Module 3: Coffee Establishment, Rehabilitation and Renovation

Objectives

- To enable growers understand coffee planting practices that ensures optimum plant population, production, productivity and quality.
- To bring back into production coffee farms that have been neglected, devastated by pests or adverse weather conditions

Content

i) Introduction.
ii) Ecological requirements - altitude, temperature, rainfall and soils.
iii) Coffee varieties - improved, traditional, suitable area, spacing and attributes.
iv) Land preparation - timing, procedure, soil analysis and conservation.
v) Layout and preparation of planting holes - procedure, hole size, timing, media preparation and back filling.
vi) Field planting - source of seedlings, age, timing and procedure.
vii) Field maintenance of young coffee - mulching, irrigation, weeding, nutrition and intercropping.
viii) Coffee rehabilitation and renovation - definitions, importance quality improvement, pest and disease incidence, increase national production, profitability.
ix) Considerations for renovation and rehabilitation - extent of pest and disease attack, climate change, poor agricultural practices, age, succession management.
x) Rehabilitation and renovation process - timing and procedure.
xi) Steps of rehabilitation and renovation - assessment, program structure, partners, funding, implementation, monitoring and evaluation.
xii) Barriers towards renovation and rehabilitation - costly, reduced incomes, knowledge, competition from other enterprises, risk involved.

Methodology

i) Lectures - land preparation, filed maintenance, mulching, irrigation, weeding, nutrition and intercropping.
ii) Demonstration - layout and preparation of planting, field planting.
iii) Observation - morphological difference of coffee varieties.
iv) Field visit to a recently established farm.
v) Field visits and observations on neglected and rehabilitated farms.
vi) Case studies on rehabilitated / renovated coffee farms.

Teaching aids/materials

i) Trainers Manual.
ii) Flip chart, marker pens.
iii) Illustrations on proper establishment, deep and shallow planting.
iv) Mature seedlings.
v) Fertilizer samples –TSP/SSP fertilize manure, lime.
vi) Tools - Pegs, planting line, hoes, spade, tape measure and sisal twine.

3.1 Introduction

Coffee is a perennial crop with a long lifespan. Proper establishment is necessary to enhance root development for anchorage, nutrient and water uptake. This will lead to a sustained high yield and quality.

3.2 Ecological requirements of coffee

3.2.1 Arabica Coffee

- Altitude: from 1,200 to 2,100 m above sea level.
- Optimal temperature range: 15 °C -27°C.
- Maximum day temperature: not more than 30°C.
- Minimum night temperature not below 15°C.
- Diurnal Temperature range not more than 19°C.

Above19°C diurnal temperature range results in distortion, yellowing and cracking of leaves and tips, a condition known as "hot and cold" or crinkle leaf.

- Well distributed rainfall of not less than 1000mm per year for East of Rift Valley and 1145mm for West of Rift Valley. Coffee requires a stress period of 1-2 months before the rains to stimulate flowerings.
- Soils: free draining up to a depth of 1.5m to 3m in drier areas, fertile and slightly acidic (pH range 4.4-5.4 calcium chloride method).
- Avoid planting coffee on black cotton soils.

3.2.2 Robusta Coffee

Robusta coffee is a high yielding species well adapted to warm and humid equatorial climates. It requires more hot and humid environment.

- **Altitude:** from 500-1432m.
- **Temperature:** Optimal range of 18°C to 36°C, minimum not below 10°C.
- **Rainfall:** The ideal amount of rainfall lies between 900 and 2000mm that is well-distributed.
- **Soils:** free draining up to a depth of at least 1.5m and 3m in drier areas, fertile and slightly acidic (pH range 4.4-5.4).

3.3 Coffee varieties

The commercial Arabica varieties in Kenya are SL28, SL34, K7, Kenya Blue Mountain, Ruiru 11 and Batian. Ruiru 11 and Batian are resistant to CBD and CLR.

The areas grown, spacing, tree population and the specific varietal attributes are given in Table 1.

Table 1: Commercial coffee varieties

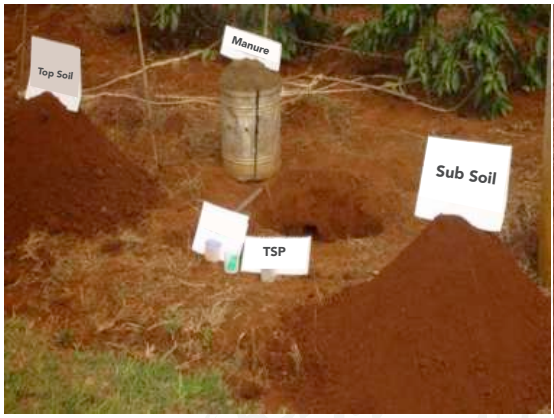
Variety	Areas Grown	Spacing and population density	Attributes
Batian	All coffee growing areas	2.1 x 2.4 m (7 x 8ft) 1905 trees/ha	• Resistant to CBD and CLR • Early maturing (18 months) • Cost effective - reduces costs by 30% • High yielding, high quality
Ruiru 11	All coffee growing areas	2 x 2 m(6.6 x 6.6ft) 2500 trees/ha	• Resistant to CBD and CLR • Early maturing (18 months) • Cost effective - reduces costs by 30% • Compact growth amenable to high density planting • High yielding, high quality
SL 34	High altitude with good rainfall	2.74 x 2.74 m (9 x 9 ft) 1330 trees/ha	• High yielding, high quality • Susceptible to Coffee Leaf Rust and Coffee Berry Disease
SL 28	Medium to high altitude coffee zones less prone to Leaf Rust	2.74 x 2.74 m (9 x 9 ft) 1330 trees/ha	• High yielding, high quality • Susceptible to Coffee Leaf Rust and Coffee Berry Disease
K7	Low altitude	2.74 x 2.74 m (9 x 9 ft) 1330 trees/ha	• Tolerant to Coffee Leaf Rust • Tolerant to drought • High yielding, high quality

3.4 Land preparation

- Prepare the land well in advance, digging out all tree stumps, roots, bushes and grasses. Land cleared of trees within 6 months should not be used for coffee planting because of the risk of Armillaria, a fungal disease which causes root rot.
- Ensure soil analysis is done to determine the inherent soil condition.
- Make terraces or other soil conservation structures where the land has steep slopes.
- Protect bench terraces by planting grasses e.g. Blue grass (Paspulum notatum) on the bench faces.

3.5 Layout and preparation of planting holes

- Layout and peg the planting points along the contours at the appropriate spacing
- Space holes at 2.74m x 2.74m (9ft × 9ft) for SL 34, SL 28 and K7; 2m × 2m (6.6 ft x 6.6 ft) for Ruiru 11 and 2.1m x2.5m (7ft x 8 ft) for Batian variety.
- Dig the planting holes during the dry season, at least three months before planting/ onset of rains.
- Planting holes should measure 60cm x 60cm x 60cm (2ft × 2ft × 2ft).
- Place top-soil (first 15cm or 6 inches) and sub-soil (15cm-60cm or 6”-24”) separately.
- 1 month before planting fill the holes with the top soil mixed with a minimum of 1 “debe” (20 litre bucket) of well decomposed manure or well-rotten coffee pulp, 100g TSP or 200g SSP If the soil pH is below 4.4, add 100g of lime to the mixture, otherwise add as per soil test results.
- Slightly mound the mixture in the holes to allow for settling.
- Place pegs at the centre of the holes and align appropriately.



Planting media

Back filled holes with pegs replaced

3.6 Field planting

- Obtain coffee seedlings from KALRO - CRI or any licensed coffee nursery.
- Select seedlings that are about 30 - 40 cm tall, with 1 - 2 pairs of primary branches and that should have undergone sufficient hardening.
- Plant the seedlings at the start of the main rain season after the soil has become wet up to about 60cm (2ft) deep.
- Remove the pot carefully to avoid disturbing the root system.
- Open the soil mound sufficiently at the top centre to accommodate the tap root and other roots and plant the seedling without burying the stem crown.
- Fill in the soil and press firmly without compacting and avoid stepping on it.
- Avoid deep planting as this usually interferes with nutrient uptake leading to stunted growth.

Deep planting

Correct planting

3.7 Field maintenance of young coffee

3.7.1 Mulching

- Young coffee requires mulching in order to conserve moisture, suppress weeds and moderate soil temperatures.
- Apply the mulch around the stem and ensure that it does not come into contact with it to avoid incidences of insect pest attack.

Mulching of young coffee

3.7.2 Watering

- During dry spells, water the seedlings at least two times a week until they are well established.
- Avoid over-watering to encourage proper root development.

3.7.3 Weed Management

- Undertake hand weeding around the young trees. Use implements like the half-moon jembe to weed in between the rows.
- In the event that there are stubborn weeds like couch grass, cover the seedlings (with a bucket or bag) before spraying the weeds with a suitable herbicide.

3.7.4 Nutrition

- Apply 50g of CAN per seedling six months after planting.
- After one year, apply 80g of NPK e.g. 17:17:17 per tree.
- one and half year apply 100g of CAN.
- At two years, apply NPK at 125g per tree. Subsequent applications should be as per the recommendations - based on soil analysis.

3.7.5 Intercropping

- Intercropping can be undertaken within the first two years after establishment. Suitable intercrops include short leguminous crops such as field beans, tomatoes and irish potatoes.
- Plant the intercrops using a recommended fertilizer preferably NPK fertilizer such as 17:17:17.
- Plant the intercrop at the middle of the inter rows at least 2 feet away from the coffee rows/stem.

Young coffee intercropped with beans

3.8 Coffee rehabilitation and renovation

Rehabilitation is the stumping or pruning of coffee trees to rejuvenate diseased, aging or otherwise underproductive trees. Renovation is the entire replacement of diseased, aging or otherwise unproductive trees with new plants. It also entails infilling dead spots in existing farms and planting more coffee in top-worked fields to attain optimal plant density.

Neglected coffee farm

Well tended coffee

3.8.1 Importance of renovation and rehabilitation

- Brings back into production coffee trees that have been neglected and improves quality.
- Reduces incidences of pests and disease attack on the well managed coffee farms as neglected farms act as breeding grounds.
- Rehabilitation of neglected farms help to increase National production.
- Renovation helps to bring back farms into profitability.

3.8.2 Factors to consider in renovation and rehabilitation

- **Extent of diseases and insect pest attack:** some pest and disease damage can be overcome without replanting but severe outbreaks can necessitate replanting.
- **Climate change:** increasing temperatures and moisture stress can demand replanting with drought – tolerant varieties, or varieties that are particularly suited to yield in certain climatic condition.
- **Agricultural practices:** poor agricultural practices can lead to the deterioration of trees to the point where they require R&R. It is important that R&R is always accompanied by GAPs to prevent the same decline from happening again.
- **Age:** coffee production, quality and resistance to diseases may deteriorate with age that may necessitate renovation.
- **Succession management:** lack of proper succession management within coffee farming business leads to negligence of the farms upon the demise/incapacitation of the owner/ investor.

3.9 Rehabilitation and renovation process

- Rehabilitation is normally conducted after the peak productive period and may entail pruning or change of cycle.
- It starts by clean stumping, then raising of suckers and finally selecting two or three to become the new heads.
- It is critical to complement R&R with GAP to avoid trees deteriorating again.
- Replanting starts with uprooting the old trees, preparing the holes and then planting new coffee seedlings. That kind of renovation can ensure higher yields in future but the farmer has to endure a longer period without income thus risking implementation program.
- The best alternative is top-working if the stump is not diseased, followed by infilling to increase the plant population in case of varietal conversion to Ruiru 11.

Rehabilitation process

3.10 Steps in undertaking rehabilitation and renovation

- Assess short and long term viability of R&R based on cost, capacity and farmer willingness to invest.
- Design a program and focus on farmer need analysis.
- Identify and partner with suitable support organizations.
- Source for funding by either own savings or grant/loan.
- Implement the components of the program.
- Follow up to monitor efforts and evaluate results.

3.11 Barriers towards rehabilitation and renovation in the smallholder sub- sector

- High cost of R&R and lack of access to finance.
- Lack of knowledge to implement R&R.
- Farmers have to endure a period of about two years with reduced or no income. To overcome this, farmers are advised to undertake the processes in blocks.
- Competition from other crops or preferable income activities.
- The risk of price fluctuation may demotivate farmers from undertaking R&R.