

Module 2: Coffee Nursery Management

Objective

To enable trainees understand all aspects of coffee nursery management in order to raise quality planting materials for enhanced productivity.

Content

- i) Introduction.
- ii) Nursery licensing – terms and conditions, types of licensing, licensing authority.
- iii) Selection of a nursery site - slope, accessibility, security, water supply.
- iv) Coffee varieties – Arabica: SL 28, SL 34, K7, Ruiru 11 Batian, Blue mountain and Robusta
- v) Construction of a nursery structure – Orientation, sand beds, propagators and shade.
- vi) Methods of coffee propagation - seed, Cuttings, Grafting and tissue culture.
- vii) Potting media and transplanting - materials and ratios, specification of potting materials; transplanting - age of pre-germs.
- viii) Maintenance of seedlings - watering, weeding, insect pest and disease management.
- ix) Hardening of seedlings - hardening procedure.
- x) Nursery diversification – fruit trees, agroforestry trees.

Methodology

- i) Lectures - Licensing, site selection, varieties, nursery structure construction, propagation, seedling maintenance.
- ii) Demonstrations - nursery structure construction, seed de-husking, sowing, potting, transplanting, grafting and cuttings.
- iii) Field visits to a coffee nursery and clonal gardens.
- iv) Group discussions on alternative materials for nursery construction.

Teaching aids

- i) Slides and diagrams.
- ii) Design plans.
- iii) Charts.
- iv) Coffee nursery.
- v) Samples - seeds, suckers, potting materials, manure/compost, top soil, UV treated polythene sheets, disinfectant.
- vi) Tools - secateurs, grafting.

2.1 Introduction

Proper nursery management is key to raising quality planting materials to ensure optimum number of seedlings are obtained.

2.2 Nursery licensing

For quality control purposes, all coffee nurseries must be licenced by the relevant licensing authority. To ensure traceability, nursery operators shall maintain proper records in regard to source and amount of seed, number of seedlings realized and to whom the seedlings are sold to.

2.3 Selection of a nursery site

Characteristics of an ideal nursery site:-

- Level or gently sloping land to avoid depressions where cold air settles at night.
- Avoid areas that are prone to flooding.
- Easily accessible and properly secured.
- Sheltered from wind.
- Permanent supply of uncontaminated water.

2.4 Coffee varieties

The existing Arabica commercial coffee varieties are SL 28, SL 34, K7, Kenya Blue Mountain, Ruiru 11 and Batian. Ruiru 11 and Batian are resistant to CBD and CLR and are adaptable to most coffee growing areas of Kenya. Robusta coffee is also grown in Lake Basin region and is also suitable for the coastal strip.

2.5 Maintenance of seedlings

- Water seedlings regularly depending on prevailing weather conditions. Avoid overwatering which predisposes seedlings to damping-off. Other factors that may cause damping off includes; poor potting mixture, over shading and acidic soils.
- Regularly uproot any emerging young weeds.
- Apply foliar feed as recommended after 4 months following transplanting.
- Control diseases such as damping-off and Brown eye spot by using 0.5% copper solution.
- Control the common insect pests like green scales, giant looper and leaf miners as they occur.



Damping off



Brown eye-spot

2.6 Construction of nursery structures

2.6.1 Construction of a propagator for seed and cuttings

- Constructed on East to West direction in order to have shade all the time.
- The propagators are constructed at 1.5m width and a maximum of 10m length.
- To achieve good drainage, scoop the soil out to a depth of 37.5cm (1.5ft). Thereafter, fill with gravel to a depth of 15cm (0.5ft) and then add 7.5cm layer of sand.
- A 15cm layer of rooting media is put on top of the sand.
- For seeds, the recommended seeding media is pure clean river sand.
- For cuttings, the recommended rooting media are either sawdust from cypress trees, pure river sand or red subsoil.
- Construct a wall of 22.5cm above the ground to avoid crumbling of media, surface run-off and assist in holding the polythene sheet cover in place.
- 1.2m high Posts are erected at 3m intervals on either side of the bed.
- To maintain ideal relative humidity and temperatures the propagators are covered with a 1000 gauge UV treated translucent polythene sheet.



Conventional propagator



Improvised propagator

2.6.2 Construction of a nursery shade

- Shield the seedlings from direct sunlight by erecting a shade at 2m high using posts spaced at 3m apart.
- Thick galvanized wire of gauge four is strained on the posts to hold the shade material in place.
- Use appropriate shading material like Shade net(50%) , split bamboo, banana leaves, maize Stover, grass or sisal poles.
- 75-80% and 50% shade nets are ideal for propagators and hardening shade respectively.



A conventional nursery

2.7 Methods of coffee propagation

The main methods of coffee propagation are:

- Seeds
- Cuttings
- Grafting
- Tissue culture

2.7.1 Propagation by seed

- Coffee seeds are acquired from Coffee Research Institute.
- With proper management, 1kg of coffee seed produces between 3000-4,000 seedlings.
- To ensure high germination rate, seeds should be sown immediately after collection. If not sown, the seeds should be kept in cool dry place and not for more than one day.
- Use 5-7cm (2-2.75 inches) deep pure clean river sand (without soil) as propagation media.
- To reduce germination period, de-husk the seed by use of hands just before sowing.
- Sow the seeds at a spacing of 2.5cm by 2.5cm (1inch X 1inch) and a depth of 1cm. The centre cut should face up.
- The seeds are then thinly covered with sand and moistened with water using a watering can.
- Cover the propagator with a 1000 gauge translucent UV treated polythene sheet to maintain ideal temperature and humidity. Ensure the propagators are shaded.

- Apply adequate clean water regularly (ensure adequate moisture by using a finger to check for wetness)
- Regularly uproot any emerging young weeds
- The pre-germs usually emerge after 6 – 8 weeks
- Pre-germs are ready for potting when they have a pair of cotyledons leaves This takes about 2 -2 ½ months



Sowing-centre cut up

Seed thinly covered

Germination & emergence

Pre-germs

2.7.2 Vegetative propagation

Vegetative propagation is a method of producing planting materials using plant vegetative parts instead of seeds. The materials produced vegetatively are genetically identical to the mother plant. This is done predominantly on the disease resistant hybrid cultivar Ruiru 11.

2.7.2.1 Clonal mother plants

- These trees are derived from seedlings which have undergone a pre-selection test for Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR) resistance.
- The selected mother trees are established in the field at a spacing of 1m by 1m.
- After 12-18 months, the primary branches are removed and the stems bent and pegged down in a horizontal position to encourage growth of orthotropic (vertical) shoots.
- Suckers grow from the dormant buds at each node, and are ready for harvesting after six months.



Clonal garden - young suckers



Clonal garden – Suckers ready for harvesting

2.7.2.2 Propagation by cuttings

- Harvesting of suckers should be done early in the morning when the atmospheric relative humidity is relatively high.
- Single node cuttings are prepared by making a cut at an angle below the node but retaining the pair of leaves.
- The cuttings are planted in the propagators at a depth of 2 to 4 centimetres and at a spacing of 4cm by 4cm.
- Callus formation begins 3 weeks after planting and is complete in 5-6 weeks.
- Root development follows after 8-10 weeks.

2.7.2.3 Propagation by grafting

- This is the successful healing of the union between the scion and root-stock.
- Grafting requires 10-12 months old seedlings (or pencil thick) to be used as root-stock.
- Root-stocks of other commercially existing Arabica coffee varieties are compatible with Ruiru 11.
- The graft union is tied with a polythene tape and the entire seedling is placed in a propagator to heal.



Grafting process

2.7.2.4 Propagation by Tissue culture

- This is the generation of plantlets using plant parts such as leaves by use of growth hormones.
- The method is limited to highly specialized facilities/ laboratories and therefore cannot be adopted at the farm level.

2.8 Potting media and transplanting

- The recommended potting mixture consists of three parts top soil, two parts sand and one part manure (top soil: sand: manure=3:2:1). For example, to fill 125 polybags of 5 by 9 inches, use 3 debes of sieved top soil, 2 debes of sand, one debe of well decomposed manure, 25gms TSP or 50gms SSP.
- Put the mixture in National Environment Management Authority (NEMA) compliant potting materials, place them in rows in the shaded beds and water thoroughly.
- Make a hole in the centre of the pot using a pointed stick and insert the pre- germ to the level of the stem crown. For pre-germs, transplanting is done after the two cotyledons unfold, which is about 8 weeks after sowing. Weak pre- germs or those with twisted roots are discarded.
- For cuttings, transplanting is after 8-10 weeks.
- Carefully firm the mixture around the stem.



Poly bags with potting mixture



Pre-germs transplanted

2.9 Hardening of seedlings

- Gradually reduce shade and the watering frequency to harden the seedlings at 7-8 months after potting.
- Completely remove the shade one month before planting.
- Ideally, seedlings are ready for transplanting when they have 1-2 pairs of primary branches. This is around 8-10 months after potting.