



**Government of the Union of Myanmar  
Ministry of Forestry  
Forest Department  
Forest Research Institute**



**Vegetative Propagation of Bamboo As  
A Raw Material For Paper Mill**

U Saw Yan Aung C.Doo, B.Sc. (For.) (Ygn.), M.S (Hawaii),  
Emeritus Professor,  
Institute of Forestry  
and  
Daw Thida Mundt, B.Sc. (Bot.) (Mdy.)  
Research Assistant,  
Forest Research Institute  
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**စက္ကူစက်အတွက် ကုန်ကြမ်းဖြစ်သော ဝါးစိုက်ပျိုးထူထောင်ခြင်းနည်းစနစ်ကို  
လေ့လာခြင်း**

ဦးစောရန်အောင်စိဒူး၊ B.Sc. (For.) (Ygn.), M.S. (Hawaii)

ဂုဏ်ထူးဆောင်ပါမောက္ခ၊ သစ်တောတက္ကသိုလ်

နှင့်

ဒေါ်သီတာမန်း၊ B.Sc. (Bot.) (Mdy.)၊ သုတေသနလက်ထောက်

သစ်တောသုတေသနဌာနခွဲ

**စာတမ်းအကျဉ်းချုပ်**

စက္ကူစက်အတွက် ကုန်ကြမ်းဖြစ်သော ဝါးအထူးလိုအပ်လျက်ရှိရာ စက္ကူစက်အနီးတဝိုက် ဝါးစိုက်ခင်း ထူထောင်နိုင်ရန် ဝါးစိုက်ပျိုးသောနည်းစနစ်ကို လေ့လာသော စာတမ်းဖြစ်ပါသည်။ ၎င်းစာတမ်းတွင် ဝါးအထွက်နှုန်းများနှင့် ဝါးထုတ်ယူနိုင်သည့် အချိန်ကာလကိုလည်း တင်ပြထားပါသည်။

## **Vegetative Propagation of Bamboo As A Raw Material For Paper Mill**

U Saw Yan Aung C.Doo, B.Sc. (For.) (Ygn.), M.S (Hawaii),  
Emeritus Professor, (I.O.F)

and

Daw Thida Mundt, B.Sc. (Bot.) (Mdy.)  
Research Assistant  
Forest Research Institute

### **Abstract**

The paper dealt with the investigation of vegetative propagation method of two species of bamboos. The annual growth of the bamboos were assessed. The production per clump and the time of maturity for harvesting were also described.

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## 1. Introduction

One of the most unique and versatile groups of plants known to mankind is bamboo. For almost half the human race in the world life would be quite different without bamboo. It is used for food, as a weapon or as a tool, as a cooking instrument or container, as a musical instrument or as an object of beauty, as shelter and even as medicine .

Bamboos are integral not only to the culture of Myanmar but that of the entire Southeast Asia. The wide range of their uses qualifies this group of species to be one most associated with the mainstay of rural life and culture there in our country.

The ever growing human population, like in most countries has greatly affected the condition of the Myanmar Forests. The indiscriminate use of the natural resources in the forests has resulted in the denudation of vast tracts of land in the country. To improve the productivity and ecological stability, massive planting of bamboos becomes a major issue for the country.

Bamboo belong to the grass family Gramineae. In Myanmar there are 97 species and 4 varieties of bamboos. The bamboos grow abundantly in mixed deciduous forests. The most gregarious grown species is in Rakkhine Forest Division.

One of the most important contributions of bamboo to modern-day is the production of paper. Though once called poor man's timber it is no longer cheap. Its used as a long fibre raw material in the pulp and paper industry is well known and it is one of the most sought after raw material in the tropics.

At one time the supply of bamboo was thought to be perpetual. Bamboo was often viewed by foresters as an inexhaustible forest product. This impression soon proved to be a mirage. The rapidly increasing population with associated demands for fuel and farmland resulted in a significant decrease of land area under forest.

The shortage supply of bamboo as raw material for paper mill has become a problem for the mill manager. Hence, a call for bamboo plantations in the vicinity of the paper mill has become the limelight for paper industry.

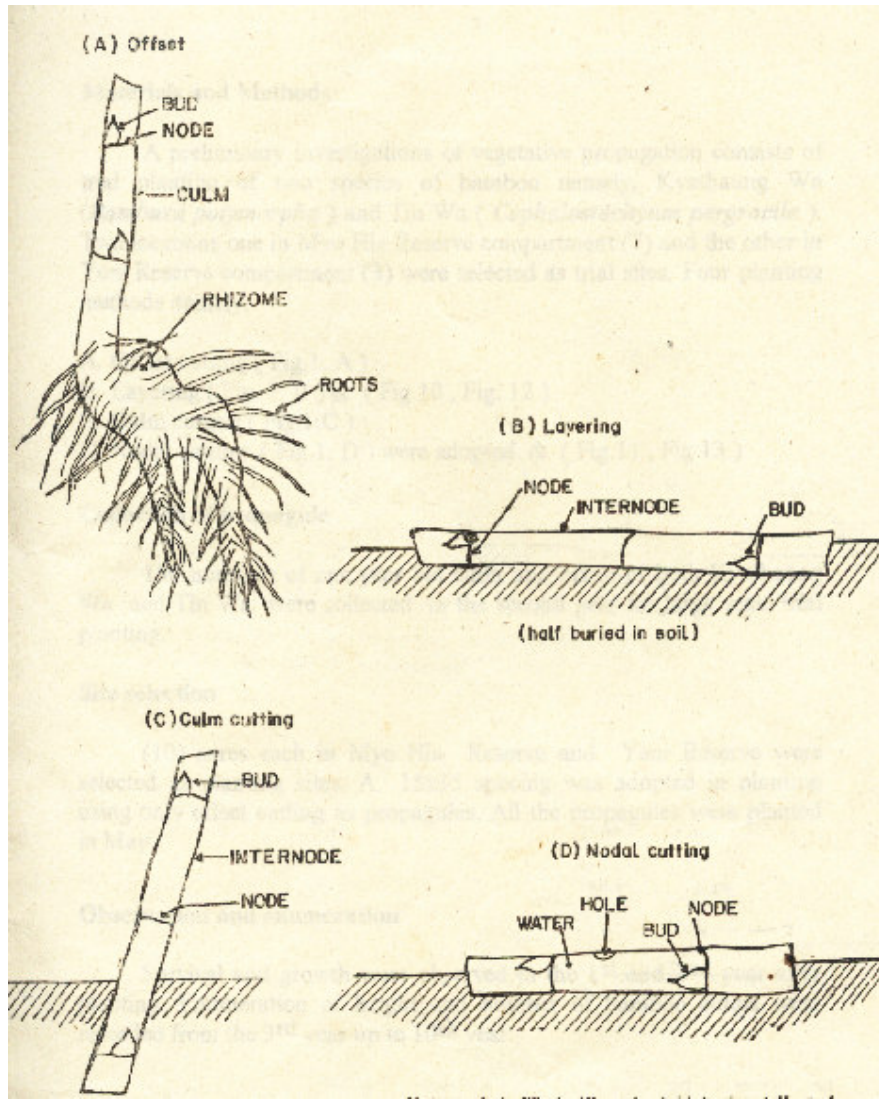
## 2. Materials and Methods

A preliminary investigations of vegetative propagation consists of trial planting of two species of bamboo namely, Kyathaung Wa (*Bambusa polymorpha*) and Tin Wa (*Cephalostachyum pergracile*). Two locations one in Myo Hla Reserve compartment (7) and the other in Yeni Reserve compartment (3) were selected as trial sites. Four planting methods namely,

- A. Offset cutting (Fig.1, A)
- B. Layering (Fig. 1, B) & (Fig. 10, Fig. 12)
- C. Culm cutting (Fig. 1, C)
- D. Nodal cutting (Fig. 1, D) were adopted. & (Fig. 11, Fig. 13)

### Collection of Propagule

150 numbers of one year old culm and offset of both Kyathaung Wa and Tin Wa were collected in the second year for large scale trial planting.



(oblique planting with one node buried in soil)

(internode is filled with water laid horizontally and buried level with ground)

Fig.1. 4 methods of planting in the experimental plots.

## Site Selection

(10) acres each in Myo Hla Reserve and Yeni Reserve were selected as planting sites. A 15x 15 spacing was adopted in planting using only offset cutting as propagules. All the propagules were planted in May.

## Observation and Enumeration

Survival and growth were observed in the 1<sup>st</sup> and 2<sup>nd</sup> year after planting. Enumeration of height and number of bamboo culms were recorded from the 3<sup>rd</sup> year up to 10<sup>th</sup> year.

## Result

In a preliminary trial planting of bamboo it was observed that by adopting method A (offset cutting) there were 40% and 10% initial sprout of Kyathaung Wa and Tin Wa in the month of June. But the sprout increased to 80% and 24% of Kyathaung Wa and Tin Wa respectively in July.

In the second method of planting B (layering) there were 72% sprout of Kyathaung Wa but there was no sprout of Tin Wa in June. The sprout increased to 92% Kyathaung Wa and 28% of Tin Wa in July.

A third method C (culm cutting) had the poorest of growth with only 5% of sprout of Kyathaung Wa and no sprout in Tin Wa in June. There was 30% sprout of Kyathaung Wa and 58% of Tin Wa in July.

The last method D (nodal cutting) produced a good sprout of 76% of Kyathaung Wa and 70% of Tin Wa in June. However the survival decreased in 44% in Kyathaung Wa and 40% in Tin Wa in July. (Fig.2,3)

The growth of the buds on the Rhizome is usually activated by summer in sympodial rhizomes. Suitable season for planting vegetative propagules, especially offsets and clump divisions, is the beginning of the active growth season of the Rhizome buds. Generally offsets from 1-2 year old culms give better results as such rhizomes are vigorous and possess active culm buds; desirable length of the culm is 1-1.5 m (3' – 3.6'). The favorable period for offset planting is one or two months before monsoon when the rhizomes buds are most active.

In culm cuttings, generally 1 to 2 noded cutting of 1-3 years old culms are planted obliquely or horizontally. April is generally the best month for planting. The importance of high humidity cannot be neglected to give better results.

A survival percent are 92% and 85% of Kyathaung Wa and Tin wa were recorded after the 2<sup>nd</sup> year of planting.

The height of Kyathaung Wa and Tin Wa increased from ten feet in the 3<sup>rd</sup> year to approximately twenty five feet in the 10<sup>th</sup> year in Yeni trial sites. (Fig. 4). The number of both Kyathaung Wa and Tin Wa per clump increased from 5 in the 3<sup>rd</sup> year to 20 in the 10<sup>th</sup> year in Yeni trial sites (Fig. 5).

There was a slight difference of growth in Myo Hla trial sites. The height of both Kyathaung Wa and Tin Wa increased from eight feet in the 3<sup>rd</sup> year to approximately twenty feet in the 10<sup>th</sup> year. (Fig. 6)

The number of culm per clump increased from 5 in the 3<sup>rd</sup> year to 10-15 in the 10<sup>th</sup> year (Fig. 7).

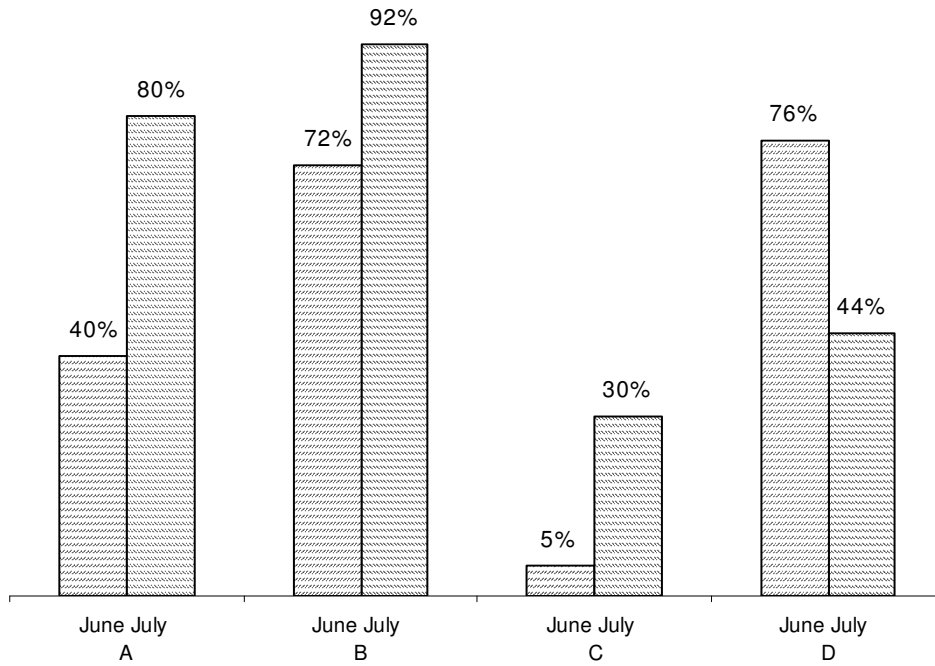


Fig 2. Comparison of survival percent. Kyathaung wa planted in May using (4) planting methods.

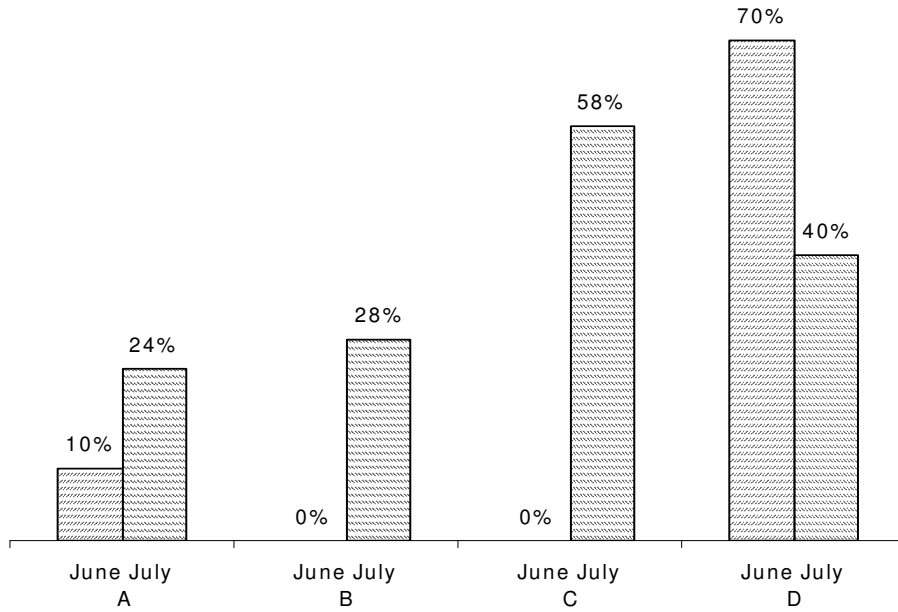


Fig 3. Comparison of survival percent. Tin wa planted in May using (4) planting methods



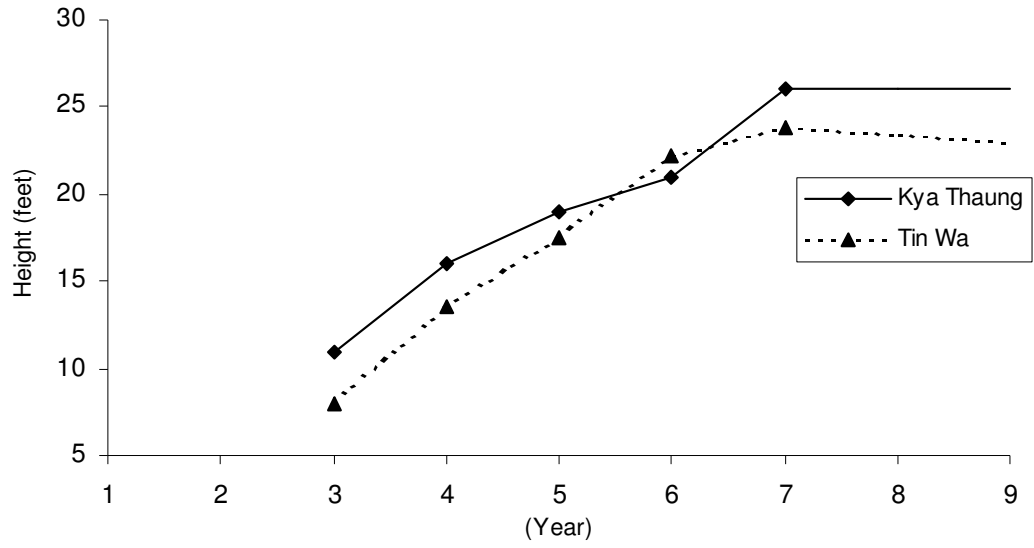


Fig 4. Annual increment of height of Kyathaung and Tin Wa in Yeni experimental plot.

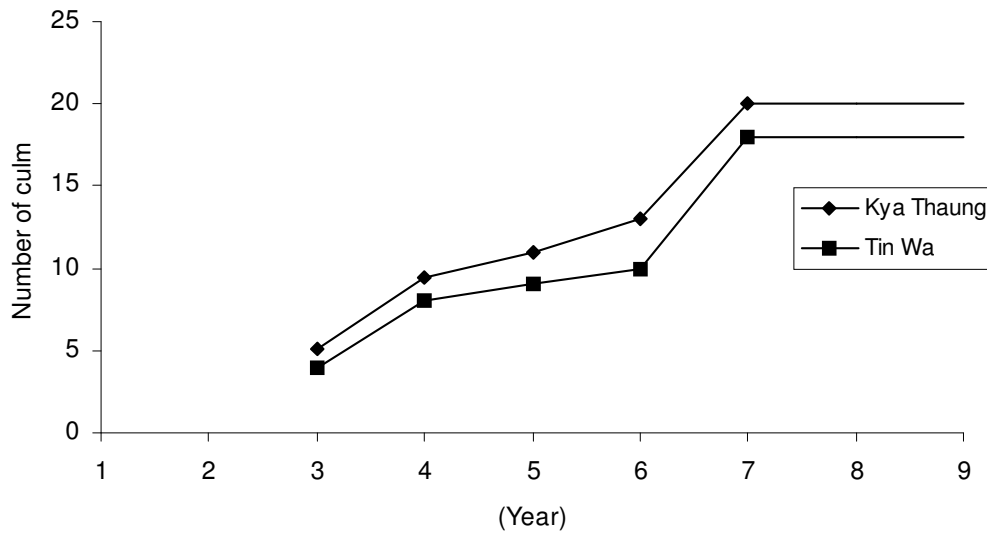


Fig 5. Number of annual increment of bamboo per clump in Yeni experimental plot.

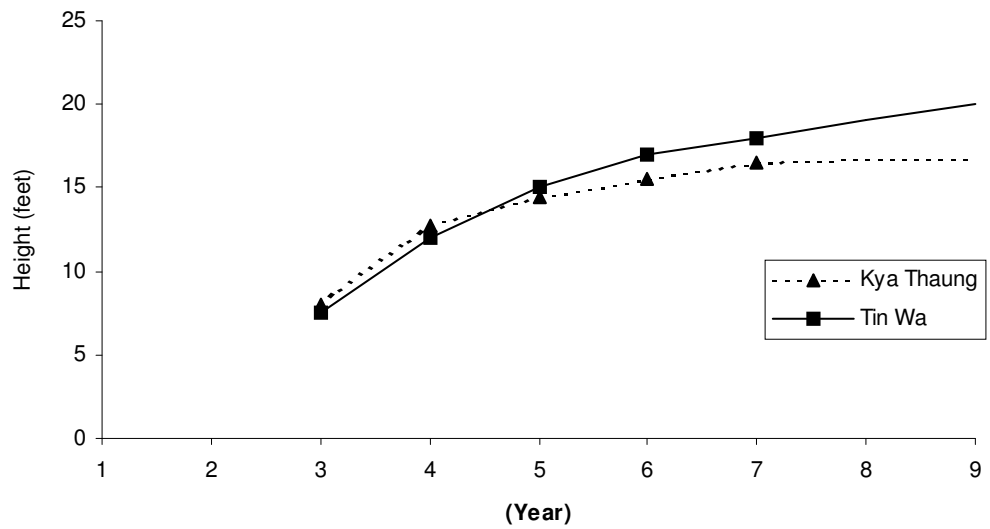


Fig 6. Annual increment of height of Kya thaung and Tin wa in Myo Hla experimental plot

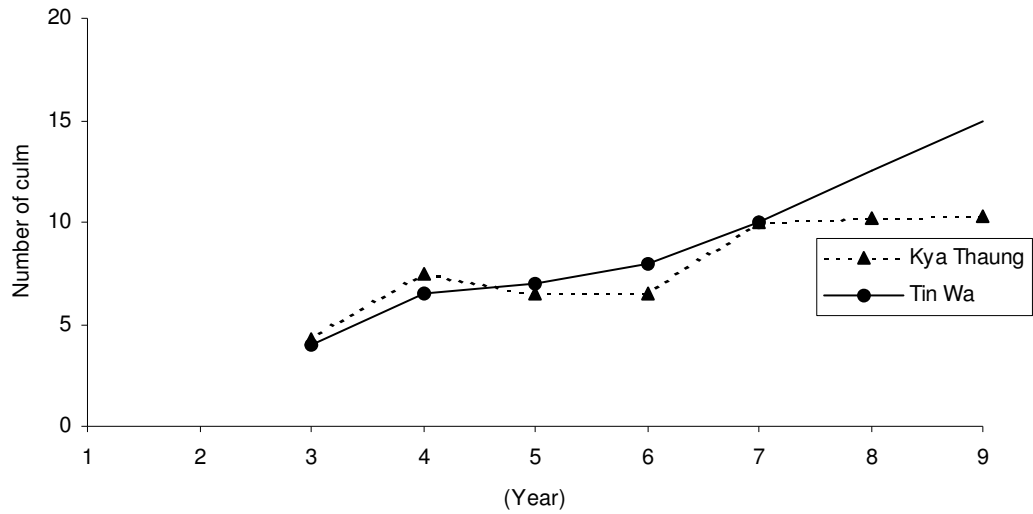


Fig 7. Number of annual increment of bamboo per clump in Myo Hla experimental plot.



Fig 8. New shoots development of Kyathaung-wa after 9 years of planting



Fig 9. 10 years old Kyathaung-wa planted in Yeni Reserve. Average height - 25 feet.

## **Discussion and Suggestions**

In the propagation of bamboo availability of moisture is paramount for the development of shoots and roots. The duration for planting propagule should be timely. Collection of propagule must be adjusted according to the break of monsoon. Some of the methods for planting are not appropriate for the dry area. It is observed that shoots developed very well after planting, but the plant died after sometimes due to loss of moisture before the development of root. The first method (offset cutting) is the safest method for the propagation although it is a little expensive than other methods. (Fig. 1, A)

An area having annual rainfall of 50" and above may be quite safe for propagation of bamboo. During the course of experiment bamboos were harvested at the age of seven and twelve years old. (Fig. 8, 9). At least 150 tons of bamboo were obtained from 10 acres plot. It is suggested that it would be very helpful to have a large scale of bamboo plantations established in the vicinity of paper mill.

## **Management of Bamboo Clumps**

To have a good clump of bamboo development it is important to manage bamboo clumps. Both pests and diseases usually destroy the clumps which reduce their vigour and growth.

## **Harvesting Age**

It is important to know when to harvest a bamboo culm. Culms usually mature in strength at the age of 2-3 years. The age of bamboo can be obtained by counting the leaf sheath scars on the latest branchlets. The number of scars plus one is the age of the culm.

## **Cutting Height**

It is best to cut bamboo culms above a node and a few internodes. Culms of 4 years or older can be cut close to the ground as they are less likely to sprout. Trim the cut stump back to the cross wall of a node so that it shed rain water. It is always better to cut a bamboo above a node and a few internodes above ground level so that it will take a longer time for the stump and hence its rhizomes to die. The stump will be an indicator of the whether the rhizome is alive or dead.

## **Harvesting Season**

Harvesting should be completed during the October to March dry season when moisture content is at a minimum. Bamboos should not be harvested during the Summer as this is the shooting season and new shoots are easily damaged.

usaomif:0g:pdkufenf: (B)



Fig 10. Layering of Kyathaung - wa culm cutting. Shoot development after one month of planting

usaomif:0g:pdkufenf: (D)



Fig.11. Nodal cutting of Kyathaung-wa. Shoot development after one month of planting

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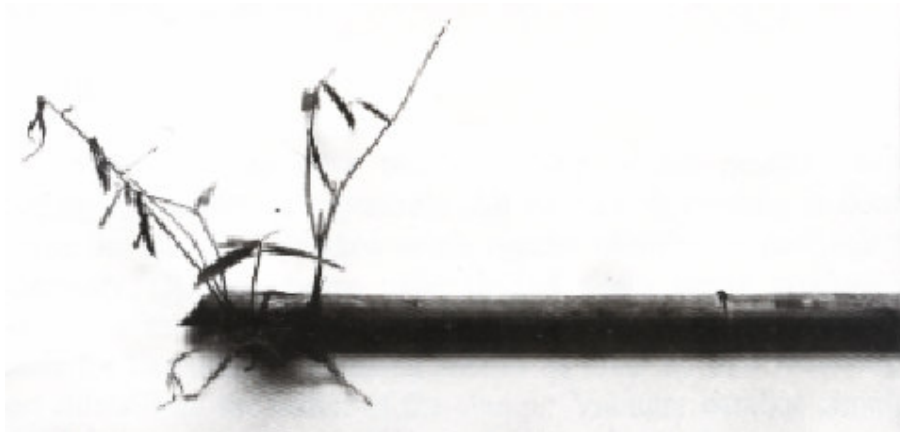


Fig 12. Layering of Tin-wa culm cutting. Shoot development after one month of planting.

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Fig 13. Nodal cutting of Tin - wa. Shoot development after one month of planting

## **Thinning**

Total harvesting of a bamboo clump is not possible without damaging its ability to regenerate. All bamboo harvesting is done by thinning the clumps. Bamboo needs regular thinning to maintain their productivity. Bamboo culms older than 4 years rarely produce new shoots from their rhizomes. At their age they are fully mature and suitable for harvesting. Thinning should be done by first removing the oldest culms from the center of the clump. Younger bamboo should be retained for more maturity and the production of new shoots.

## **Cleaning**

Old clumps can be rejuvenated by removing broken, dead and rotting culms, stumps and fallen branches shrubs etc. Treat over crowded stump to a good thinning leaving only healthy, younger culms. Clear around clumps at least once every 6 months.

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11. Tewari D. N. Dr, Forest Research Institute, Indian Council of Forestry Research & Education, Dehra Dun.