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# Preliminary Observations on Trial Planting of Tropical Pines in Burma

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# မြန်မာနိုင်ငံတွင်အပူပိုင်းထင်းရှူးမျိုးများစမ်းသပ်စိုက်ပျိုးခြင်း

ဦးမင်းကိုကိုကြီး၊ ဦးအောင်ခင်၊ ဦးဇော်ဝင်း
နှင့်
ဒေါ်သိန်းကြည်
သစ်တောစိုက်ပျိုးပြုစုရေးဌာနခွဲ
သစ်တောသုတေသနဗဟိုမာန်

## စာတမ်းအကျဉ်းချုပ်

အောင်မြင်ဖြစ်ထွန်းသည့် ထင်းရှူးစိုက်ခင်းများထူထောင်ရန် အခြေခံဖြစ်သော ထင်းရှူးပျိုးထောင်နည်းစနစ်များကို စူးစမ်းသုတေသနပြုခဲ့ပါသည်။ ထင်းရှူးပင်များကို ပျိုးဥယျာဉ်၌ ပျိုးသက်အမျိုးမျိုး၊ ပျိုးအိတ်အရွယ်အစားအမျိုးမျိုးနှင့် စပ်မြေအမျိုးမျိုးတို့ကို နှိုင်းယှဉ်စမ်းသပ်ခဲ့ပါသည်။ ပျိုးဥယျာဉ်ကာလအတွင်း အပင်အမြင့်တိုင်းတာခြင်း၊ အမြစ်၊ ပင်စည်ပိုင်းအချိုးတိုင်းတာတွက်ချက်ခြင်းတို့ကို ဆောင်ရွက်ခဲ့ပြီးကွင်း၌ စိုက်ပျိုးပြီး(၃)လအကြာတွင် ရှင်ပင်ရာနှုန်း ကောက်ယူခဲ့ပါသည်။ ဤစာတမ်းတွင် အပူပိုင်းထင်းရှူးများကို မြန်မာနိုင်ငံ၌ စမ်းသပ်စိုက်ပျိုးတွေ့ ရှိချက်များကို သုံးသပ်ဆွေးနွေးအကြံပြုထားပါသည်။

# Preliminary Observations on Trial Planting of Tropical Pines in Burma

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## Abstract

An attempt to raise a good nursery stock was made this led to a series of nursery experiments such as comparison of different seedlings ages, different pot size and different soil mixtures. Plant height and root/shoot ratios were measured in the nursery stage while survival was assessed (3) months after planting out in the field. The results were discussed and suggestions were made.

# Contents

# 1. Introduction

Tropical pines have been introduced and planted extensively in the tropical and sub-tropical countries (Bacon & Hawkins, 1980; Hawkins *et.al.,* 1978; Lamb, 1967, 1973; Whitmore and Liezel, 1980). This is mainly because of their good growth, the capability of some of them to grow in lowland area and the versatility of their timber (Halins et. al., 1978, Lamb,1972). However, this species has never been considered for planting by the Forest Department in Burma until 1980 ( Ko Ko Gyi & Aung Khin, 1982).

The need to grow tropical pines, especially in the lowland area was intensified with the interest shown by the paper industry to use lowland pine as long fibre raw material for pulp and paper. At present, the paper industry is highly dependent upon bamboo as long fiber raw material. But how far can we depend upon bamboo for this purpose is a question which is difficult to answer. No doubt we have rich bamboo resources in our country, but they are being heavily cut and it has yet been possible to manage our bamboo forests under proper management system. This is because there is an involvement of both social and economic problems, as the farmers and the people which from the majority of the population in Burma is greatly dependent upon bamboo for building material, piscatorial uses and bamboo shoot. Artificial regeneration of bamboo presents the problem of getting regular and adequate of seed, while the practicability of vegetative propagation for large scale plantation establishment still needs to be studied and considered.

This, if the introduction of the tropical pines in lowland area should be successful and a proper nursery and planting techniques established, the need to supply long fibre raw material for paper and pulp can greatly be met. This in turn will reduce on the pressure on the supply of bamboo.

# 2. Review of the Past Experience

### Raising of seedling stock

Planting of lowland tropical pines in Burma was initiated in 1980; seeds were imported and pine nurseries were established by the East Pegu Yoma Plantation Project. This was done under the guidance of an international silvicultural consultant for the project. As a precaution against damping off, only relatively sterile subsoil which was supposed to contain no organic matter was used as a major component in the soil mixture Watering and NPK nutrient application was carried out by mean of the subirrigation system. The seedlings produced were small and unhealthy. Their root systems were poor and only evidences of mycorrhiza formation was observed.

However, with the understanding of the importance of organic matter in the nursery soil mixture, the auther (FRI) decided to carry out experiment by using forest topsoil as the major component in the potting mixture (Ko Ko Gyi & Aung Khin, 1982). Seedlings obtained by using this technique was significantly much more superior than those poor seedlings obtained by using the subsoil method i.e., the average height being 19.6 cm as compared to 7.8 cm at 7 months of age. The formation of the root system was also much better clumps of active mycorrhizae was also observed.

**Field planting in lowland area**

This seedlings raised by both EPP (using subsoil) and FRI (using topsoil) were planted out in the field in June 1981. Available survival and height datas for *Pinus caribaes* assessed in March 1982 were as stated in Table 1.

**Table 1. Survival and height of *P.caribaea* established in June 1981.**

| Location | Nursery Technique Used | Survival % | Height (cm) |
|---|---|---|---|
| Sein Ye | Topsoil | 38.4 | 18.3 |
| Moswe | Topsoil | 31.4 | 24.4 |
| Yeni | Topsoil | 20.0 | 18.3 |
| Thagaya | Subsoil | 15.1 | NA |
| Moswe | Subsoil | NA | NA |

NA = not available

By surveying all the areas planted with pine in 1981 and assessing the datas were available, it was found that the areas planted with seedling produced by the subsoil technique were a complete failure and have been replanted in 1982. Although not very satisfactory, the areas planted with seedlings by the use of topsoil in the nursery gave a much better results. This indicated that with the use a correct nursery technique to produce healthy seedlings, the field survival percentage of *Pinus caribaea* can be increased.

The survival at the Yeni experimental plot was poor (see table 1) because soil working was done around each seedling in the first year. This caused root damage to the seedlings which resulted in heavy mortality.

In order to see the performance of *Pinus caribaea* in the second year, 17 months old 1981 experimental plot at Moswe was again assessed in November 1982. (see plate 1a. & 1b). The results obtained were as stated in table 2.

**Table 2. Performance of 17 months old *Pinus caribaea* at Moswe**

| Survival % | Max. Height (m) | Min Height (m) | Ava. Height (m) |
|---|---|---|---|
| 31.4 | 1.7 | 0.3 | 0.7 |

The seedlings looked very healthy (see plate 1a) and the maximum height (1.7 m) obtained was very encouraging.

**Field Planting at Highland Area**

Pine seeds from high elevation (over 700 m) namely *Pinus patule, Pinus oocarpa* and *Pinus pseudostrobus* were also raised at Taunglelon FRI nursery in the Southern Shan State (S.S.S). Here also topsoil was used as the major component in the soil mixture.

The seedlings were planted out in June 1981 at Pinlaung junction near Aungban. The survival and growth assessed in March 1982 was as stated in Table 3.

The seedlings were looking very healthy. However, the survival percentage has dropped due to damage caused by termite and shoot damage caused shoot borer. (see plate 2a). If protection measures can be taken, the species tested can be considered to be very encouraging for the area tested.

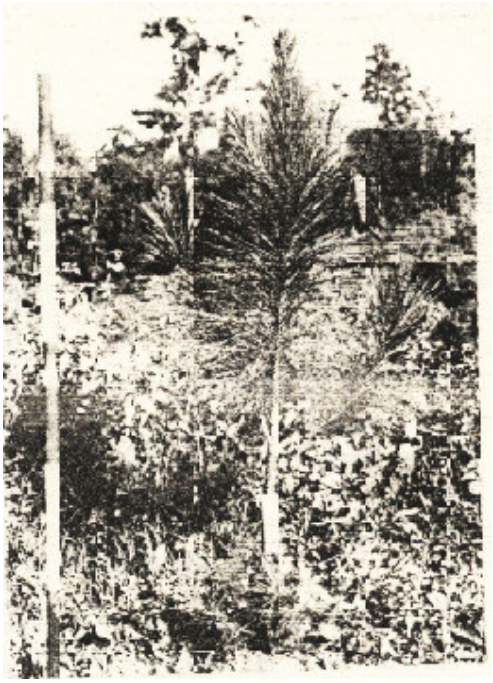


PLATE 1a. Close up view of 17 months old seedling

PLATE 1b. 17 months old *Pinus caribaea* var. *hondurensis* which managed to survive showing good performance in the second year Established 1981. Moswe.

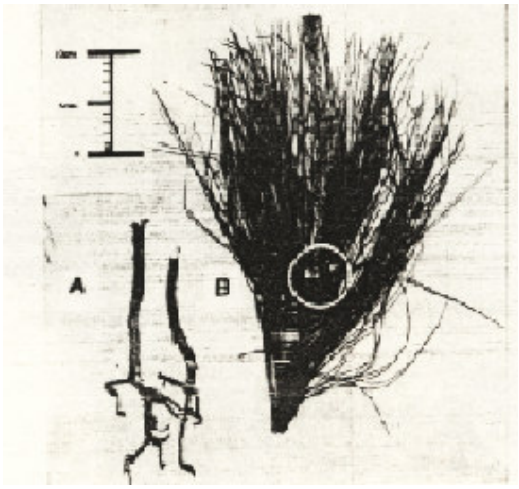
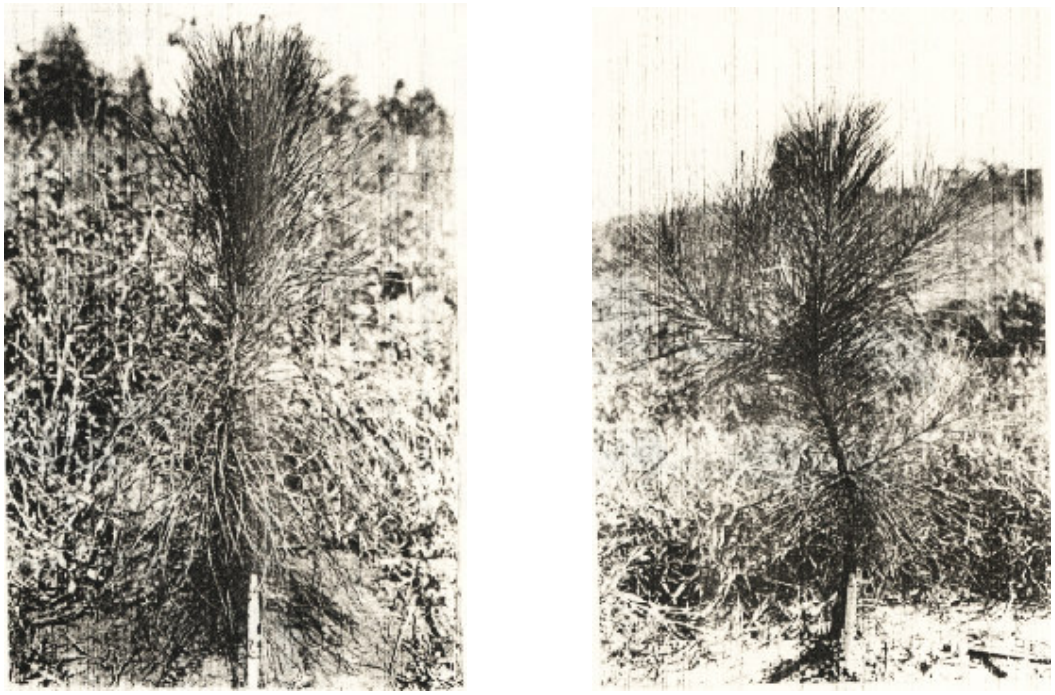



PLATE 2a. A = Root damage caused by termite and
B = Shoot damage caused by shoot borer.

PLATE 2b. 17 months old trial planting of *Pinus oocarpa, Pinus patula* and *Pinus pseudostrobus* at Pinlaung junction (s.s.s.)



5 months old (Yeni) 17 months old (Yeni)

PLATE 3. Better growth obtained from *Pinus caribaea* var. *hondurensis* with improved seedling stock

PLATE - 4 Comparison of *Pinus caribaea* var. *hondurensis* seedlings grown in 3 different soil mixtures

A= Sand: Sawdust: Soil: Mycorrhiza;

B = Sand: Manure: Soil: Mycorrhiza;

C = Sand: Sawdust: Manure: Soil: Mycorrhiza;


DIAGRAM - 1 Growth comparison of *Pinus caribaea* var. *hondurensis* seedlings grown in 3 different soil mixtures

PLATE - 5a Comparison of *Pinus caribaea* var. *hondurensis* seedlings of different ages at time of planting.
A = 8 ½ months, B = 7½ months, C = 6½ months


PLATE – 5b Comparison of *Pinus caribaea* var. *hondurensis* seedlings grown in different tube sizes.
A = 6cm x 10cm, B = 6cm x 15cm, C = 6cm x 20cm

**Conclusion**

Review of the past experience indicated that in the introduction of tropical pines into Burma –

(a) care should be taken in carrying out the cultural operations. Spot weeding by scraping around the seedlings or soil working should be avoided as this causes root damage which can result in high mortality rate,

(b) measures for protection against insect should be taken, and

(c) a suitable nursery technique is needed to be established. With the use of a correct nursery technique to produce sturdy seedling stock with good root formation, there is great possibility that *Pinus caribaca* var. hondurensis can survive the long hot dry season and flourish in this country. Survival at higher elevation was better (See Table 3) due to the cooler and more favourable climatic conditions of the area tested.

**Table 3. Survival and height of pines grown in the highland area**

| Location | Species | Survival % | Height (cm) |
|---|---|---|---|
| Pinlaung Junction | *P.patula* | 87.8 | 24.4 |
| | *P.oocarpa* | 69.4 | 27.7 |
| | *P.pseudostrobus* | 80.7 | 33.5 |

**Table 4. Performance of 17 months old pine experimental plot at Pinlaung Junction**

| Species | Survival % | Max. Height (m) | Min. Height (m) | Av. Height (m) |
|---|---|---|---|---|
| *P.patula* | 69.33 | 0.84 | 0.06 | 0.43 |
| *P.oocarpa* | 46.60 | 0.96 | 0.09 | 0.49 |
| *P.pseudostrobus* | 71.93 | 1.27 | 0.09 | 0.72 |

A much better survival can be expected with a good seedlings stock. Consequently, necessary nursery experiments were conducted at the FRI pine nursery. The experiment is reported in the following chapter.

## 3. Nursery Experiments for Tropical Pine

### Objective

To find the most appropriate (a) soil mixture, (b) pot size and (c) age of seedlings at the time of planting for *Pinus caribaea* var. *hondurensis* in the nursery.

### Materials and Methods

*Pinus caribaea* var. *hondurensis* seed used in this experiment was of Figi origin and the seeds were soaked in water for 24 hours before sowing. Seeds were germinated in a ordination box containing pure sand. They were pricked out into polythene tubes after germination.

As a container, polythene tubes of three different sizes were tested. They are

(i) 6 cm diameter x 10 cm height
(ii) 6 cm diameter x 15 cm height
(iii) 6 cm diameter x 20 cm height

The above polythene tubes were filled with three different soil mixtures that were to be tested. They are

(i) sand; sawdust; forest soil; mycorrhiza; 2:2:5:1
(ii) sand; manure; forest soil; mycorrhiza; 2:2:5:1
(iii) sand; sawdust; manure; forest soil; mycorrhiza; 2:1:1:5:1

The soil mixtures were mixed in volumetric ratio. Only coarse sand and well aged sawdust and manure were used in the soil mixture.

Seedlings that were sown in the 3 different container sizes and 3 different soil mixtures were germinated on the 15$^{th}$ of October, November and December so that they are of the following ages at the time of planting

(i) 8 ½ months old
(ii) 7 ½ months old
(iii) 6 ½ months old

30 seedlings were measured for each treatment in the nursery experiment. Therefore there were altogether 3 x 3 x 3 x 30 = 810 seedlings assessed.

The seedlings were kept under 50% shade for two weeks after which they were exposed to full sunlight. The seedlings were given NPK (2:1:1) fertilizer at the rate of 0.18 gms per seedling. This was done by dissolving 1 oz of fertilizer in 1 gallon of water and applying to 160 seedlings. Fertilizer was applied once a month once the seedling has reached the age of 2 months.

Watering was carried out twice a day.

Height measurements were taken once a month while the plant dry weight was assessed just before the seedlings were planted out in the field.

**Results**

**Table 5. Comparison of seedlings grown at one month interval**

| Treatment | Relative height growth (cm/cm/day) | Total dry weight (gm.) |
|---|---|---|
| 6 ½ months | 0.0045 | 1.78 |
| 7 ½ months | 0.0042 | 2.50 |
| 8 ½ months | 0.0046 | 3.20 |

Although there is a tendency of increased total dry weight (See Plate 5a) with increase in age, the differences were statistically not significant. Difference between the relative growth rate were also not significant.

**Table 6. Comparison of seedlings grown in different tube size**

| Treatment | Relative height growth (cm/cm/day) | Total dry weight (gm.) |
|---|---|---|
| 6 cm x 10 cm | 0.0036 | 1.87 |
| 6 cm x 15 cm | 0.0045 | 2.36 |
| 6 cm x 20 cm | 0.0046 | 3.21 |

Although there is a tendency of increased relative height growth and total dry weight with increase in tube size, the differences between treatments were not significant. Root formation seedlings grown 6 cm x 20 cm tube size also appear to be better (See Plate 5b).

**Table 7. Comparison of seedlings grown in different soil mixtures**

| Treatment | Relative height growth (cm/cm/day) | Total dry weight (gm.) |
|---|---|---|
| Soil mix A | 0.0024 | 0.98 |
| Soil mix B | 0.0064 | 2.73 |
| Soil mix C | 0.0050 | 1.62 |
| **L.S.D** | 0.0009** | 1.05* |

Analysis of variance of both the parameter assessed showed significant differences. For simplicity, ranking are given below with lines linking treatments which did not differ significantly.

| Relative height growth | Total dry weight |
|---|---|
| Soil mix B | Soil mix B |
| Soil mix C | Soil mix C |
| Soil mix A | Soil mix A |

The relative height growth of seedlings grown in soil mix B (i.e. sand; manure; forest soil; mycorrhiza; 2:2:5:1) was the best while seedlings grown in soil mix A. (i.e. sand; sawdust; forest soil; mycorrhiza; 2:2:5:1) was the poorest. The difference between the treatments were significant at 1% level.

Assessment of the total dry weight also showed that seedlings grown in soil mixture B was significantly better than seedlings grown in soil mixture A and C (i.e. sand; sawdust; manure; forest soil; mycorrhiza; 2:1:1:5:1). Although seedlings grown in soil mixture C tends to be more heavy than those grown in soil mixture A, the difference was not significant.

**Discussion**

The results indicated that so far relative height growth and dry weight is concerned, 6½ months old seedling is the same as 8½ months old seedling. However, the results need to be confirmed by field trial.

Statistical analysis also indicated that 6 cm x 10 cm, 6 cm x 15 cm, and 6 cm x 20 cm range of pot sizes may be used without affecting the relative height rate and weight of the seedlings. This also needs to be confirmed by field tests. If field test should also show no difference smaller pot sizes can be economically used in raising tropical pines

From the results obtained, soil mixture B was definitely very suitable for pine while mixture C ranked second. This indicated the importance of the effect of ratio of manure in the soil mixture for pine. As a following different rations of manure in the soil mixture in pine nursery should be tested.

**Field check of the present year planting**

In order to see the effectiveness of the present nursery technique applied for pine, an assessment was made on the 5 months old 1982, pine plantings. The results were as given in Table 8.

**Table 8. Survival and height of pine seedlings planted in June 1982**

| Location | Species | Survival % | Height (cm) |
|---|---|---|---|
| Yeni (FRI) | *P.caribaea* | 91.5 | 32.76 |
| Moswe (FRI) | *P.caribaea* | 77.1 | 24.13 |
| Thagaya | *P.caribaea* | 89.2 | 27.17 |
| (EPP) | *P.oocarpa* | 85.3 | 36.57 |
| Tegaungtaung | *P.caribaea* | 98.3 | 26.41 |
| (S.S.S) | *P.patula* | 72.8 | 8.91 |
| (FRI) | *P.pseudostrobus* | 94.6 | 43.82 |

The soil mixture used in the nursery this year contain more organic matter than that previous year as manure and forest topsoil were used as the major component.

The results, i.e., the survival percent has improved greatly with the improved seedling stock. It is also expected that more seedlings were able to be survive the long hot dry season. Assessment will again be made at the end of the dry season.

Apart from the survival %, the height and the general vigour of the seedling this year is also much better.

The size of most of the seedlings planted at Yeni this year was almost identical to those that were planted last year (See Plate 3). This was also due to the improved seedling stock that was raised this year.

## 4. Conclusion

From the review of the past year experience on tropical pine and the results of the experiment conducted, it is suggested that:

(1) for the present a soil mixture containing sand: manure: forest soil: mycorrhiza in the ratio of 2:2:5:1 should be used in pine nursery until a more suitable mixture can be found. Coarse and well aged manure should be used.

(2) NPK fertilizer 2: 1: 1 should be applied monthly only after the seedlings have reached the age of 2 months 28.35 gms of fertilizer dissolved in 0.454 liters of water should be applied to 160 seedlings.

(3) Scrape spot weeding and soil working around the seedling should be avoided.

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