Module 6: Coffee Canopy Management

Objective

To enable growers understand practices of managing the coffee tree canopy for optimal production and regular annual cropping

Content

i) **Introduction** – definitions, forms of canopy management
ii) **Benefits of canopy management** - crop leaf ratio, flowering stimulation, growth of new stems, pest and disease, overbearing ,biennial cropping and tree rejuvenation
iii) **Coffee tree training systems** – single and multiple stem systems, capped and uncapped
iv) **Main pruning** – definitions, when, how to prune capped and uncapped, benefits and limitations of capped and uncapped system
v) **Handling and de-suckering** – definitions, timing and procedure
vi) **Change of cycle** –definitions, procedure for capped and uncapped system
vii) **Top- working** – definition, methods used, how to top-work and procedure

Methodology

i) Lectures on benefit of canopy management, training system, handling and de- suckering
ii) Demonstrations on capping, pruning, handling and de-suckering, change of cycle and top-working
iii) Discussions on benefits and limitations of capped and uncapped systems
iv) Practical on pruning, handling, de-suckering, change of cycle and top-working

Teaching aids / materials

i) Trainers Manual/ brochures/ fliers
ii) Flip chart
iii) Pruning saw
iv) Secateurs
v) A primary branch with secondary branches
vi) Coffee suckers
vii) Mature plant for top-working viii)Grafting knife
ix) Grafting bags
x) Tubing
xi) Protective gear
xii) Disinfectant

6.1 Introduction

Canopy management is the overall process of ensuring optimal production of the bearing wood in order to maximize annual regular cropping. It includes pruning, tree training, handling, de-suckering and change of cycle.

6.2 Benefits of Canopy Management

- Maintains a suitable crop: leaf ratio
- Opens the tree to sunlight which stimulates flowering
- Encourages growth of new stems and crop producing branches
- Reduces pests and disease susceptibility
- Helps to reduce over-bearing and dieback
- Reduces biennial cropping
- Maintains an appropriate tree shape
- Rejuvenates the coffee tree

6.3 Coffee Tree Training Systems

6.3.1. Single and multiple stem training

In a single stem system, the coffee tree has only one bearing head while in multiple stem system, the tree has two or more heads. In preparing trees for multiple stem system, cut the shoot above the first pair of primaries, approximately 1foot from the ground and this will encourage growth of several suckers. Select and leave the desired number of suckers.

6.3.2 Capped and uncapped system

- The capped system involves cutting the heads at a height not exceeding 6 feet from the ground while in the uncapped system, the apical stem growth is maintained
- The free growth is appropriate for smallholder, small estates and medium estate farmers while the capped system is appropriate for the mechanized plantations

Capped system

Free growth system

6.4.1.1 Benefits of uncapped tree system

- It is cheap, simple and quick to manage.
- Good for crop control and prevention of over-bearing.
- Stems replacement and change of cycle is easy.
- It bears crops mostly on primaries which give bigger beans of higher quality.

6.4.1.2 Limitations of uncapped tree system

- Tree breakages are common especially with delayed change of cycle.
- Picking and spraying is difficult on tall trees.
- Irregular growth of trees in a field.
- Rotting of stumps with age.

6.4.2.1 Benefits of capped tree system

- Easy picking and spraying at convenient uniform height.

6.4.2.2 Limitations of capped tree system

- Pruning is complicated, slow and requires skilled labour.
- Top branches liable to scorching without shade

6.4 Pruning

Pruning is a process through which undesired branches are removed in order to concentrate growth on the wanted branches and it is normally carried out after the main harvesting. Unhealthy trees due to die-back should be pruned only after new vegetative growth.

Un-pruned coffee tree

Pruned coffee tree

6.4.1 How to prune coffee under the uncapped system (free growth)

- Remove all primary branches touching the ground
- Open the centre by removing all the secondary branches within 9 inches (22.8cm) for traditional and Batian varieties and 6 inches (15cm) for Ruiru 11 from the main stem.
- Remove all the interlocking primaries
- After the third main harvest, maintain a bearing height: 5.5 feet for coffee in the coffee-tea zones, 5 feet for main coffee zones and 4.5 feet for marginal coffee zones.
- Remove the old primaries below the above recommended bearing height
- Allow 4 non-cropping secondary branches per primary and 2 more bearing ones
- Remove the interlocking primaries spirally, one from each alternate head especially for Ruiru 11
- Remove all the dry branches
- Remove all secondary branches growing upwards, inwards and downwards
- Cut back primaries to ensure they do not grow beyond 3 feet
- Maintain 2 or 3 bearing heads per stem

Too many heads

Correct number of heads

Well pruned primary branch

6.4.2 How to prune coffee under the capped system

- Has a fixed bearing head, hence the crop is mostly borne on the secondary branches and tertiaries.
- Capping is done at 1.83 metres (6ft) from soil level.
- Cut back primaries to maintain a length of 2.5 feet. Primaries carrying a crop should not be more than one metre long.
- Cut off secondary branches, tertiaries and laterals which have carried two crops to encourage new laterals.
- Leave 4 bearing secondary branches and 2 non-bearing ones on one Primary.
- If possible leave only one secondary on each node on alternate sides of primary.
- Remove secondary branches and laterals growing upright or within 15cm (6 in) towards the main stem
- Always remove suckers unless wanted for change of cycle.
- For capped multiple stem remove all inside primaries.

6.5 Handling and de-suckering

- Handling involves thinning out of the young shoots that develop after rains or irrigation
- De-suckering is the removal of suckers on main stems and at the base of the trunk
- Handling can be done at any time but mainly at the end of the rain season
- De-suckering can be done at any time but at least every 3-4 months for the uncapped system and every 2 months for the capped system
- Replace the non-bearing secondary branches which have matured with young shoots. Do not remove those carrying a crop
- Do not allow suckers to grow unless they are for change of cycle or replacement of broken bearing head(s)

6.6 Change of cycle

A process of rejuvenation (renewal) of the old bearing heads with new ones. This can be done through gradual replacement or clean stumping. This should be preferably done after every 5 major main crops

6.6.1 Uncapped (free growth)

- Start preparing for change of cycle 18 to 24 months before heads are to be cut off.
- Cut off the inside primaries leaving those within 1.5-2.5 feet from the top. This will make the heads to bend outwards as illustrated below
- Allow suckers to grow in the main stem at about 12 to 18 inches from the ground
- When suckers are about 18 inches high, select 4 strong, health and well- spaced suckers and cut off the rest.
- Just before the long rains, cut off 1 sucker leaving 3 to develop into new heads
- One year before cutting the old stems, prune off all the primaries inside the main stems
- Remove one head each year starting with the one on the sunrise side. Cut off at an angle of 450 slanting outwards
- Change of cycle can be done by clean stumping where all stems are cut to allow for regeneration of new suckers. The suckers are progressively selected to allow for development of up to 3 bearing heads

Change of cycle process for uncapped

6.6.2 Change of cycle in a capped system

- Change of cycle is done after 5 cropping years
- In case there are 3 heads per stem start the process by removing the head facing the sunrise side
- Side prune the remaining heads on the sunrise side to allow adequate light at the base of the stem
- Allow suckers to grow in the main stem at about 12-18 inches from the ground
- The rest of the procedure is as for the uncapped
- Undertake stem surgery whenever necessary to remove the dead wood and create space for sucker expansion

Change of cycle for capped system

6.7 Top-working

Top-working is varietal conversion that involves converting disease susceptible mature trees of Arabica coffee into Ruiru 11/Batian without uprooting and replanting.

6.7.1 Methods used in top-working

- Side wedge grafting that leaves the upper portion of the root stock as a breather -gives rise to weak stems
- Whip and tongue grafting-done on pencil thick suckers and is the most common method
- Bark grafting -done on the side of the main stem and gives rise to weak stems which can easily break off

Top-work during cool and wet weather to achieve best results

6.7.2 How to top-work

Top working procedure:

- Induce sucker growth on the trees to be converted by side pruning in September to October or January to February
- When the suckers are six months old, they will be approximately pencil thick, hardened and suitable for grafting
- Select 3 to 4 healthy suckers per stem originating from as near the ground as possible (4-6 inches) and graft with single node scions of Ruiru 11 or Batian bearing a pair of leaves
- Tie the graft union with a tape to keep the scion in place and to prevent fungal infections
- Lower a milky tube to enclose the grafted sucker and tie the lower open end tightly just below the graft union
- Pour a little water (approximately 50ml) carefully into the polythene bag maintaining its level below the graft union. The water helps to maintain a high relative humidity for enhanced healing
- Remove the bag when the graft union is completely healed (after about 6 months)
- Remove the tape tying the graft union
- Remove the old stems when the grafted suckers start bearing
- Infill with the selected variety to achieve the recommended plant population for the new variety

Steps in top working

6.7.3 Benefits of top-working

Steps in top working

- There is no interference with normal cropping pattern
- The farmer saves on the cost of uprooting old bushes and establishment
- The well-established root system of old stumps prevents lodging which may occur when young trees carry a heavy crop
- Gets into production faster than through -uprooting and replanting
- Increased plant population per unit area especially where compact varieties are used
- It leads to high returns as a result of foregone fungicide costs