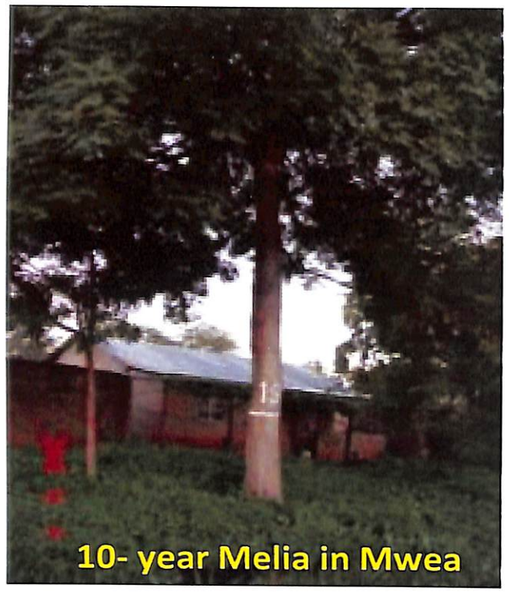
Guidelines on raising seedlings and growing of Improved *Melia volkensii*

FOR SEED/SEEDLING USERS

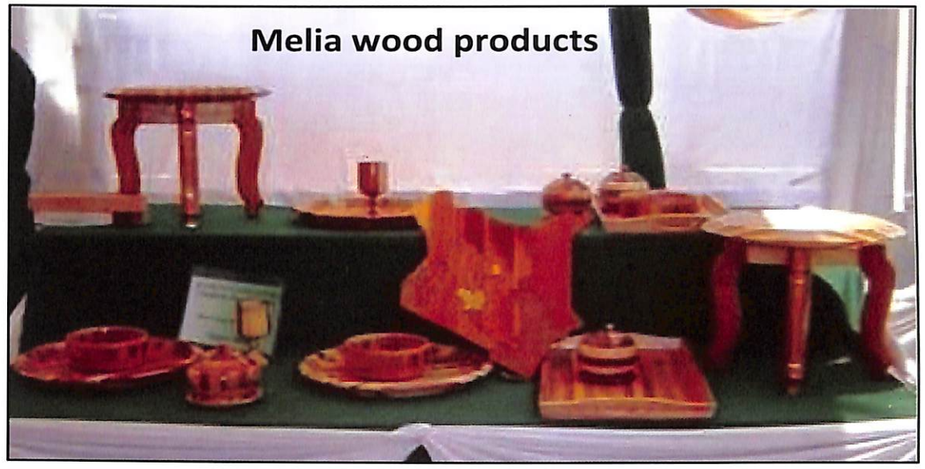
What is Melia and its uses?



10- year Melia in Mwea

- *Melia volkensii* is an indigenous tree species found in most arid and semi-arid areas of eastern and northern Kenya.
- The species is drought tolerant and termite resistant
- Also known as Mukau (Kamba, Mbeere, Tharaka), Mpendabure (Swahili), Kirumbutu (Taita) and Maramarui (Samburu/Maasai)

Melia produces high quality timber used for making high value furniture, doors and windows frames.



Melia wood products

Why and Where should I plant improved *Melia volkensii* ?

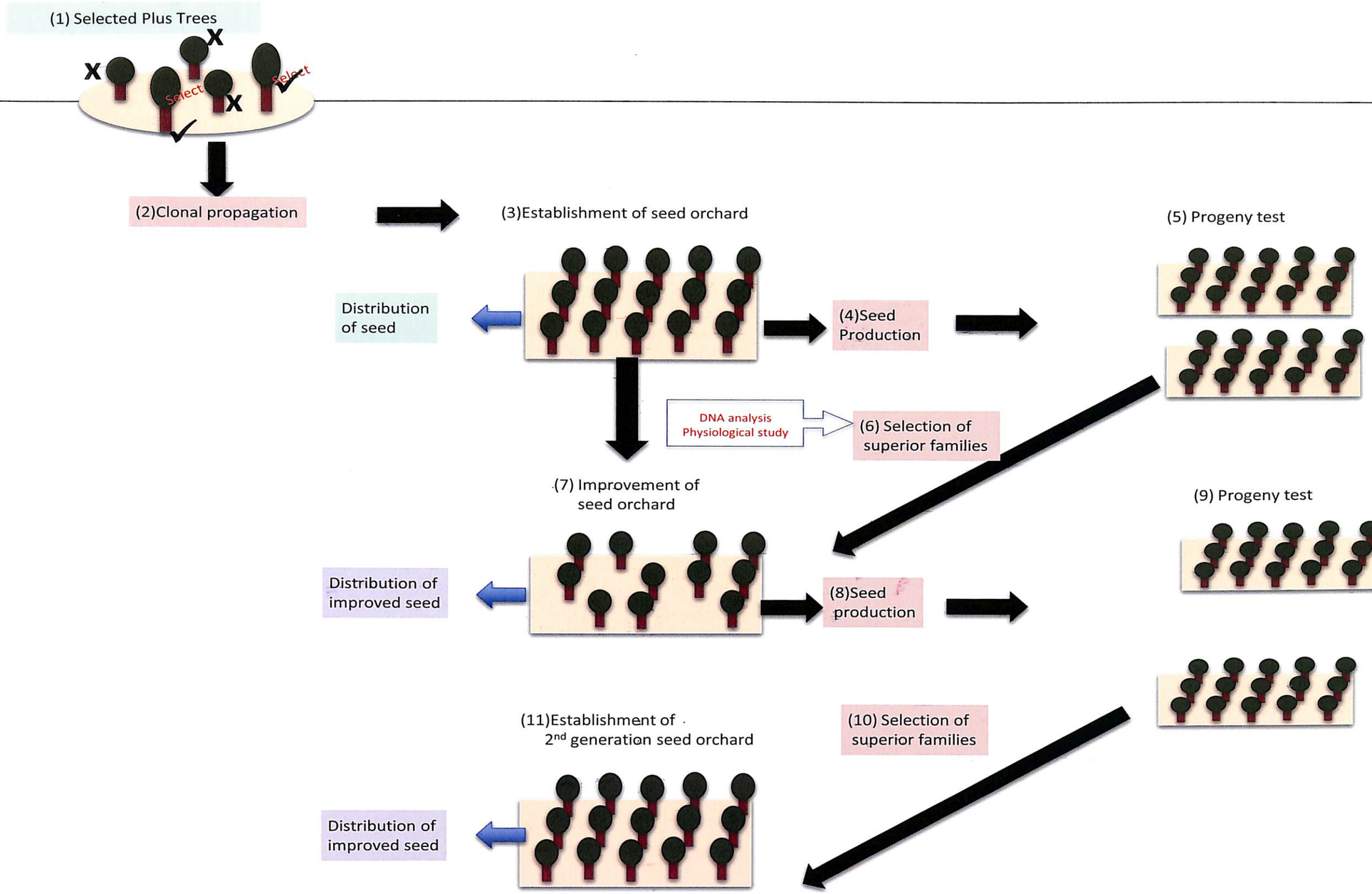
WHY ?

- Since 2006, KEFRI initiated the *Melia volkensii* improvement programme in collaboration with JICA and FTBC. The initiative will make available genetically improved seed to be distributed for planting programmes
- Fast growth with a rotation age of 10-12 years
- Provides high timber returns with value of Ksh8,000-12,000/per tree and about Ksh. 3.6 - 4.6 million per Ha at maturity under well managed system
- Less competition with food crops compared to other species
- Provides fodder for animals.
- Faster growth of improved compared to un-improved Melia

WHERE

- Sites: Arid and semi-arid areas ; • Altitude: 100-1700 m above sea level
- Rainfall requirements: 250-1000 mm;
- Soil type: Well drained sandy clay soils or sandy soils

Overview of tree breeding



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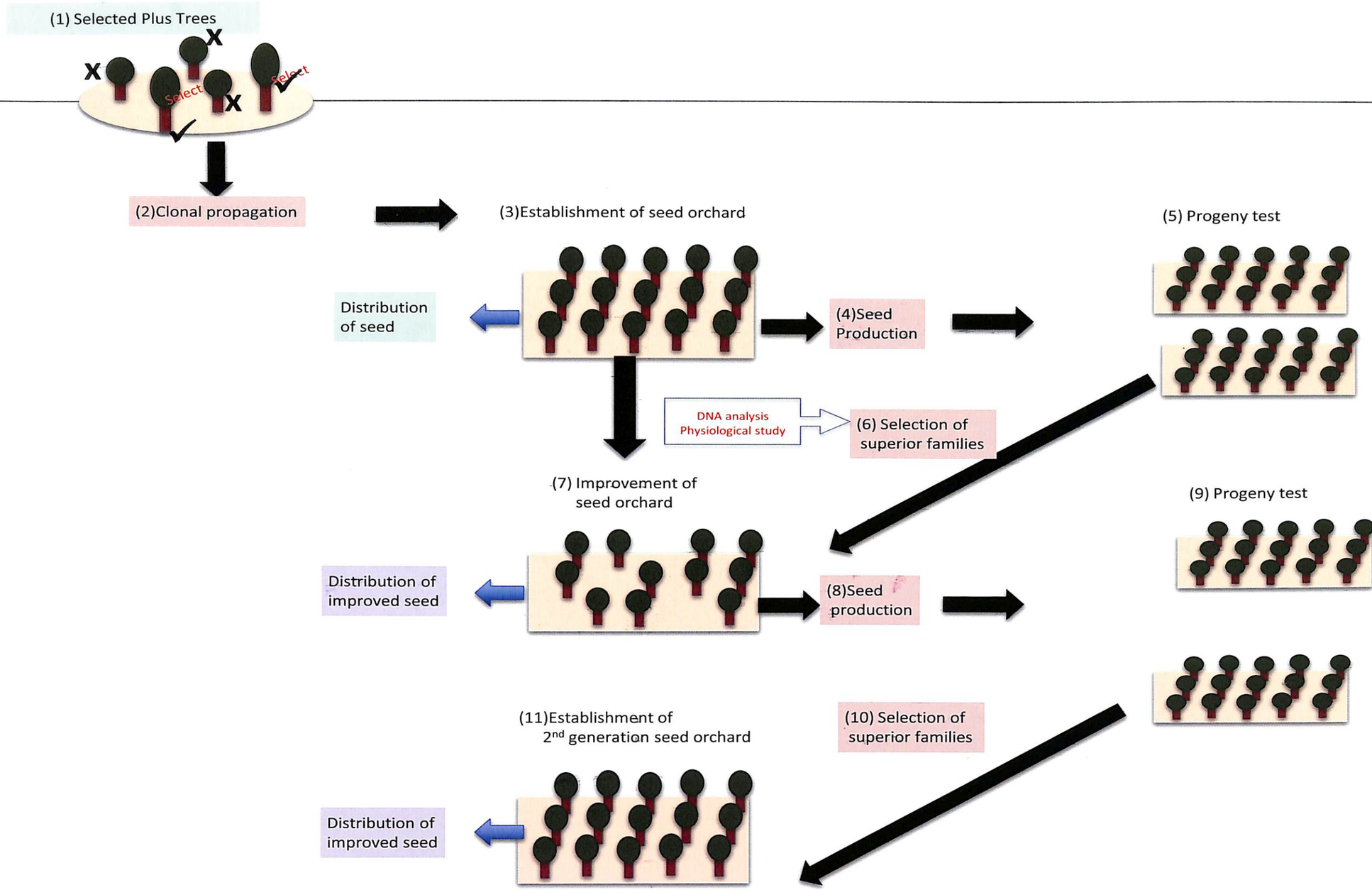
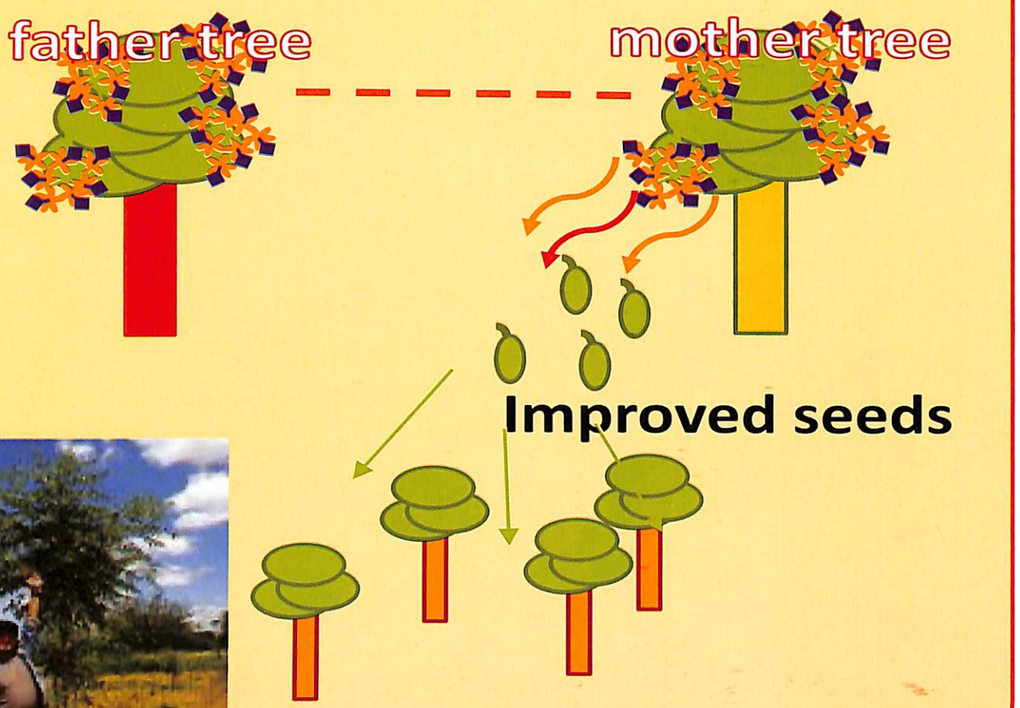
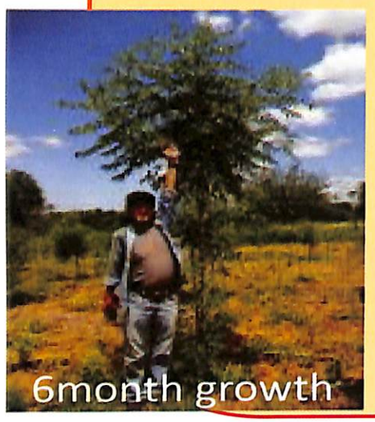


Good performing Melia trees can only be raised from high quality seed obtained from KEFRI bred Melia grown in seed orchards

Do not use Melia seeds from the **un-authorized seed sources** because they will have inferior growth performance

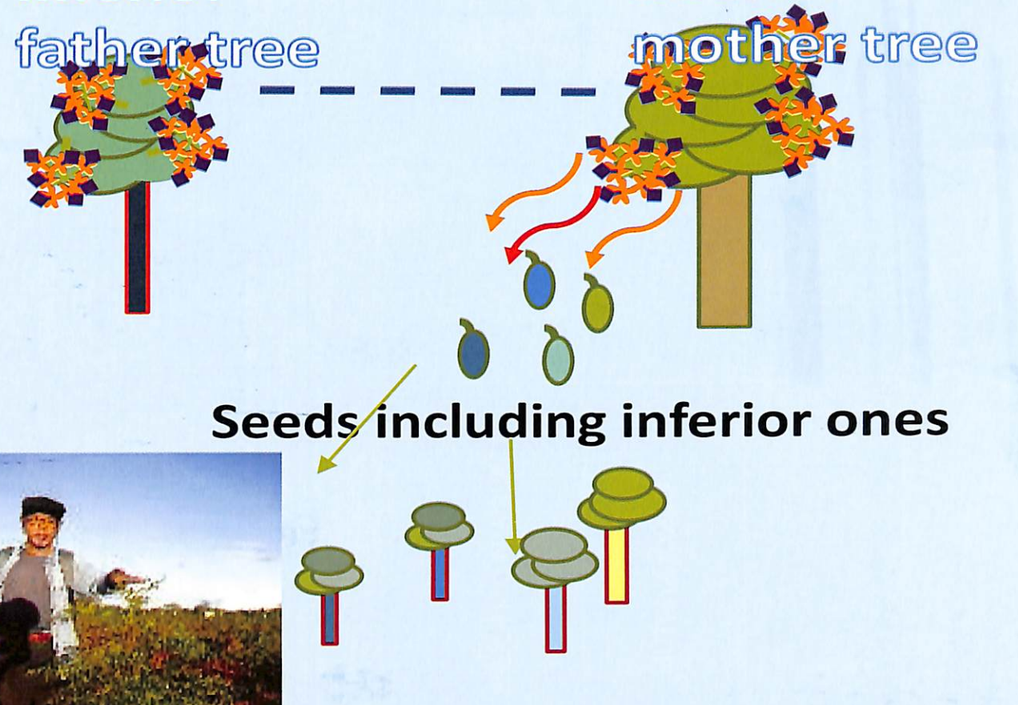
High quality Seeds from KEFRI Improved Seed Orchards





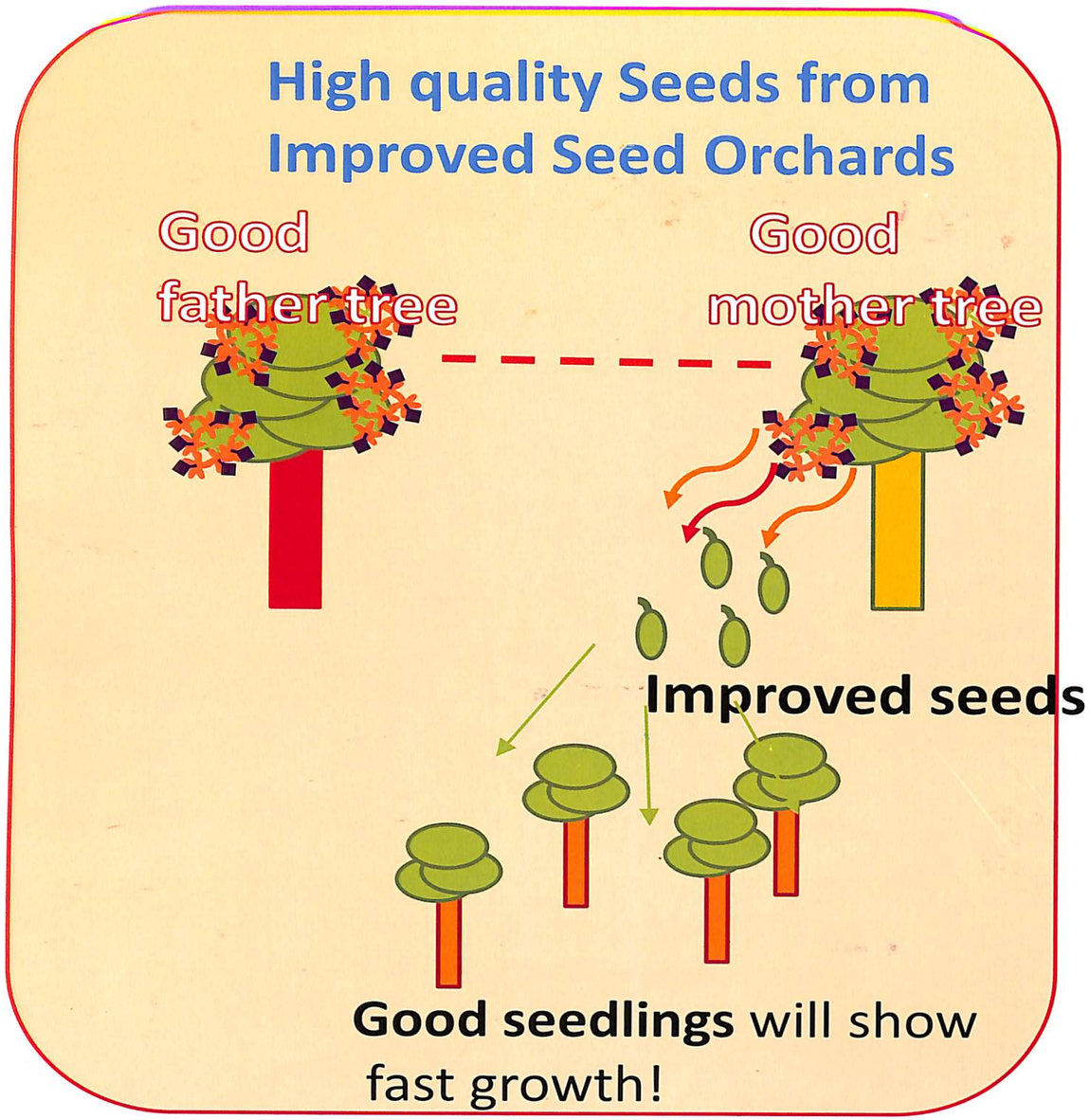
Good seedlings will show fast growth!

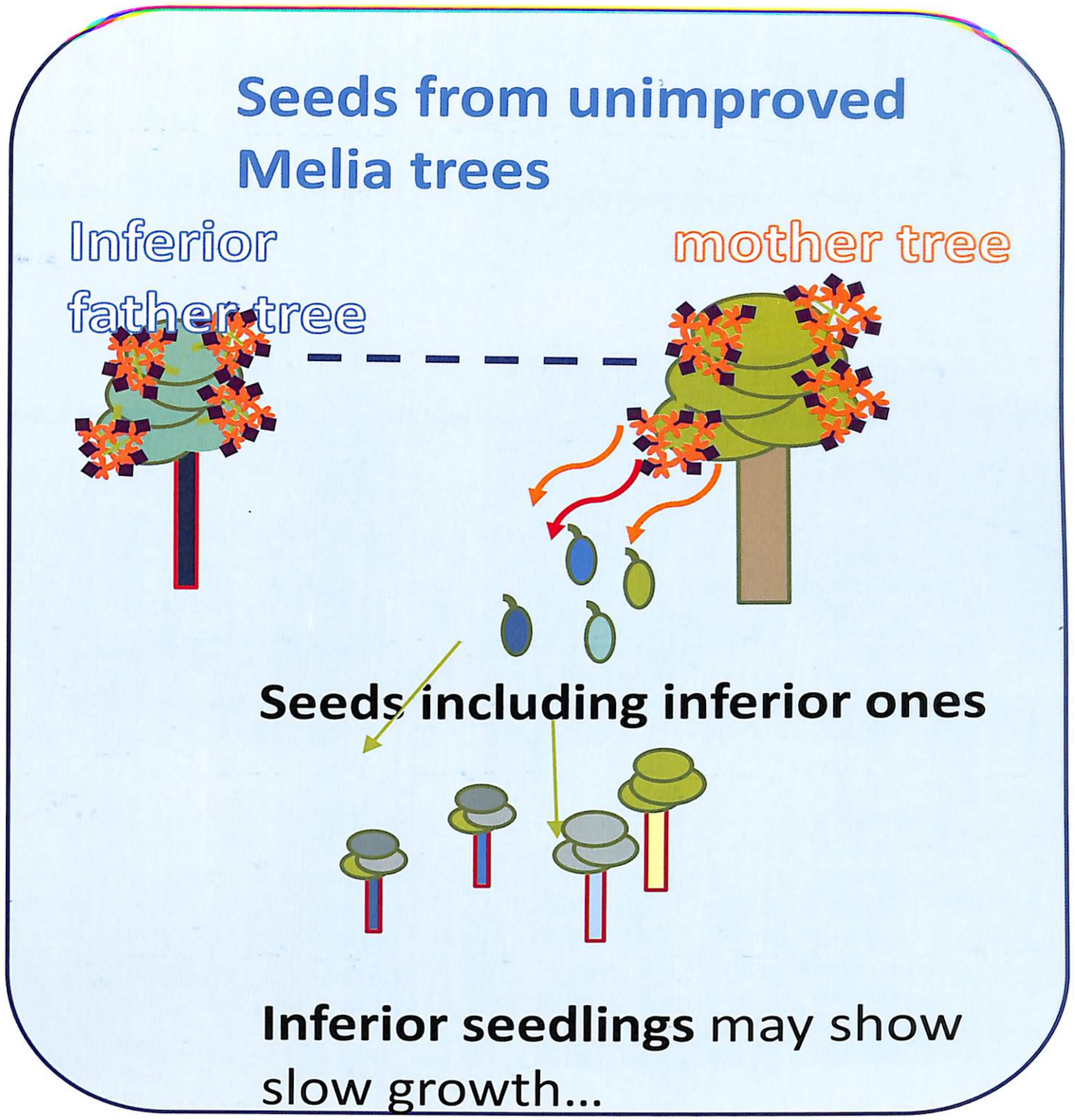
Seeds from unimproved Melia trees



Inferior seedlings may show slow growth...

Even if the tree stands are developed with improved seeds/seedlings, the seeds from them are not quality guaranteed. Cross pollination from surrounding inferior trees depredate the seed quality.



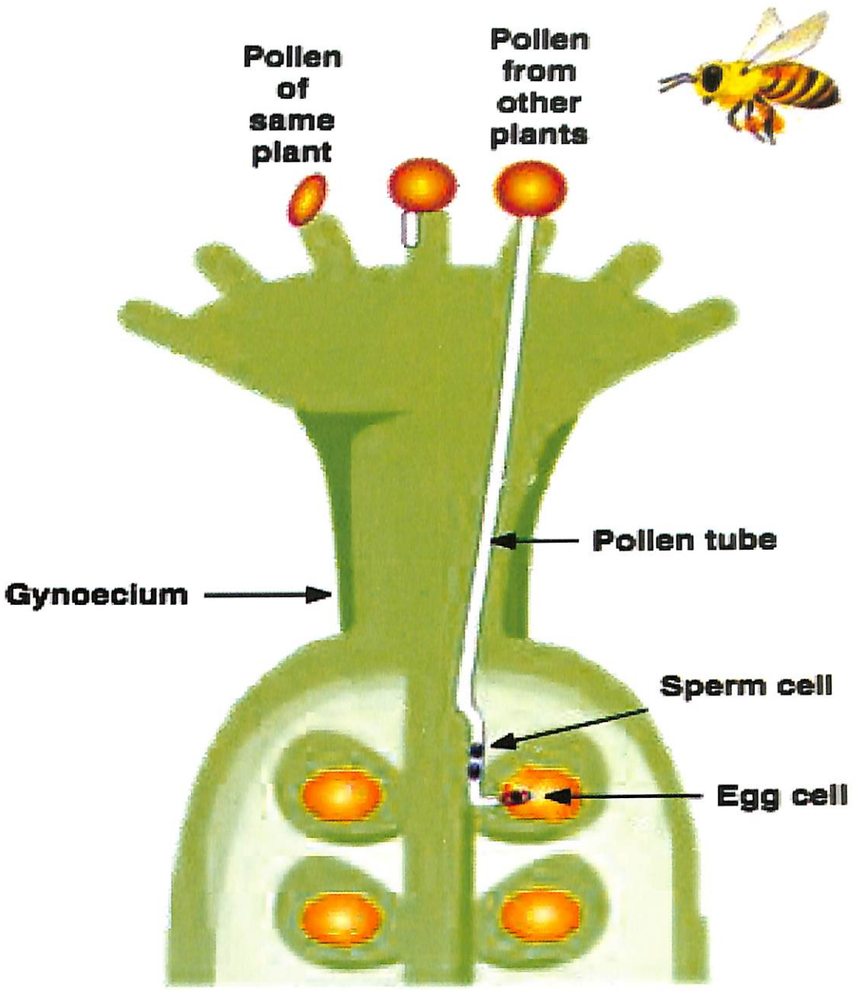


Trait inheritance and tree breeding

- In tree breeding we initially select physically better trait trees (Candidate Plus Trees) and let them mate at random so as to produce seeds and other propagation materials which have inherited superior character of Plus trees
- However, superior characteristics in trees are confirmed through use of progeny testing, which is tests the genetic value of parent trees and also the heritability of traits (capacity to pass on favorable traits to their offspring
- Evaluation of a mother tree's true genetic worth is done by evaluating how its offspring perform compared to offspring from other trees
- By nature of the open pollination, only the genetic of the mother can be evaluated. However, in more advanced breeding as controlled pollination, then the worth of both parents can be tested

Pollination and *Melia volkensii*

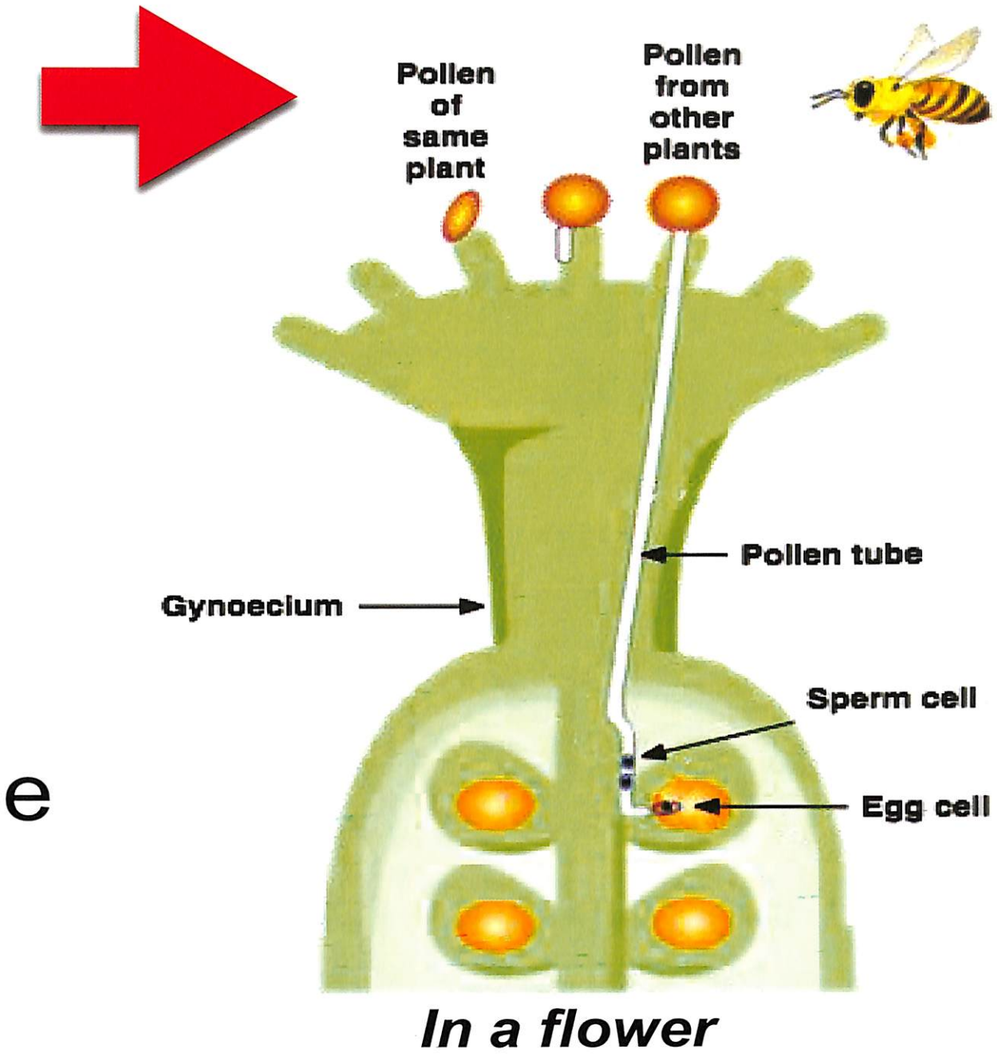
- Seed production in plants including Melia requires pollination.
- Pollination is transfer of pollen from anther (male part) to the stigma and eventually the ovary (female part).
- Pollination leads to fertilization when pollen grows through flower into the ovary and fusion of male and female gametes occurs (see figure)
- *Melia* is an insect pollinated species and most likely by bees.



In a flower

Pollination and *Melia* cont.

- Some flowering plants like *Melia* are mainly cross-pollinated. They need another individual of same species.
- That is why every *Melia* tree has mixed traits of both seeding mother tree and other tree which provided pollen.

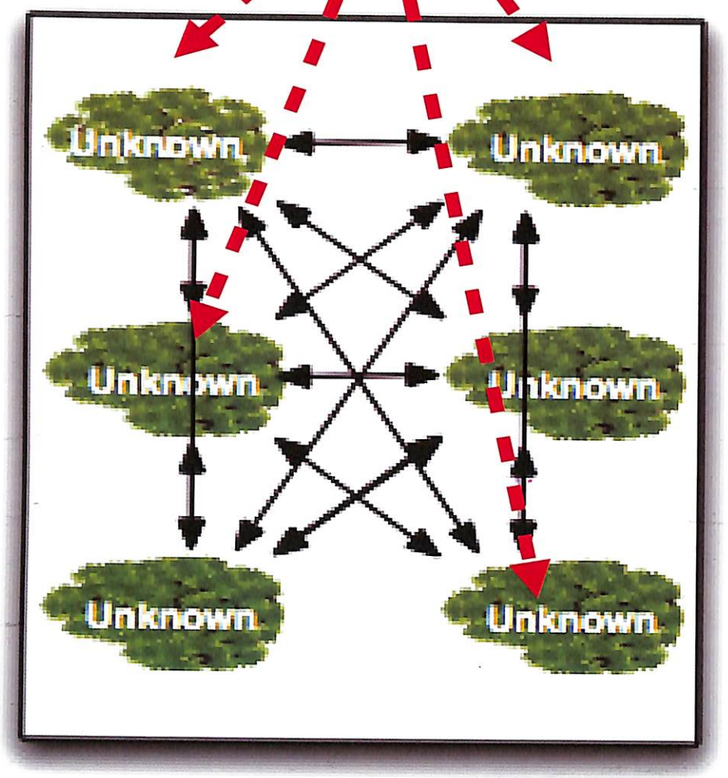


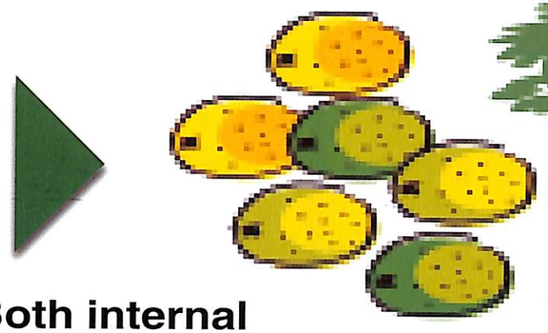
In a flower

Seeds from general sources

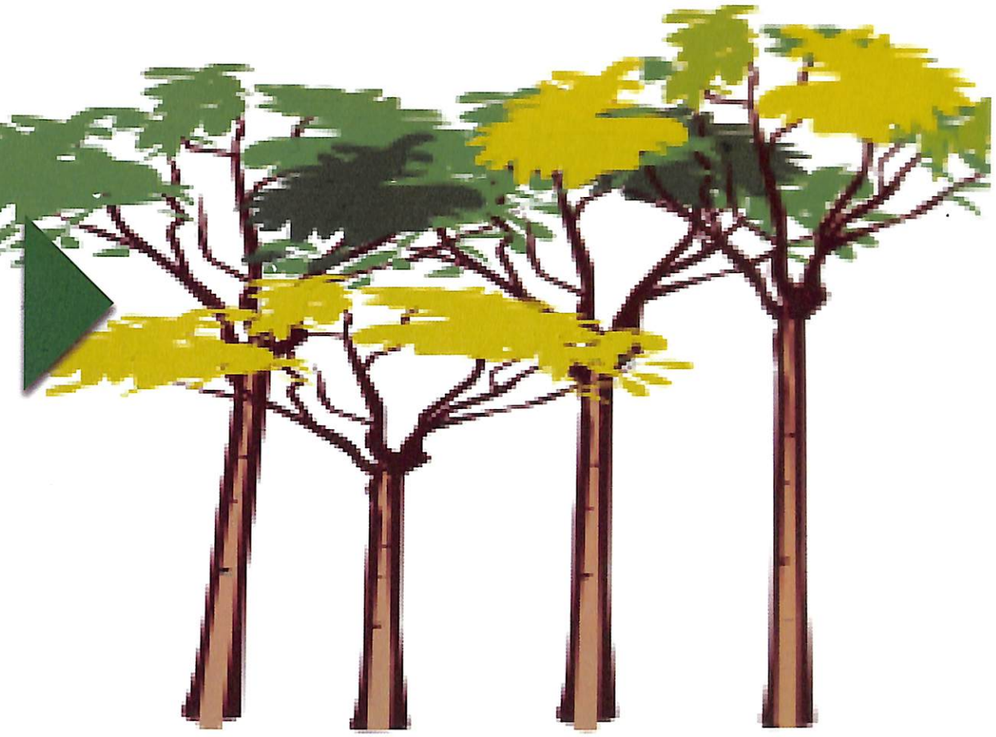
Open site

Pollens come from nearby *Melia* trees which have unknown/mixed characteristics





Both internal and external cross-breeding

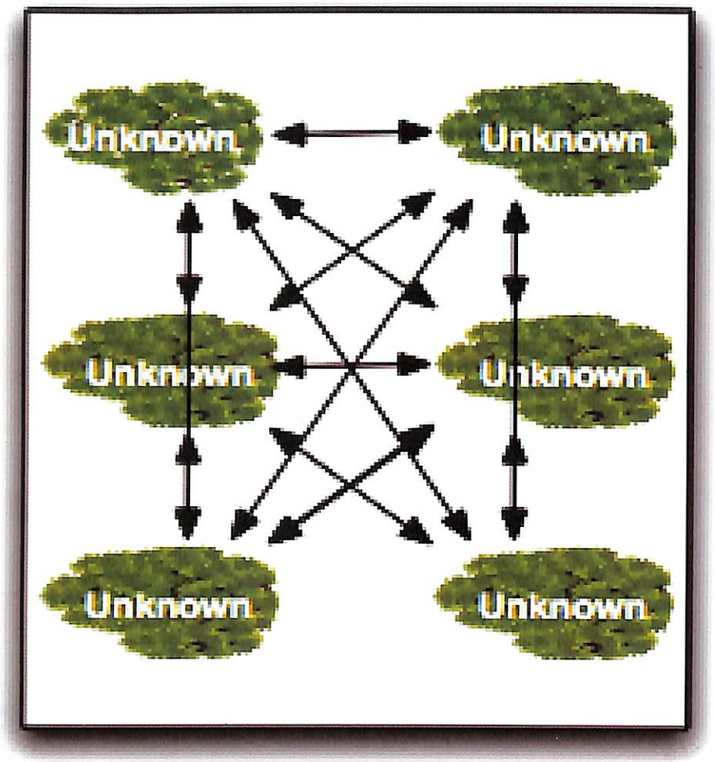


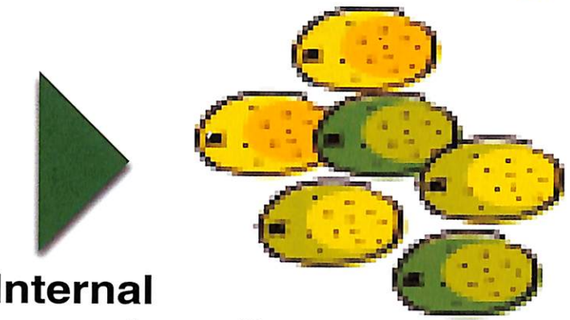
Unknown/mixed characteristics & performance trees

Seeds from improved seed orchard

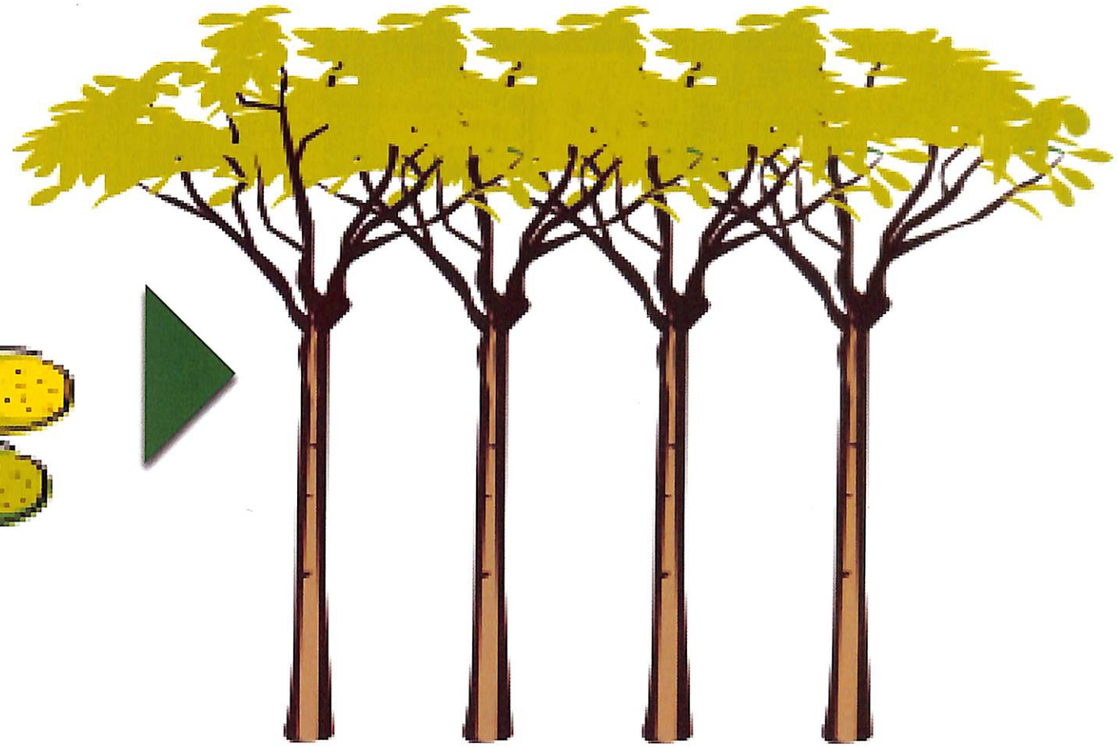
Isolated from surrounding trees

Very few pollens come from outside



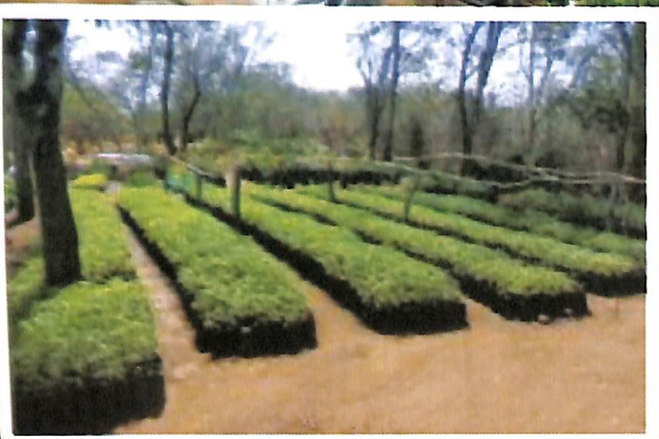


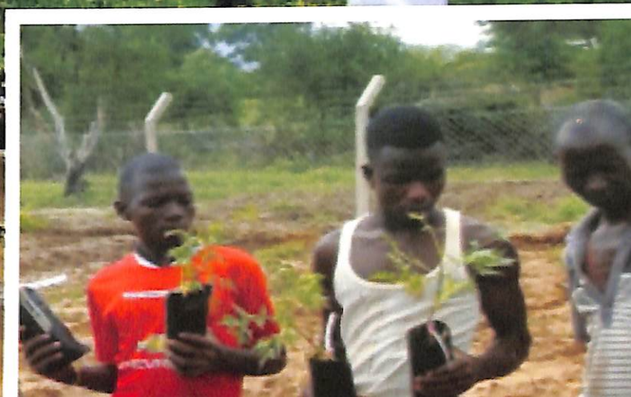
Internal cross-breeding only



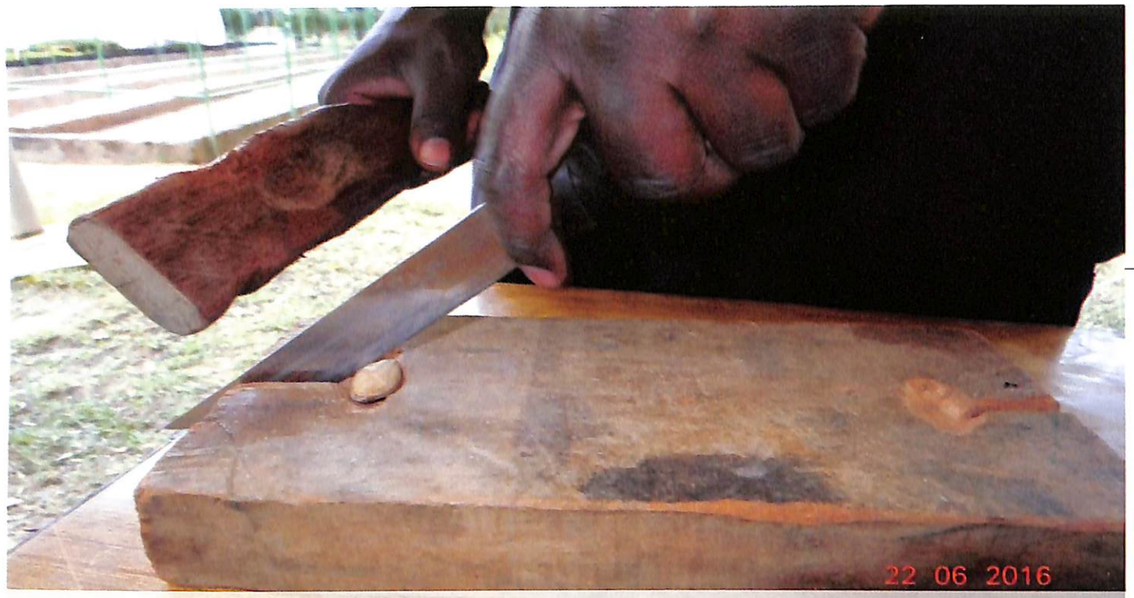
Good characteristics & performance trees only

The process of raising improved Melia seed orchards involves controlled nursery processes to ensure quality





Manual seed extraction from nuts



Put a nut in a dent of a plank or wood base

Carefully crack with a knife or machete

Now seeds can be extracted manually

Melia seed pre-sowing treatments– 3 steps

Melia seed has 2 coats which hinder moisture penetration. This makes it necessary to have a pretreatment process before sowing

1 Nipping of seed on caruncle

Avoid germinating Melia during cold season as low temperatures are not favourable for Melia germination

3: Slitting Melia seeds longitudinally

2: Soak in cold water for 24 hrs

All treatment should be under hygienic conditions. Fungicide such as Ridomil can be added to the water used for soaking

Melia seed sowing

After pre-treating the Melia seed, sow in a germination bed or plastic basin

Use river sand sterilized with 450 ml of Sodium hypochlorite solution such as Jik ™ per 20 L of water and fungicide such as Ridomil ™ 5 g/Litre

Sow by placing seed on sand and covering with a thin layer of sand equal to double the length of the seed

Water thoroughly (once, using sterilized water) and cover the germination bed or plastic basin with clear polythene

Subsequently, water only when needed. Seed will germinate in 3 to 6 days

Several types of *Melia volkensii* germination beds

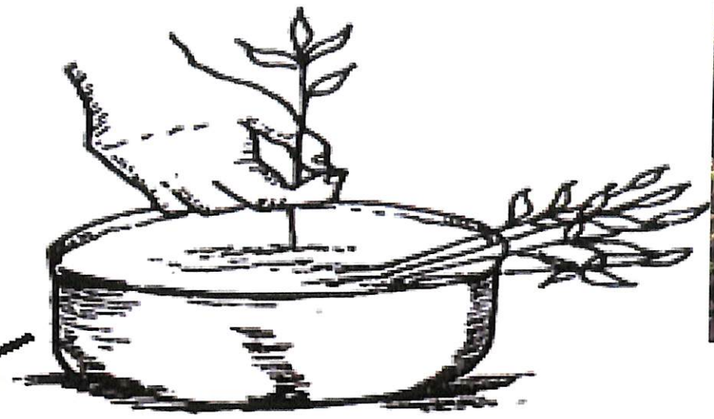
Typical *Melia* germination bed with wood and plastic sheet

Small germination bed with local material

Germination bed used plastic basins

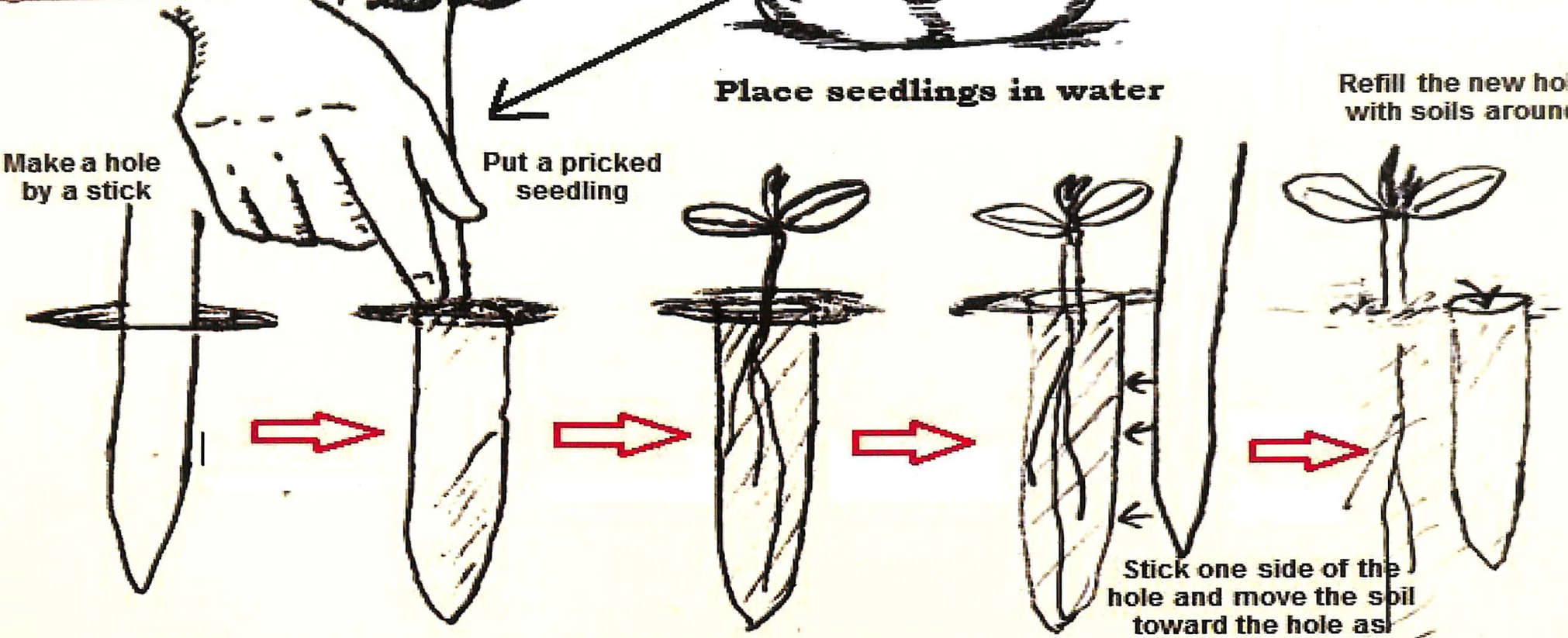
Pricking out process

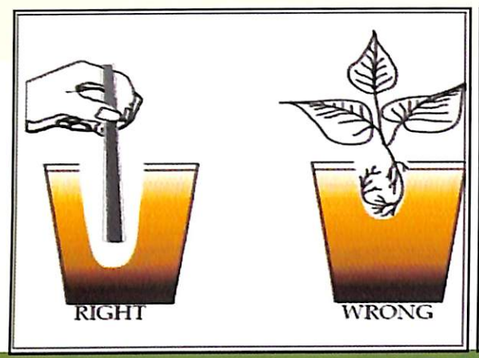
Remove seedling from sowing bed

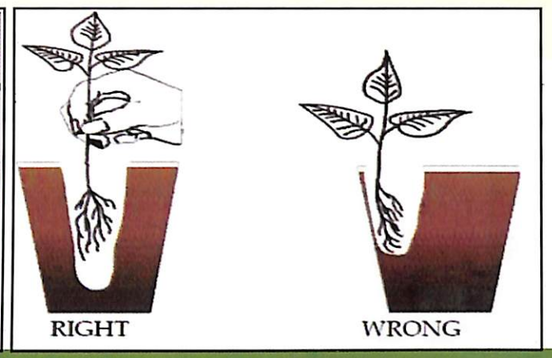


Place seedlings in water

Refill the new hole with soils around

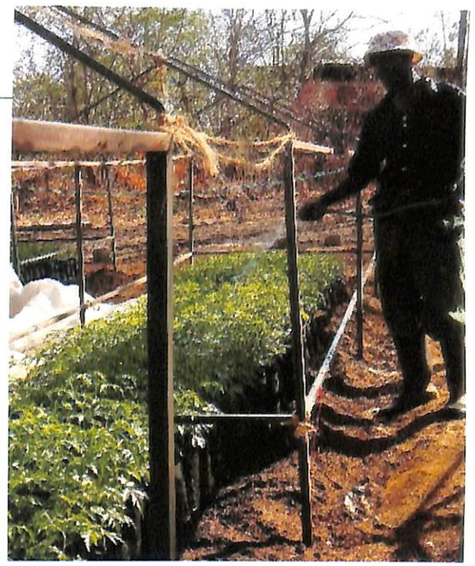






Keep seedlings under 75% shade for 2 weeks after pricking out and protect from heavy rain

Seedlings Management



Watering and disease control

Melia seedlings are sensitive to water logging, and so it is important to control watering. Over-watering pre-disposes the seedlings to fungal attack such as (*Fusarium* spp.) causing damping-off disease. Seedlings are therefore watered once in two days or when the potting soil is dry

Weeding and root pruning:

Keep nursery and seedling pots free of weeds. Frequently lift the pots to prevent roots from embedding into ground

Hardening off

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

Melia tree and plantation management

PLANTING:

- Prepare land in readiness for intercropping
- Use 30 x30x30 cm to 45x45x45cm planting hole size depending on site
- Use a spacing of 4x4 to 5x5 metres (400 to 625 stems per ha) for Melia planting
- Use atleast 30cm seedling size during planting

MANAGEMENT:

- Ensure periodic spot weeding (1m around tree)
- Ensure regular removal of buds
- Start pruning when trees are at least 2 m in height
- Protect young seedling from animals, pests and diseases
- High and low pruning can be avoided if buds are removed early

Laws and regulations

- **While establishing improved *Melia* orchards, KEFRI identified and documented their DNA characteristics.**
- **Therefore, every material produced from improved *Melia* seed orchard, can easily identified through DNA analysis.**
- **It will there be easy to detect any fake seeds/seedlings presented as improved Melia material. Misrepresentation is prosecutable under the laws of Kenya**