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# RAISING BAMBOO FROM STEM CUTTINGS

A guide for  
extension workers and bamboo growers

Jonathan C. Njuguna and Bernard N. Kigomo



KEFRI Guideline Series No. 7: June 2008



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(KEFRI)



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## **Foreword**

Bamboo is a fast growing woody grass that is naturally found on mountains ranges and highlands of eastern Africa, and in medium altitudes and lowlands of other countries. Bamboo plays a vital role in the protection of soils and watershed areas. It is a forest resource that forms bulk of elephant and other wildlife in their natural habitats. For many years, human beings have used bamboo as a construction material and as delicacy in Asia and Africa. Because of its many uses and quality, bamboo is now considered a superior resource to many other plants.

This guideline is aimed at promoting the growing of bamboo on farms. It is expected that increased production of bamboo by farmers will reduce pressure on the natural sources that serve as water catchments and protected forests. The guide provides information on vegetative propagation of bamboo, which has remained a bottleneck on its adoption on farms in Kenya. The guide also supplements information on bamboo work that was initiated by KEFRI in 1986.

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## 1.0 Introduction

Bamboo belongs to the grass family and is mostly found in tropical, sub-tropical and in rare cases temperate zones. In terms of ecological habitat, it is classified into lowland and highland bamboo. Lowland bamboo grows naturally in tropical Asia where temperature ranges from 20 to 35°C and rainfall is over 1500 mm per year (Okamura, 1986).

In Africa, indigenous bamboo grows mainly in the highlands and medium altitudes of Eastern and Central Africa. In nature, bamboo grows as pure stands or is mixed with other trees.

Bamboo growing in forested catchments plays a vital role in the protection of soils and water sources. It also forms the bulk of elephant and wildlife feed and has diverse utility ranging from construction to delicacy in Asia and Africa (Ong, 2004).

Bamboo has several desirable qualities that make it a useful resource compared to many other plants. These include:

- Ability to regenerate vegetatively
- Tolerance to repeated harvesting
- Strong and lightweight material
- Ability to restore degraded sites
- Short growing cycle
- Compatibility with other tree species.

Bamboo can be raised through various methods such as seeds, wildings, cuttings, offsets and tissue culture. However, indigenous and introduced species in Kenya do not readily produce seed. Among the methods of bamboo propagation, vegetative technique, through the use of culms (bamboo stems), has been recommended, as it is faster in providing adequate planting material (Kigomo, 2007). Furthermore, inadequate information on propagation has remained a bottleneck to promotion and adoption of bamboo on farms in Kenya (Kigomo, 1995; 2007).

These guidelines present propagation technique that uses bamboo stem cuttings in raising seedlings. The technique is mainly applied to exotic bamboo species such as: *Bambusa tulda*, *Bambusa vulgaris* var *vitatta*, *Dendrocalamus brandisii*, *Dendrocalamus asper*, *Dendrocalamus membranaceus*, *Bambusa vulgaris* and *Bambusa hamiltonii*, among others.

## 2.0 Propagation Procedure

The propagation method involves several stages as follows:

- Collection of healthy bamboo culms (stems)
- Preparation of cuttings and nursery for propagation
- Propagation of the cuttings in nursery or greenhouse
- Separation of sprouts from cuttings and potting
- Multiplication of sprouts or seedlings
- Managing potted seedlings in a nursery or greenhouse
- Hardening seedlings for planting

### Collection of Bamboo Culms

- Identify health clumps for selection of culms (Plate 1).
- Select culms that are between one year and three years of age. Very young culms should not be cut for propagation since these have not developed buds to enable production of shoots and roots (Plate 2).



**Plate 1: A clump where healthy culms are selected**



**Plate 2: A clump with young shoots that is not desirable for collecting propagation materials**

- Using a sharp knife or a bow saw, cut culms that have at least three buds (Figure 1). If the culm is alive then the bud is alive. The size of the bud determines whether it is living or dead. Buds fused to the culm are assumed to be dead.
- Ensure the culms are cut between 15 and 45 cm from the ground, but not below the first prominent node above the ground
- Ensure the butt edges of the cut culms are not split (Figure 1)
- Determine the length of the cuttings for propagation according to the transport to be used and the size of the propagation unit in use
- Obtain cuttings for propagation from the middle parts of the culms
- Cover the cuttings with wet grass, wet straw or wet straw mats when transporting from the cutting site to the propagation nursery or greenhouse. This will protect the cuttings from wind that may cause excessive loss of water. Avoid using a poly ethylene sheet to cover cuttings being transported, as this will increase temperatures and humidity that may cause damage to the cuttings.

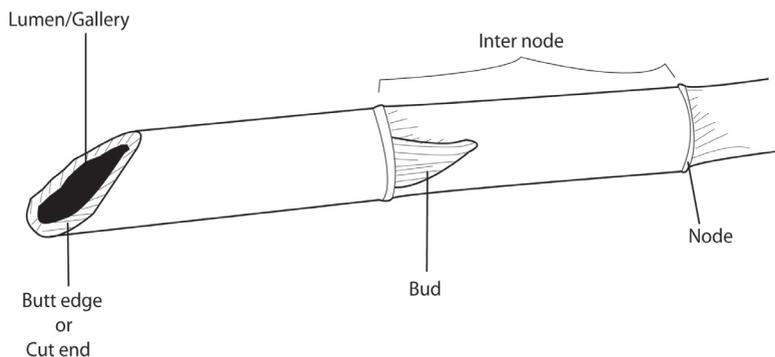


Figure 1: A bamboo cutting

## Preparation of Cuttings

- Using a sharp panga or chisel, make holes at internodes of cuttings (Plate 3). The holes allow water to be poured in the gallery to sustain life. The holes should be made as soon as cuttings arrive in the nursery, preferably the same day.

## Preparation of Nursery

- In medium and low temperature areas, the use of a greenhouse is desirable (Plate 4). An open nursery may be used in warm sites but use of greenhouse is recommended. A greenhouse increases temperature and humidity that increase success in sprouting and rooting of cuttings.
- Prepare nursery beds on the floor of greenhouse or on the ground in open nursery by flattening the ground.
- Make raised beds for placing potted seedlings. Raised beds allow for self-pruning of seedling roots.



Plate 3: Making a hole between two nodes of a cutting



Plate 4: A green house made from standing poles and covered with polythene sheet

## Propagation of Cuttings in Nursery or Greenhouse

- Place polyethylene sheet on the ground and pour a thin layer of volcanic ash or river sand. The polyethylene sheet will prevent water loss into the ground.
- Arrange the cuttings on the polyethylene sheet with buds facing sideways and holes facing upwards. Ensure the live buds do not face downwards as this may choke the emerging shoots leading to deaths (Plate 5).

- Pour clean water through the holes to fill the entire volume of the cuttings (Plate 6).



**Plate 5:** Laying cuttings on polythene sheet with the holes facing upwards



**Plate 6:** Water being poured into the cuttings through the holes

- Cover the nodes with volcanic ash or river sand. Avoid spilling sand into the holes as this may introduce microorganisms into the culms, which may cause infection leading to decay.
- Leave the holes open to allow refill with water once a week.
- Water the dry sand and cover the cuttings loosely with a polyethylene sheet, to reduce moisture loss through excessive evaporation (Plate 7).



**Plate 7:** Cuttings covered with polyethylene sheet to protect them from losing too much moisture

- Observe through the clear sheet for development of shoots. Raise and support the polyethylene sheet with pegs to create more growing space as the shoots grow.
- Remove the polyethylene sheet to allow the young sprouts to grow upright once most of the buds at nodes have produced shoots (Plate 8).



**Plate 8: Shoot sprouts from buried cuttings uncovered to allow better growth**

### **Separation of Sprouts from Cuttings and Potting**

- Separate the sprouts at the internodes using a hacksaw (Plate 9) when the shoots are at least 10cm long and roots have developed. Some species, however, take long to root and more time should be allowed before separation of sprouts is undertaken.
- Dip the separated sprouts into a systemic fungicide (Plate 10) to protect them from attack by pathogens.
- Pot the treated sprouts in tubes filled with growth media of sand, soil and manure in the ratio of 1:2:1 respectively (Plate 11).



Plate 9: Separation of sprouts at nodes using a hacksaw



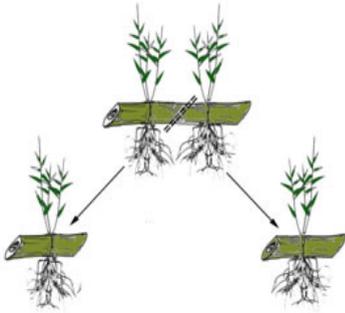
Plate 10: Separated sprouts dipped into a fungicide



Plate 11: Potted seedling obtained from separated sprouts

### **Multiplication of Sprouts or Seedlings**

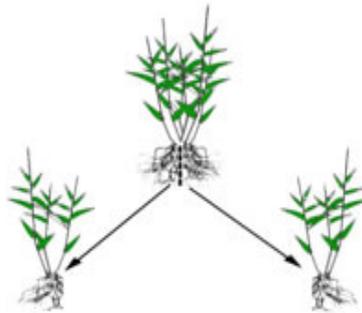
- The potted seedlings produce more shoots and roots that can be multiplied by further separation. The process of mass production of seedlings through splitting or separation of sprouts and seedlings, bearing small rooted rhizomes, is commonly referred to as multiplication or proliferation (Plates 12, 13 and 14).
- Depending on the demand for a particular species, multiple or periodic proliferation can be done to rejuvenate the seedlings for planting in a coming season.



**Plate 12: Separation of sprouts at internodes**



**Plate 13: A multiple stemmed seedling ready for separation**



**Plate 14: Seedlings separation**

### **Managing Potted Seedlings in a Nursery or Greenhouse**

- Keep the potted shoots or seedlings in the nursery or greenhouse (Plate 15) for at least one month to allow recovery and establishment of more roots.
- Water the seedlings twice a day, preferably early in the morning and later in the evening. Avoid over-watering, as this will encourage fungus growth, which may cause seedling death.
- Remove the seedlings from the greenhouse after at least a month, but ensure that they are kept under shade before exposing them to direct sunlight.



**Plate 15: Potted seedlings in the greenhouse**

### **Hardening Seedlings for Planting**

- Harden the seedlings by reducing watering intensity, and shading from 60% to direct sunshine, over a period of one to two months. This process adapts the seedlings to the climatic conditions of the planting area. Such seedlings are now ready for planting in the field.

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## Glossary

<b>Butt</b>	The bottom end of a cut bamboo stem
<b>Clump</b>	A cluster or group of stems of bamboo growing from a common underground rhizome system
<b>Culm</b>	Stem of a bamboo plant
<b>Gallery</b>	The hollow space between two nodes of a bamboo cutting
<b>Proliferation</b>	The method of separating a developed system of rhizome in young nursery material into many individuals
<b>Rhizome</b>	Thick, horizontal stem of bamboo just below the ground, from which new shoots and roots grow
<b>Bud</b>	An extension feature that has emerged from the node which sprouts into a seedling when the culm is incubated.



