 1979-80. Govt. Press, Dhaka. 78 pp
- Davidson, J. 1985a. Trees for People: What to plant and where to plant in Bangladesh. UNDP/FAO Project BGD/79/017. 60 pp
- 1985b. Field visit to Bogi Mangrove Silviculture Station and Dhangmari Seed Orchard Centre, BFRI and the Sundarbans littoral forest. UNDP/FAO Project BGD/79/017. 5 pp
- Habib, M. G. 1982. Improvement of Sundarbans Forest by enrichment plantation. Proceeding Second Bangladesh National Conf. on Forestry, held from Jan 21-26, 1982, in Dhaka. pp 150-55
- Hassan, M. M. 1984. Salt balance in the coastal soils of Bangladesh. Paper presented in UNDP/UNESCO Training Seminar on Geology, Sedimentology, Erosion and Accretion in Mangrove Areas, Dhaka, Jan 14-Feb 5, 1984, 9 pp
- Imam, S. A. 1982. The Sundarbans and its future. Proceedings Second Bangladesh National Conference on Forestry, Dhaka, Jan 21-26, 1982 pp 150-155
- Khattak, G. M. 1979. History of Forest Management in Bangladesh. Pakistan Journal of Forestry. 29(3) : 121-128