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Trial Plantation of Fast Growing Species in Pegu Yoma Forests with Particular Reference to Toungoo Forest Division

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အရှေ့ပိုင်းပဲခူးရိုးမ တောင်ငူတောင်ပိုင်း သစ်တောနယ်အတွင်း အပေါက်မြန်သစ်များ စမ်းသပ်စိုက်ပျိုးခြင်း။

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စာတမ်းအကျဉ်းချုပ်

အရှေ့ပိုင်းပဲခူးရိုးမအတွင်း စမ်းသပ်စိုက်ပျိုးထားသော အဘိုးတန် သစ်များ၏ ကြီးထွားနှုန်းကို တင်ပြထားခြင်း ဖြစ်ပါသည်။ ယခုအခြေအနေအရ အရှေ့ပဲခူးရိုးမတွင် ကျွန်း၊ ရေမနေ၊ မအူလက်တံရှည် များသည် ပေါက်ရောက်နှုန်း ကောင်းပါသည်။ စိုက်ပျိုးသောပျိုးပင်များ၏ ခွက်အရွယ်အစားများ နှိုင်းယှဉ်ချက်လည်း တင်ပြထားပါသည်။ တောကို အပြောင်ခုတ်ခြင်း၊ မီးရှို့ခြင်း မပြုဘဲလိုင်းအလိုက် ကွက်လပ်များတွင် စိုက်ထားသော ကျွန်းပင်များ၏ ရှင်သန်မှုကိုလည်း တင်ပြထားပါသည်။

Trial Planting of Fast Growing Species in Pegu Yoma Forests with Particular Reference to Taungoo Forest Division

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Abstract

Fourteen species of valuable tree species were put on trial in East Pegu Yoma Forest. The most significant of growth are found in teak (*Tectona grandis* Linn), Yemane (*Gmelina arborea* Roxb), Ma-U-Lettan -She (*Anthocephalus cadamba* Miq), Result of growth of teak I different sizes of container and result of enrichment planting is also discussed.

Introduction

Consumption of wood has increased as the population of Burma increases at rate of 2.2%. In parts of our natural forests consider-able proportions of the forests have low stocking of valuable species. In due time it is hoped that a changing pattern of use and improvements in technology will lead to a solution of the problems of utilizing the greater part of the so-called secondary species. However, it is essential that production of primary species be maintained at high levels for domestic and export use.

An unfortunate factor in the management of natural forests is the common widespread problem of chieving a worthwhile increase in out put and productivity in a few decades or even in a full rotation. Growth response and regeneration are often disappointing; usually too little is known about the possibilities of inducing regeneration. Where the unit area of land is important and much of the accessible forest area has been exploited there is an abvious incentive to establish plantations of trees.

For that purpose, much information is needed on the silvicultural characteristics of indigenous commercially valuable species; trial planting of some of the priority listed species is imperative. The basic objective of production forestry is the provision of an improved supply of raw materials to both domestic and foreign demand.

Forest in which the proportion of the more valuable species is too low naturally or through exploitation, and natural regeneration is poor, an intensive form of artificial regeneration by planting is sometimes applied under the term enrichment.

The gap planting, group planting, strip planting, differential planting and other methods of planting are synonymous to enrichment planting and aim at improving the natural forest by planting valuable species at widely spaced intervals. Silvicultural practice in Burma is a selection system which has been adopted more than a century ago. Under the selection system regeneration is theoretically in continuos progress throughout the forest. Regeneration is expected to fill the gaps., but this has not been observed, especially with teak. Enumeration of teak stock indicates a decline in exploitable volume of timber and growing stock. As a mean of replenish our exploited. Forest, artificial regeneration by taungya method has been practiced. The method has advantages but it has more disadvantages for the following reasons:

(1) Erosion problems;
(2) Limited suitable sites;
(3) Labour problems;
(4) Wastage of timber (Slash and burn);
(5) Cost.

On the otherhand, as reported by Duncun Poore (1976) the consequences of removal of Tropical Moist Forests is unimaginable and may be summerised as follows;

(1) Modification of climate;
(2) Biological consequences;
(3) Consequences to the indigenous forest people;
(4) Other Bio-cultual consequences;
(5) Consequences for soil and water.

Considering these facts the endeavor to replenish the Tropical Moist Forests by enrichment planting is worth a trial.

The experiments conducted were trial of teak planting technique, mixed planting of commercial important species, and enrichment planting.

Methods and Materials

Study 1. Container tests.

The following 4 size of containers were tested to determine the development of teak seedlings and also for planting in the field.

Code No.	Size (inches) Orifice diameter	Length	Ratio
01 PT	1.0	4.0	0.056
02 PT	1.5	4.5	0.167
03 PT	2.0	3.5	0.2
(04 plastic bag)	2.5	6.0	1.0

PT = Portable and semi - durable tubes.

Teak seeds were germinated on the Seed bed and after a pair of leaves developed the seedlings were transferred to different containers. The soil mixture of two parts forest top soil, one part manure and one part sand were used for seedling production. The seedlings were planted in the field from the end of June to the first week of May.

A degraded bamboo forest was chosen for planting by taungya method. The seedlings were measured before planting. 5 blocks were chosen for trial. In each block 4 treatments were randomly allocated.

Enrichment planting

Enrichment planting of teak was done in Moist Deciduous Forests where there were gaps devoid of natural regeneration. After the removal of commercial species, the brushwood cutting and canopy lifting were done. A light burning was run through the plot.

15 foot strip spaced at 40 feet were form in an acre plot having 132 trees spaced out at 6' x 6'. The closed spacing was adopted for choice better trees in thinning.

Seedlings were raised in nursery bed and out planted after the seedlings were 1'.6" high.

Cleaning and weeding in the strip was done 3 times in the first. 2 times in second and one in the third year after planting. Fire protection was maintained throughout the trial.

Mixed planting

Mixed planting of Teak, Pyinkado, and Padauk was tried in Moist upper mixed Deciduous forest in Kaboung Reserve Forests, Compartment 220. Two pattern of planting was adopted. One was by Block planting and another was row planting. The seedlings were raised in nursery bed and after the seedlings were 1 feet high they were out planted in the field. Survival Count was done after 6 months of planting. The growth of all the species was measured after 3 years of planting.

Further observation of Fertilizer treatment

9 treatments of Nitrogen and Phosphorus source were tried in Moist Upper Mixed Deciduous Forests in Kaboung Reserve, Compertment 221 (Saw C.Doo ., F.R.I. Leaflet No. 12/80-81). The results of the treatrment was again observed after 2 years. Both the height and girth at 1 feet was measured for further analysis.

Trial planting of Valuable species

Trial planting of fast growing species were conducted in Kaboung Reserve, Compartment 220 and 221. The type of forests was an Upper Mixed Deciduous Forests. Taungya method was adopted in the trial. Uniform seedlings which attained height of 18 inches were used for the Trial planting. Randomized Block design was adopted. An 80 x 80 foot plots were randomly selected and allocated for planting of Teak, Yemane and Ma-U-lettan-she. During the course of trial weeding, fire protection and measuring of the growth of the trees were observed.

Results and Discussions

Table 1. Statistically Analysis of different size of Containers of Teak planted in degrade bamboo forest area

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Containers	Means	Combination	Statistic
01	11.05	01 Vs 02	2.818**
02	9.15	01 Vs 03	1.494
03	10.15	01 Vs 04	6.004**
04	8.70		

** Significance at 1 % level.

From the above Table (1) it could be expressed that there were difference in height growth between each container used. However container 01 and 03 did not show significance difference between eachother, particularly for 01 and 03. Container 02 and 04 has no significance different in height growth. In this case, container 04 has the least advantage in planting out in the field. Container 03 proved to be the most suitable container for field application as it has a volume ratio of 0.2 compared to 1.0 of container 04.

Enrichment planting

Three year old Teak planted in 15' strip spaced out at 40" interval demonstrated an average height of 16 feet, on the Eastern and 15 feet on the Western aspect. Along the ridge the average height was also 15 feet. There was no significant different between the location of Site. Although the enrichment planting has a certain advantages it seems that the growth of teak was much slower than teak planted by taungya method which has an average height of 25 feet after three year.

As teak a light demander species it needs an open space for growth. In enrichment planting the opening was sometimes hinder by a large crown in the vacinity of the planting strip. This hindrance may be the cause for the slow growth of teak planted in strip.

Pattern of Mixed Planting of Teak, Pyinkado and Padauk

K_{19}	Po	Pd_{12}	K_{18}	Po	Pd_{17}	K_{20}	Po_{5}	Pd_{14}
K_{18}	Po	Pd	K_{24}	Po_{13}	Pd_{17}	K_{20}	Po_{5}	Pd_{16}
K_{20}	Po_{12}	Pd	K_{24}	Po	Pd_{18}	K_{20}	Po_{13}	Pd_{18}
K_{18}	Po_{12}	Pd_{16}	K_{22}	Po	Pd_{15}	K_{20}	Po	Pd
K_{23}	Po_{10}	Pd_{16}	K_{22}	Po	Pd	K_{21}	Po	Pd_{15}
K_{22}	Po_{8}	Pd	K_{19}	Po_{16}	Pd_{11}	K_{19}	Po_{13}	Pd
K_{20}	Po_{11}	Pd_{7}	K_{21}	Po_{13}	Pd_{20}	K_{20}	Po	Pd_{15}
K_{24}	Po_{8}	Pd	K_{17}	Po	Pd_{15}	K_{20}	Po	Pd
K_{22}	Po_{5}	Pd_{17}	K_{19}	Po	Pd	K_{18}	Po	Pd_{12}

K_{29}	Po	Pd	K_{32}	Po	Pd_{16}	K_{28}	Po_{10}	-
Po_{10}	Pd	K_{28}	Po_{10}	Pd_{13}	K_{30}	Po_{16}	Pd_{20}	K_{22}
Pd_{13}	K_{30}	Po	Pd_{20}	K_{30}	Po_{14}	Pd_{15}	K_{27}	Po
K_{30}	Po_{10}	Pd	K_{27}	Po_{19}	Pd_{15}	K_{31}	Po_{10}	Pd_{15}
Po_{18}	Pd_{17}	K_{27}	Po_{14}	Pd_{13}	K_{30}	Po_{14}	Pd_{20}	K_{21}
Pd_{14}	K_{15}	Po_{16}	Pd_{15}	K_{27}	Po_{19}	Pd_{18}	K_{21}	Po
K_{25}	Po_{9}	Pd_{10}	K_{25}	Po	Pd_{18}	K_{22}	Po	-
Po	Pd_{10}	K_{21}	Po	Pd	K_{21}	Po_{8}	Pd_{15}	K_{15}
Pd_{16}	K_{18}	Po_{11}	Pd_{13}	K_{20}	Po	Pd	K_{20}	Po

K = Teak
Po = Pyinkado
Pd = Padauk

The number indicates the height of the tree.

Figure 1. Teak experimental plots, Kaboung Reserve, Compartment 221. Average height 25 feet.

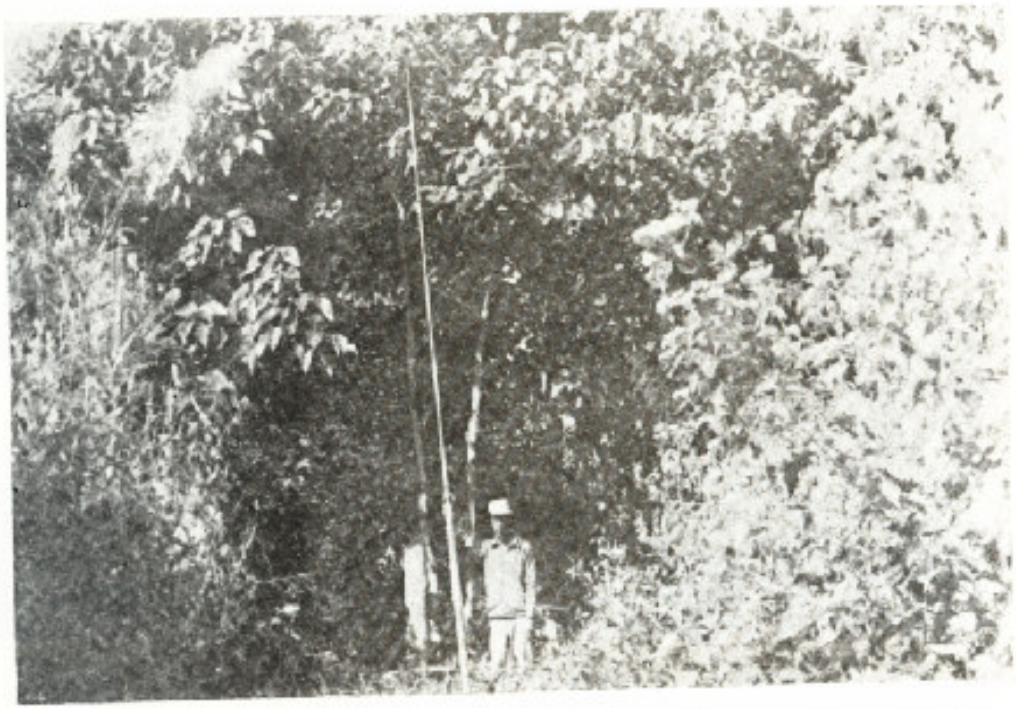

Figure 2. Yemane experimental plots, Kaboung Reserve, Compartment 220. Average height 25 feet.

Figure 3. Ma-U-lettan-she experimental plots. Kaboung Reserve, Compartment 220. Average height 25 feet.

Figure 4. Ma-U-lettan-she experimental plots. Kaboung Reserve, Compartment 220. Average height 25 feet.

Mixed planting

After there years of the trials, the survival percent of the mixed planting for Teak was 100 % Pyinkado 51 % and Padauk 66% respectively. The average height were Teak 20 feet, Pyinkado 10 feet and padauk 15 feet respectively in the first pattern.

In the second pattern survival percent were Teak 100 % Pyinkado 59 % and Padauk 77 % respectively. The average height were Teak 25 feet, Pyinkado 13 feet and Padauk 15 feet respectively.

It was demonstrated that Teak was the most dominant tree in the trial followed by Padauk and Pyinkado. The survival percent of Pyinkado was far less than Teak. This demonstrated that Pyinkado was much growing trees, which in turn was dominated by Teak and Padauk.

Further observation of Fertilizer treatment

According to Table (2)m and (3). There was a significant different of height and girth of two year old teak treated with 1 oz of Urea and 2 oz of Phosphate per tree. Although there were no other significant different growth in other treatment, the plots treated with fertilizers were better than control plots. The response of teak was very much in line with teak reported in the previous Fertilizer experiment (Saw C. Doo, 1982, FRI Leaflet No. 12.).

In the trial, there was a significant different between Blocks. These may be due to site quality between blocks. As the quality of forest area varies from place a micro-site becomes important to be observed in all the experiments.

Table 2. The Mean Height of Two Year Old Teak Treated With Urea and Super- Phosphate.

Block Treatment N/P	Block I	Block II	Block III
00	14.04	15.98	15. 04
01	13.28	16.64	17.36
02	17.68	16.72	16.72
10	12.78	19.48	16.7
11	10.54	17.9	19.2
12	18.06	20.2	20.1
20	15.96	17.9	16.68
21	9.16	16.32	16.2
22	13.86	18.36	19.2

Table 3. The Mean Girth (AT 1 Foot) of Two Year Old Teak Treated With Urea and Super-Phosphate.

Block Treatment N/P	Block I	Block II	Block III
00	7.76	9.32	8.76
01	8.02	9.68	9.52
02	10.2	9.68	8.92
10	7.96	10.32	9.12
11	6.04	10.32	9.92
12	9.56	11.2	11.84
20	8.68	9.4	9.73
21	6.68	9.2	9.96
22	7.92	10.28	11.56

Trial planting of fast growing species

In figure (4) it was demonstrated that the growth of teak on slope was better than those on the ridge top. This may be due to the fact that site quality on slope was better than those on the ridge. However, in figure (5) there was no significant of growth of Yemane on slope as well as on ridge top.

In all the case, Teak Yemane and Ma-U-lettan-she reached more or less to an average height of 25 feet after 3 years. This may be assumed that all these three species had the same rate of growth for the initial period.

Conclusion

On the whole experiments the following information can be summarised for further application in the field.

1. In using container, PT 03 can be used for raising teak seedlings which is much portable compared to PT 04.
2. In the early establishment of teak plantation, Urea and super-phosphate at the ratio of 1 oz and 2 oz per tree, may be applied for faster growth of teak in the initial stage.
3. When a mixed plantation is to be established choice of species become important. In the experiment instead of choosing Teak, Pyinkado and Padauk, Teak may be associated with Yemane Ma-U-lettan- she. It is still too early to suggest for enrichment planting Lettan-she. A further research plan for adoption scheme should be materialized to obtain a more reliable information on enrichment planting.

Table 4. Statistical Analysis of The Trial Plots of Three Year Old Teak Located on The Slope and Ridge of The Planting Site.

Plots	No. of observation	Df	Mean Ht..	Some of Squares
A (Slope)	13	12	*22.6	79.1
B (Ridge)	13	12	18.8	29.8
	Sum =	24	Mean Diff= 8.8	108.9

$$S^2 = \frac{\text{Total Sums of Squares}}{\text{Total df's}} = \frac{108.9}{24} = 4.5$$

$$S_x = \frac{25^2}{n} = \frac{2 \times 4.5}{13} = 0.8$$

$$t = \frac{(\text{Mean A}) - (\text{Mean B})}{S_x} = 4.75$$

Tabular $t_{.01}$ with 24 df = 2.8 . As calculated "t" exceed 2.8 so the two plots are shown to be significantly different

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* Mean average of Ma-U-lettan - she 25.7 feet.

Table 5. Statistical Analysis of The Trial Plots of Three Year Old Yemane Located on The Slope And Ridge of The Planting Site.

Plots	No. of observation	Df	Mean Ht..	Some of Squares
A (Slope)	13	12	*23.0	4.15
B (Ridge)	13	12	21.6	1.01
	Sum =	24	Mean Diff= 1.4	5.16

$$S^2 = \frac{\text{Total Sums of Squares}}{\text{Total df's}} = \frac{516}{24} = 21.5$$

$$S_x = \frac{25^2}{n} = \frac{2 \times 21.5}{13} = 3.3$$

$$t = \frac{(\text{Mean A}) - (\text{Mean B})}{S_x} = \frac{1.4}{3.3} = 0.4$$

Tabular $t_{.05}$ with 24 df = 2.086 . As calculated "t" exceed 2.086 so the two plots are shown to be significantly different

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* Mean average of Ma-U-lettan - she 25.7 feet.

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