

PRELIMINARY STUDIES ON THE GROWTH AND YIELD OF ALBIZIA FALCATARIA

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SUMMARY

Albizia falcataria Fosberg is a fast-growing exotic tree species. It was introduced into Bangladesh as a shade tree in the tea gardens. Diameter-height, age-diameter, age-height relationships and the growth pattern of the species have been investigated. At the end of the 8th year the MAI has been found to average about 31.0 m³/ha. The total merchantable wood yield, excluding the branch wood and brush wood (5 cm top dia), at the end of 8th year has been found to be 248 m³/ha. Data collected from the Bangladesh Forest Research Institute Campus at Chittagong showed that the MAI was about 33 m³/ha. The total calculated yield from the same site was 402 m³/ha at the end of the 10th growing season. The preliminary growth curves indicate that the rotation-age would be more than 10 years.

INTRODUCTION

A. falcataria Fosberg Syn *Albizia moluccana* Miq. *A. falcata* Buckers, is a large fast-growing tree, indigenous to the Moluccas. From there, it was introduced into Java and then was distributed throughout the Far East including Malaysia, Fiji, Srilanka, Philippines and Africa including Kenya, Nigeria, Rhodesia, Uganda and Zanzibar. It is a branchy tree and has light foliage with a fairly straight bole. The wood is soft and rather light (416 to 464 Kg/m³ air dry) and non durable. It is considered satisfactory for rotary peeling for

packing case veneer, and safety matches. It makes a poor firewood. Paper made by sulphate pulping compares favourably with that made from coniferous kraft pulp and the yield is satisfactory (Streets 1962).

Only a few growth and yield data have been published, based mainly on small sample plots. Troup (1932) reports that *A. moluccana* grows rapidly in the wet zone where the annual rainfall ranges from 1850 mm.

A. falcataria has been introduced to Bangladesh 15 to 20 years back by the Tea planters as shade trees in tea gardens.

In Forest Research Institute, Chittagong 49 trees were planted in the arboretum in 1972 at a spacing of 2.4 x 2.4 m. The species was found to be very suitable for tea-chests and match sticks (Salhuddin 1974) and also for paper (Akhtaruzzaman 1971). Das (1982) indicated its successful introduction in Bangladesh. Considering its growth rate Hossain (1973) started planting *Albizia falcataria* in the Sylhet Forest Division on trial basis.

Large scale planting of the species started in 1974 in the Sylhet Forest Division but no growth data of the species are available in Bangladesh. A preliminary study has, therefore, been made to assess its growth and yield to provide guidelines for management of the plantations.

MATERIALS AND METHODS

Climate : Climate is warm and humid. More specifically it is monsoonic. The period from November to the end of February is fairly cool and pleasant. In March the temperature begins to rise, but heavy rains in May and June prevent the development of extremes of climate.

The range of temperature varies from 30°C during the month of January to 39°C during April. The means of the maximum and the minimum are 18°C and 28.5°C respectively.

The total annual rainfall is above 2500 mm. May to September are the months

of heaviest rainfall. November to February are the dry months.

Humidity is high throughout the year. Maximum relative humidity is 96% and has been recorded during the month of June, July, August and September. During the winter months, when rainfall is low, there are heavy dews and these last until well up to the beginning of summer.

Topography : The general topography of the area is undulated. The sampled area covers flat ground to hillocks of not more than 61m high and covers all aspects.

Soil : The soil is of alluvial origin and is composed of clay and sand in varying proportions depending on the degree of wash which once came from the adjoining hill ranges. Therefore, the soil varies from clay loam on level ground to sandy loam on hilly regions. The sandy loams are very fertile and are deep in the valleys on the lower slopes. However, on the ridge-tops the soils are shallow and dry out quickly.

Vegetation : The original vegetation was Wet Tropical Evergreen Forest, characterised by large numbers of species occurring together. The canopy was irregular. Epiphytes and aroids were common. Climbers were numerous. The undergrowth was sometimes a tangle of canes, bamboos and palms.

PLANTING STOCK

The seeds were collected during Jan/Feb. from the local tea garden where *A. falcataria* of unidentified provenance was introduced 15-20 years back. The seedlings

were raised by sowing seeds in poly bags (15 x 10 cm) during March. Only cowdung was added in the soil of the poly bag in the proportion of 3 : 1. The seedlings became ready for planting by the last week of May and the first week of June.

SILVICULTURE

Site preparation : 1. Clear felling of the area was done by the end of February. The jungle was cut after removal of timber trees. This work was done manually. By first week of April, the areas were burnt. The debris was collected and reburnt by the end of April. No fertilizers or manures were added to the planting holes.

Establishment : The poly bag seedlings were planted in holes. The seedlings were planted at 2.4 x 2.4 m spacing during the first shower in May/June. No replacement was made. No prophylactic treatment was made. No micronutrient was added. During initial stages of establishment some mortality was recorded due to small size of seedling. Weedings and cleanings were made as follow :

1st year ... 4 weedings
2nd year ... 3 weedings
3rd year ... 2 weedings

No weeding was done from 4th year onwards. No serious pathological problem was noted, but Loranthus attacks at the age of 7-8 years were noticed sporadically. No pruning was done and no thinning was carried out.

COLLECTION OF MENSURATIONAL DATA

Variables : Age, diameter and height.

Sampling design : Simple random sampling was made for this study. One sample plot was taken for each year's plantation. The areas of different year's plantation were of different sizes, ranging from 8 to 20 hectares. The area of each sample plot was 20 m x 20 m. The sampling was done from the midpoint of the Northern boundary. The distance from the boundary to the sample plot was located by random number which were taken as chains (1 chain=20.1 m)

Schedule of measurements : The following measurements were taken from each plot in each year's plantation raised from 1974 to 1980 at Lawachara Centre and 1976 to 1980 at Satgaon Centre. The data for 1972 plantation were collected from the plot at the Forest Research Institute Campus, Chittagong.

- (a) Diameter of each alternate tree at 1.3m from the ground level was taken.
- (b) Total height was measured by climbing the tree.
- (c) Diameter at 15 cm above ground level of each tree was also measured.
- (d) Subsequent diameter measurements were taken at suitable intervals of 3m, 2m or 1m. The length of the last log, whenever it was less than a metre, was also measured at a top diameter of 5 cm over bark.

- (c) Diameter measurements of branch wood down to 5 cm at the top were also taken.
- (f) Thickness of bark was taken at two opposite points on the circumference and mean of these was taken as bark thickness.
- (g) About 64 trees were expected to be in each plot.

COMPUTATION OF DATA

The volume of each individual tree was calculated. The timber volume and small wood volume were taken together to calculate the total volume of each tree. The volume equations used was as follows :

$$\text{Volume (O.B.)} = r^2 L = \left(\frac{d}{2}\right)^2 L$$

where, d = diameter at 1.3 m of the stem and L = height of the stem,

After the calculations of individual tree volume, the mean volume of a tree and yield per ha were found for each year. The MAI of each individual tree and per ha was calculated.

Further, the mean diameter and the mean height of stems were calculated for each year's plantation. Calculations of MAI were based on the actual number of stems found growing in the plot. No hypothetical ideal stocking was taken into consideration.

RESULTS AND DISCUSSION

The results summarised in Table 1 and Table 2 reveal that the stocking of the

plantations are very variable. It was also found that the stocking in some younger plantations was less than that of some older ones. It was found from the records that no thinning was carried out in any of the plantations. It can, therefore, be said that the missing trees were eliminated naturally. There is a linear association of diameter increment at 1.3 m with height in both the centres at the end of 8 years. More or less similar trends existed between the mean dia and height with age and the MAI. This indicates that more growth is expected with age after the 10th year. Ideal stocking could not be adopted for the calculation of yield. The yield, therefore, has been calculated on the basis of the actual stocking of the plantation except for the yield at the 10th year which was calculated on the basis of data collected from 23 stems at 2.4 m x 2.4 m spacing, existing in the B. F. R. I. arboretum plot. Therefore, in this case only a hypothetical figure of 618 trees/ha was taken into consideration. A higher MAI was obtained in case of plantations at Lawachera centre as compared to those at Satgaon ; because the number of stems survived more at Lawachara. The results have indicated that the MAI is 31. m³/ha at the end of both years. At BFRI campus MAI was 33.46 m³/ha and at the total yield in 334. 6m/ha at the end of 10 years which is better than MAI 22.9 m³/ha and the total yield 3.29 m³/ha and the total yield 229 m³/ha obtained by Mitchell (1965) in the same aged plantation in the central low lands in Malaysia where the rainfall ranges from 2000 to 5000 mm having a varying degree of soil fertility and texture. Rivella (1974) informs from Philippines that the MAI varies from 15.1 m³/ha at site index 18 to 60.3 m³/ha site index 50

Table 1. Growth and yield of *A. falcataria*

Plantation centre	Age in year	Tree/ha*	Mean Diameter (cm) at 1.3 m	Mean height (m)	Volume m ³ /tree	Volume m ³ /ha.	MAI m ³ /tree	MAI m ³ /ha
Lawachara	2	1181	7.39	8.06	.013	15.35	.007	8.27
	3	1156	10.95	11.42	.027	31.21	.009	10.40
	4	946	15.39	12.91	.064	60.54	.016	15.14
	5	867	15.75	14.53	.092	79.76	.018	15.95
	6	867	17.58	16.76	.136	117.91	.023	19.94
	7	944	20.85	18.08	.202	190.68	.029	27.38
	8	741	22.15	19.22	.335	248.23	.042	31.12
	Satgaon	2	1418	9.02	7.07	.013	18.43	.007
3		1446	9.12	8.95	.028	40.48	.009	13.01
4		709	14.33	16.62	.066	46.79	.016	12.05
5		1181	9.37	7.57	.066	77.95	.013	15.35
6		316	21.74	18.29	.241	76.16	.040	12.64
F. R. I.		10	618	31.75	20.73	.542	334.68	.053

Table 2. Growth and yield of *A. falcataria* (under bark) in metric units

Plantation centre	Age in year	Tree/ha.	Volume m ³ /tree	Volume m ³ /ha	MAI m ³ /tree	MAI m ³ /ha
Lawachara	2	1181	.011	13.22	.006	7.08
	3	1165	.024	28.12	.008	9.25
	4	946	.056	53.31	.014	13.24
	5	867	.082	70.74	.016	13.87
	6	867	.118	102.67	.020	17.34
	7	944	.177	167.07	.025	23.60
	8	941	.292	216.57	.037	27.07
	Satgaon	2	1418	.012	16.37	.006
3		1446	.024	33.26	.008	11.57
4		709	.060	41.64	.013	10.64
5		1181	.060	72.70	.012	14.17
6		316	.222	69.59	.037	11.69
F. R. I.		10	618	.484	296.6	.048

*Initial spacing 2.4 m x 2.4 m.

with a rotation of 15 years. In Indonesia, the MAI varies from 4.8 m³/ha at site quality 1 to 52.8 m³/ha at site quality 4 at a rotational age of 12 years (Anon. 1975). The bark percentage for the trees varies from 10.7 to 17.7 tending to decrease with age. The MAI/ha (Fig. 1) and the MAI/tree (Fig. 2) have been plotted. The latter gives the true picture of the growth rate and the calculation of the physical rotation is derived from this. The MAI/tree curve indicates that the growth may continue beyond 10 years of age, but probably flattens out by about age 12 years. The curve indicates that the physical rotation age would be more than 10 years and should be fixed after a thorough study of future growth patterns, technical factors like end use considerations, economic factors and the incidence of pests and diseases.

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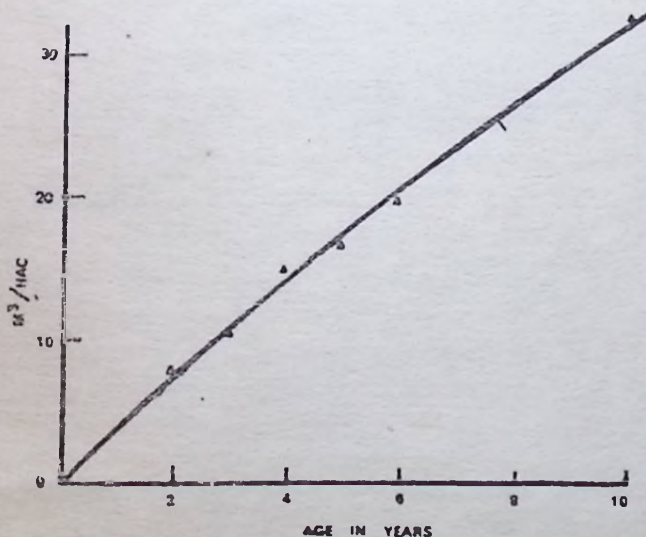


Fig. 1 MAI/Ha

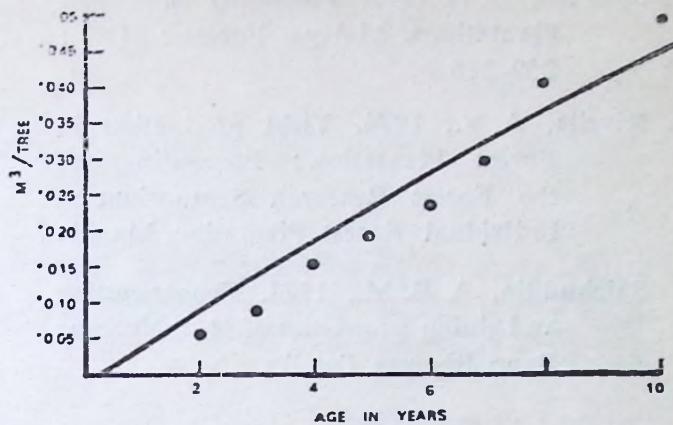


Fig. 2 MAI/Tree

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