

# Growing *Melia volkensii*

A guide for farmers and tree growers in the drylands

Bernard Muok, Akula Mwamburi, Ezekiel Kyalo and Samuel Auka



KEFRI Information Bulletin No. 3



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**Cover photograph**

*Melia volkensii* in a grazing field in Kitui District

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## Foreword

Farmers in the drylands generally have larger tracts of land than in other areas. This land, if put under appropriate high value trees, can earn income for the farmers besides protecting the environment. Tree farming is also an avenue for diversifying investment activity at farm level. *Melia volkensii* is an indigenous tree species found in the drylands of East Africa east of Mt. Kenya to southern Tanzania. It is a fast growing tree, drought tolerant and produces high quality hardwood timber used to make furniture, door and window frames.

Growing of *Melia volkensii* has the potential to increase the income of farmers in the drylands. KEFRI through its Dryland Forestry Programme has over the years developed technologies to optimize the growing of *Melia volkensii*. The knowledge on propagation, establishment and management of *Melia* accumulated over the years of research is presented in this booklet.

This booklet is intended for farmers and tree growers and aims at providing information on the growing of *Melia* as a successful economic enterprise in the arid and semi-arid lands (ASALs).

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# **1 Introduction: Why grow Melia?**

*Melia volkensii* (Melia) is an indigenous tree species in the plant family Meliaceae. Its common names include Mukau (Kamba/Mbeere/Embu/Meru), Mpendabure (Swahili), Kirumbu (Taita) and Boba (Somali). Melia grows naturally in the semi-arid zone of Ethiopia, Somalia, Tanzania and Kenya. The species is common in deciduous bushland in association with Acacia-Commiphora vegetation in Agro-ecological Zones IV –V (arid and semi-arid). In Kenya, the species grows mostly in Mbeere, Tharaka, Mutomo, Kitui, Mwingi, Makueni and Taita Taveta, where it is managed as remnants of natural stands, woodlots, scattered trees on cropland, and homestead compounds.

Melia has been heavily exploited because it is highly valued as a timber tree. This trend has been worsening over the last decade owing to shortage of alternative hardwood species. As a result, the tree growers are now striving to grow Melia as a plantation species. Propagation of Melia has, however, been a major bottle neck and has hindered planting of the species on large scale. Given that this is a high value tree species in the drylands, farmers lack enough information on appropriate Melia silvicultural practices for best production of the tree crop.

Kenya Forestry Research Institute (KEFRI) has been at the forefront in developing propagation, establishment and management techniques for Melia since the 1990s. Through on-station and on-farm research, several techniques of establishing and managing the tree have been realized. This information bulletin provides the various practices involved in Melia growing including propagation, establishment and management.



## 2 Melia tree characteristics

*Melia volkensii* is a deciduous tree, 6-20 m tall with diameter of up to 25 cm. The tree has an open crown and laxly branches. The bark is grey and fairly smooth. The bright green leaves are compound, up to 35 cm long with 3 to 7 deeply lobed leaflets. The flowers are small, and white in colour, borne in branching heads. The fruit is green, oval and about 4 cm long.

## 3 Environmental requirements

The tree grows at altitudes of 350 to 1700 m above sea level, in areas with mean annual rainfall ranging from 300 to 800 mm. *Melia* can grow well in most sandy soils but prefers sandy/loamy soils with good drainage. The tree does not tolerate black cotton soils or areas prone to water logging.

## 4 How to propagate Melia

*Melia* can be propagated through three methods:

- Seed
- Wildlings
- Vegetatively by use of stem and root cuttings

### 4.1 Propagating from seed

This is the main method of raising *Melia* seedlings. Propagation from seeds involves seed collection, extraction, pre-sowing treatment and pricking out.

#### 4.1.1 Collecting, processing and storing seed

It is important to identify good mother trees from which seed is collected. As *Melia* is grown for timber, the selected mother trees should be vigorously growing with large straight bole (stem) free from nodes. To ensure high genetic diversity, seeds should be collected from at least 20 trees which are more than 30 m apart. Mature fruits are yellow in colour and easily drop on their own.

However, it is better to collect mature fruits directly from the tree before they drop. Collected fruits should be carried in gunny bags but should not be stored for a long period as they will ferment, making the seeds lose viability.

### 4.1.2 Extracting seed

#### Step 1:

De-pulp the collected fruits using mortar and pestle (Plate 1a).

#### Step 2:

Wash the nuts obtained and dry them under shade for at least one day (Plate 1b).



Plate 1: (a) De-pulping using mortar and pestle



(b) Nuts dried in the shade

#### Step 3:

Extract seed from the nuts using either of two methods (Plate 2):

- Use a nut cracker developed by KEFRI
- For a cheaper method of extraction, use a knife and a plank of wood

**Note:** One nut contains 1-5 seeds and on average there are 200 seeds per kilogramme of nuts.



Plate 2: *Melia volkensii* nut cracking methods:  
(a) Using a plank wood



(b) Using a nut cracker

### 4.1.3 Pre-treating and sowing seed

#### a) Pre-treatment

Melia seeds contain two coats, which hinder moisture penetration. This makes it necessary to have a pre-treatment process before sowing. Pre-treatment involves 3 steps:

- Step 1: Nipping the seed
- Step 2: Soaking the seeds in cold water for 24 hours
- Step 3: Slitting the seed coat longitudinally

#### b) Sowing

Avoid damaging the seed cotyledon and the embryo during nipping and slitting. Sow the seeds in a non-mist propagator (Plate 3a) in a germination medium of river sand sterilized by using 6% sodium hypo-chlorite solution such as JIK™. You can also improvise the non-mist propagator by using plastic basins covered with polyethylene sheet and tightly wrapped with rubber band (Plate 3b). Some farmers also use a bed of sand supported by clay bricks and covered with polyethylene.



Plate 3: Different sowing chambers:  
(a) Non-mist propagator



(b) Plastic basin covered with polyethylene

#### c) Watering and temperature control

Water the seed bed thoroughly once and cover it. The plastic cover ensures that the seed bed remains humid. The objective is to create a moist but not wet medium. Temperatures in the propagators should range from 28 to 30 °C. The months of June, July and August and rainy season are not favourable for *Melia* germination due to low temperatures. *Melia* seeds are easily attacked by fungus so it is advisable to spray the germination media with fungicides such as Ridomil™ from sowing time till pricking out.

#### 4.1.4 Pricking out

Germination takes place after 3-6 days. The recommended pricking out time is 1-3 days after germination (Plate 4). Late pricking out results in higher shock to the seedlings and hence higher mortality of the germinants. After pricking out seedlings, remove the seed coat to reduce fungal attack to the seedlings. Transplant the pricked out seedlings into appropriate potting material filled with potting media composed of soil, sand and manure in the ratio 4:1:1.



Plate 4: Seedlings pricked out:  
(a) 3 days after germination



(b) 5 days after germination

## 4.2 Other propagation methods

Planting of *Melia* wildlings directly into the field is a common practice among farmers. *Melia* wildlings are also potted and managed in the nursery before out planting. Studies have also shown that vegetative propagation through stem and root cuttings are possible with limited success.

## 4.3 Managing *Melia* seedlings in the nursery

### 4.3.1 Watering and fungal control

Keep the pricked out seedlings and potted wildlings under moderate shade (50-70%) for two weeks before transferring to an open nursery area (Figure 1). *Melia* seedlings are sensitive to water logging, and so it is important to control watering. Over-watering pre-disposes the seedlings to fungal attack (*Fusarium* spp.) causing damping-off disease. Seedlings are therefore watered once in two days or when the potting soil is dry.



Figure 1: Seedlings under shade

### 4.3.2 Hardening up

The seedlings stay in the nursery for at least 3-4 months before they are ready for transplanting. Seedlings are ready for planting when they are at least 30 cm tall. At least two weeks before transplanting into the field, seedlings should be prepared for the harsh field conditions through hardening up. This is done through reducing the watering frequency and exposing the seedlings to more direct sunshine.

## 5 Transplanting Melia in the field

### 5.1 Selecting the site

Select the site for planting Melia well in advance, usually a few months before the onset of the rains. Melia does well in sandy or loamy soils with good drainage. It is sensitive to flooding and does not do well in black cotton soils. If planting on slopes, you need to construct soil conservation structures. Cultivate your land to improve water infiltration, but leave existing valuable tree species in the field (Plate 5).



Plate 5: Melia site ready for planting. Notice valuable trees are left in the field (background).

### 5.2 Spacing and pitting

The recommended spacing for Melia is 5 m by 5 m. Planting holes should be at least 45 cm square and 45 cm deep. Larger holes are better during initial stages of tree growth as they hold more rain water and make it available to the plant for a longer period. Re-fill the planting hole with the original top soil just before the rains begin. Mark the centre of the hole with a stake.

### **5.3 Field planting**

Start planting immediately the rainy season begins. The ideal planting season in the eastern drylands is during October – December rains. To test if the soil has enough moisture, dig up some soil from the lower horizons of the planting pit after a few days of continuous rain but on a non-rainy day. Then squeeze this soil in your hand. If the soil particles form a muddy wet bond then this is the ideal planting time. However, if the soil particles disintegrate on release, you must wait for more rainfall. You should plant on a cloudy day.



Figure 2: Planting seedling in field

Make a hole the size of the seedling container in the middle of the planting pit, using a jembe or machet. Slightly squeeze the seedling container on the sides to loosen the potting soil and remove the container while carefully retaining the ball of the soil around the roots. Then lower the seedling into the pit to the root collar level and compact the surface around the seedling first by hand and then by foot to increase contact between seedling roots and soil (Figure 2).

## **6 Tending and managing Melia**

There are several management practices recommended for growing Melia crop. These include: weeding, protection, pruning, managing tree-crop interactions, and pest and disease management.

### **6.1 Weeding**

For young Melia trees to survive and grow, you must ensure complete weed control. Two or three weeding per season is recommended within the first three years after the tree has taken root (Plate 6).



Plate 6: Completely weeded Melia plot

## 6.2 Protection

The major problem experienced in growing *Melia* is the browsing of young trees by domestic and wild animals such as dik-diks. To get quality timber, the planted trees should be fully protected from browsers for at least 1–2 years after they take root (Plate 7). However, livestock may graze the field if the trees are adequately protected from domestic animals such as donkeys which at times debark the trees.



Plate 7: Young *Melia* seedlings protected from browsers

## 6.3 Pruning

*Melia volkensii* is pruned by plucking young buds (Plate 8), which if not removed will develop into branches. Do not remove leaves. The pruning is important in order to get clean, long, and straight boles with few knots, and hence improve the quality of timber. Pruning is recommended to start as early as three months after planting. The *Melia* trees should be pruned up to two thirds of tree height. Over pruning will result in weak stems which bend over time.

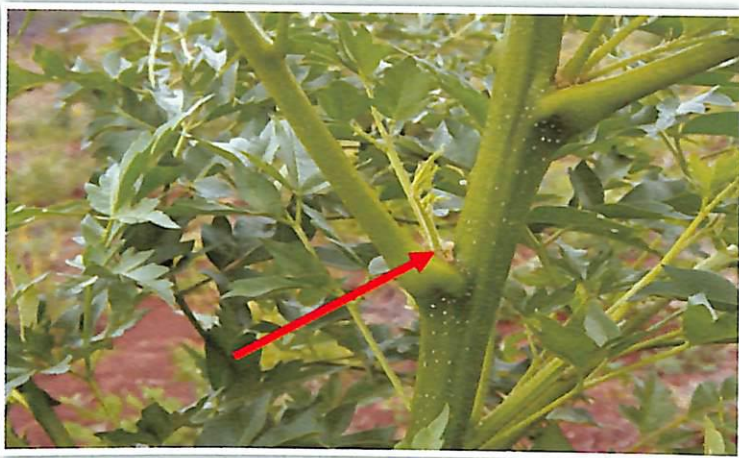


Plate 8: Pruning young *Melia* by only removing the buds (see arrow)

## **6.4 Managing *Melia volkensii* and crop interactions**

*Melia volkensii* is a fast growing tree species, reaching over 1 m height in one year. Even with this fast growth, *Melia* in its initial stages does not compete with crops as it has a light crown and the root system is not extensive. It is therefore possible to intercrop the tree with most agricultural crops. However, under plantation, it is recommended that only short crops such as beans are planted in the first year since taller crops such as maize shade the tree. After four years the tree canopy does not favour intercropping due to shading effect on the crops.

## **6.5 Managing pests and diseases**

*Melia* has few economically significant pests and diseases at field level. However, scientists are currently observing and researching on occurrences of cankers (a fungal disease).

## **7 Uses of *Melia***

*Melia volkensii* is mainly planted for its timber which is durable, termite resistant and is classified as a valuable hardwood comparable to camphor. The timber is used for construction and furniture. Its twigs, leaves and fruits are fodder for goats, cattle and sheep during the dry season. Some people also use extracts from the leaves on the skin of goats to control ticks and fleas.

## **8 Growth, yield and harvesting of *Melia***

Preliminary findings indicate that growing of *Melia* is a profitable activity for farmers in the drylands. *Melia volkensii* produces timber in shorter rotations than any other timber species in the drylands of Kenya. The tree can be harvested for timber in 12-15 years. Most farmers sell their *Melia* trees as standing trees. However, it is more profitable to harvest and sell the processed timber rather than the standing tree as *Melia* timber fetches higher prices in the market (Table 1).

One hectare can accommodate 400 *Melia* trees at 5 m by 5 m spacing. By the time of maturity, some trees could be lost naturally through animal damage or planned management procedures such as selective thinning. Some trees may also be of poor form for timber. One *Melia* log from a mature tree can produce 300 running feet of 6 x 1 inch timber. Considering a harvest of 250 trees of good quality at maturity, one hectare of *Melia* can potentially yield 75 000 feet (250 trees x 300 feet) of 6 x 1 inch timber. Assuming a price of Ksh. 40 for one foot of 6 x 1 inch timber, one hectare of *Melia* trees can earn a farmer Ksh. 3 000 000 at the end of the rotation period.



Table 1: Timber prices of selected tree species in Kitui town (December 2009)

Tree species	Price (Ksh/ft)
Pine ( <i>Pinus</i> spp.)	25
Cypress ( <i>Cupressus lusitanica</i> )	27
Grevillea ( <i>Grevillea robusta</i> )	16
Mukau ( <i>Melia volkensii</i> )	40

## 9 Selected readings

Beentje H. 1994. Kenya Trees, Shrubs and Lianas. National Museums of Kenya, Nairobi, Kenya.

Kamondo B.M., Kimondo J.M., Mulatya J.M. and Muturi G.M. (eds) 2006. Recent Mukau (*Melia volkensii* Gurke) Research and Development: Proceedings of the first national workshop. KEFRI Kitui Regional Research Centre, 16 to 19 November 2004.

Kidundo M. 1997. *Melia volkensii* – propagating the tree of knowledge. Special issue: improved trees for agroforestry. *Agroforestry Today* 9:2, 21-22.

Schmutterer H. (ed.) 1995. The Neem Tree, *Azadirachta indica* A. Juss and other Meliaceous plants. VCH, Germany.

Turnbull J.W. (ed.) 1990. Tropical Tree Seed Research. ACLAR Proceedings No. 28.

## Glossary

- Bole** – main tree stem; merchantable bole – the length of tree stem fit for utilization as timber
- Deciduous** – perennial plants that naturally shed leaves for sometime in a year
- Genetic diversity** – total number of genetic characteristics in the genetic makeup of a species
- Hardening up** – preparing tree seedlings for planting out by gradual reduction of water, shade and shelter intensity just before out planting in readiness for the harsh field condition
- Inflorescence** – flowering part of a plant and arrangement of flowers upon it
- Laxly** – lacking in vigour firmness; not firm
- Pitting** – digging of holes in the planting site
- Potting** – Process of containerizing growing media for germinated seedlings
- Prick out** – transplant small seedlings individually into nursery beds or containers
- Propagate** – breed specimens of a plant, animal, etc. by natural processes from the parent stock
- Putrefaction** – chemical decomposition that lead to decay
- Silviculture** – the growing and cultivation of trees
- Wildlings** – naturally growing seedlings, as opposed to nursery grown one, used in forest planting

