



MINISTRY OF AGRICULTURE, ANIMAL
INDUSTRY AND FISHERIES

Uganda Training Materials for Coffee Production



TRAINERS' GUIDE

First Edition 2014

PREFACE

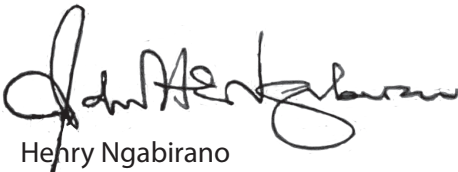
These harmonised coffee training materials, endorsed by MAAIF, have been developed by the Ugandan coffee sector to improve the productivity and quality of the coffee produced by Uganda's smallholder farmers.

Thanks to those who have contributed time, resources and materials to a team including UCDA, NaCORI, Café Africa Uganda and Mango Tree. A working group of the National Steering Committee of the National Coffee Platform spent many hours reviewing drafts and field testing the materials.

The photographs used in the posters were kindly provided by NaCORI and Kyagalanyi.

The eight topics, featured in charts, posters and this trainers' guide cover the coffee value chain and have been designed for smallholder coffee farmers in Uganda.

These materials, developed in a widely consultative effort, and funded by the aBiTrust, will form a key tool in a new and improved extension system for sustainable coffee production.



Henry Ngabirano
Managing Director
Uganda Coffee Development Authority
November 2014

Using Visual Aids and Participatory Learning

We know that people learn better if they are actively engaged in the learning process. Studies have shown that we remember only 20% of the information we hear and 40% of the information we see and hear. However, when we see ideas represented visually and also actively engage with the information through discussion, debates, role-plays, practical hands-on activities or other participatory teaching methods, we retain 80% or more of the information that is presented to us.

As trainers, it is worth the time and effort to create participatory, multi-sensory presentations. The **Uganda Training Materials for Coffee Production Module Training Set** is a tool designed to assist you in this effort. There is no pre-set way to use it. We are always interested in improving our products, so if you have suggestions, comments, or questions, please contact us.

This trainer's guide is written in English but depending on your audience, you may need to make your presentation in the local language. Read through the guide and consider how you would translate concepts into the local language.

The posters will be available in different languages.

If you need any further information or guidance on any of the topics, refer to UCDA, MAAIF Directorate of Crop Resources or NaCORI.

PART 1. TRAINING CHECKLIST

Make sure you can answer **YES** to each question before beginning the session.

- Did you gather background information about the group you are going to train?
- Did you review the trainer's guide and charts/posters?
- Do you understand the key issues to cover for each chart/poster?
- Does the venue have enough seats and space?
- Do you have all the materials you need for the activities and discussions?
- Do you have flip chart paper, markers, masking tape and a stand (if necessary)?
- Did you communicate the day, time and duration of the training to the group?
- Did you think about how best to involve women and youth in your training?

Outline of the training session for each module:

1. Welcome and introductions (10 minutes)
2. Review the session objectives (5 minutes)
3. Ice breaker (10 minutes)
4. Large group presentation and discussion of the charts/posters in the training module (approximately 5 minutes per chart/poster)
5. Break into small groups and answer the following questions: (20 minutes)
 - What are 3 things I learnt today?
 - What is 1 action I will take as a result of this training?
 - What questions do I still have about the topic?
6. Share small group discussions in the large group (20 minutes)
7. Conclusion (15 minutes)

PART 2. HOW TO USE THE TRAINING SET

- Show the first chart/poster to the participants.
- Read the title of the chart/poster.
- Ask participant to explain what they know about the topic and what they understand from the visual.
- Reinforce correct information given and correct wrong information.
- Read the tagline on the chart/poster if there is one.
- Ask participants if they have any questions about what has been discussed.
- Go to the next chart/poster.

PART 3. THE DISCUSSION SESSION

Training Module 1.0: Establishment of a Robusta and Arabica Coffee Farm

1.0 Establishment of a coffee farm

- 1.1 Uganda coffee growing zones
- 1.2 Preparing site for a coffee farm
- 1.3 Plant spacing
- 1.4 Hole preparation
- 1.5 Selecting planting materials
- 1.6 Planting coffee

Robusta Arabica

Robusta Arabica

Robusta Arabica

Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Be able to select and prepare a site for coffee growing.
- Select planting materials and plant them correctly.
- Know where to get information concerning coffee farming.

1.1 Uganda coffee growing zones

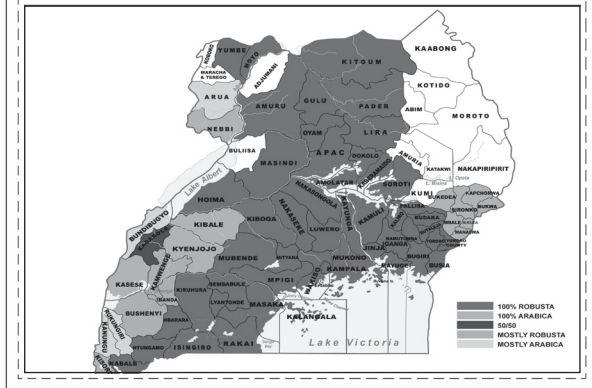


CHART 1.1: The coffee growing zones

In Uganda, Robusta coffee grows and yields better when grown at altitudes less than 1,500m above sea level. A temperature range of 18 – 27°C is ideal for its production.

An average rainfall of 1,200 – 1,500mm/year which is well-distributed for a period of about 9 months is desirable. It is better when grown on a flat or gently sloping terrain.

Robusta grows and yields better when grown on deep, well-drained, fertile loamy soils (rich in organic matter and exchangeable bases, particularly potassium).

Arabica grows and yields better when grown at altitudes between 1,300 – 2,300m above sea level. A temperature range of 15 – 24°C is ideal for production. An average rainfall of 1,200 – 1,500mm/year which is well-distributed over a period of about 9 months is desirable.

Flat or gently sloping terrain is preferable. It grows well on deep, well-drained, fertile, slightly acidic loamy soils of pH range 4.5 to 5.

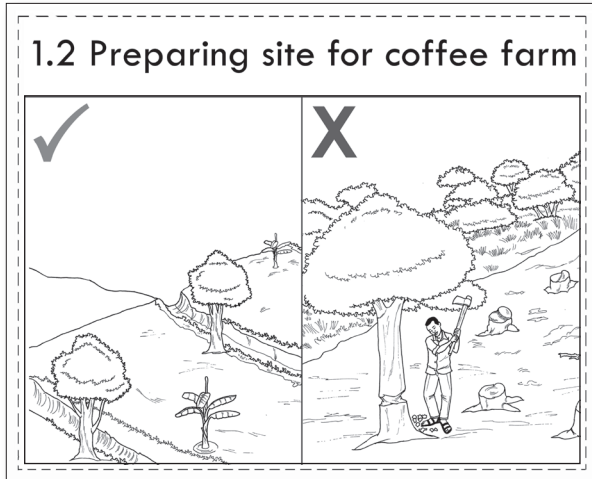


CHART 1.2: Preparing site for coffee farm

- Prepare the land during the dry season and remove any tree stumps and roots to minimise fungal diseases.
- Kill excess trees one year in advance by ring barking. Leave some mature trees for shade. Aim for a spacing of 20m x 20m. This gives a good shade cover, while not creating competition for water and nutrients.
- Remove perennial weeds such as couch grass by using herbicides, or digging and handpicking them from the ground.
- Don't till the soil unless intercropping coffee with other annual crops.
- For sloped terrain, apply soil and water conservation measures like contour trenches, contour terraces, vegetative barriers, bands, grass strips and cut-off drains to avoid soil and nutrient loss.
- Plant banana trees for extra shade if required.

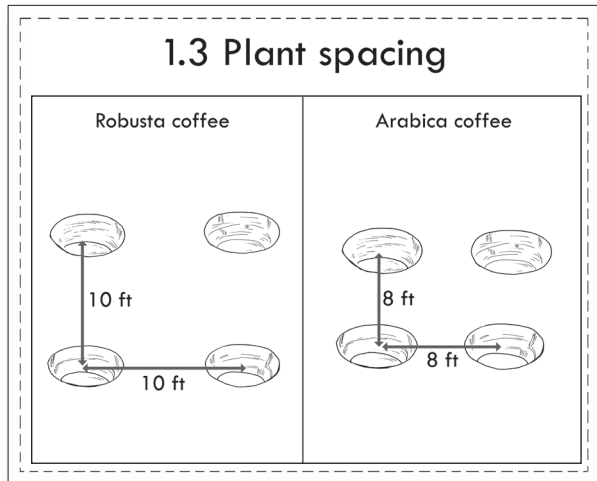


CHART 1.3: Plant spacing

- **Robusta coffee**

All Robusta coffee varieties are planted at a spacing of 3m x 3m (10ft x 10ft). This should result in about 450 plants per acre.

- **Arabica coffee**

Arabica coffee varieties SL28, SL14 and KP423 are planted at a spacing of 2.5m x 2.5m (8ft x 8ft). This should result in about 680 trees per acre.

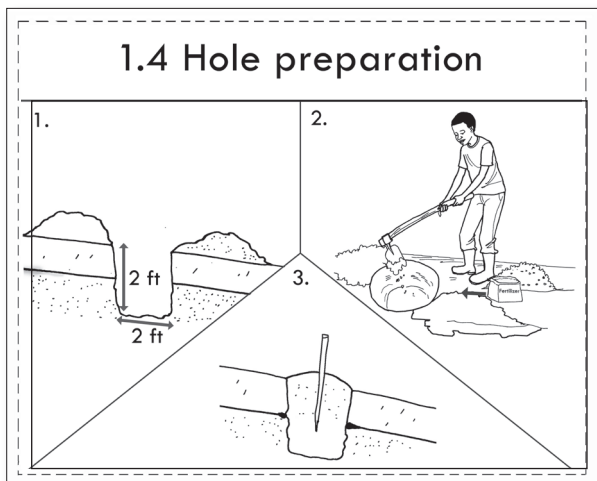


CHART 1.4: Hole preparation

- Mark positions where the coffee will be planted with pegs, arranged in regular patterns to facilitate management.
- Dig circular holes of 60cm (2ft) in diameter and 60cm (2ft) in depth at the marked points at least 3 months before planting. This allows for better water and root penetration through the soil because it has had time to loosen.
- Preparing holes before the planting season helps you to be ready for planting at the first rains.
- When digging the holes, keep the fertile topsoil separate from the subsoil.
- Refill the holes with topsoil about a month before planting. Where possible, mix the top soil with a 20-litre basin of well-decomposed manure before refilling each planting hole.
- If available, also mix in one handful of TSP, SSP or DAP. Phosphorus stimulates root growth.
- Heap the soil above the ground level to allow for sinking when the soil settles.
- Mark positions where the coffee plants will be planted with pegs.

1.5 Selecting planting materials

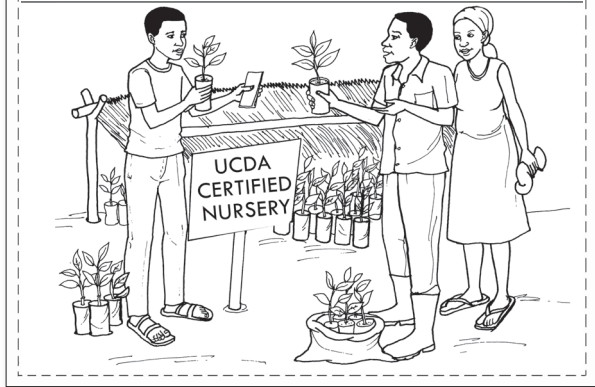


CHART 1.5: Selecting planting materials

- Get coffee plants with between 6-8 leaves from UCDA-certified nurseries one month before the onset of the rainy season.
- Seek guidance from UCDA or your DAO if you want to grow your own seedlings.
- Always use seeds or cuttings from a certified source.
- Check all seedlings for signs of pests and diseases; especially root mealy bugs, aphids and other sucking insects. This prevents introducing pests and diseases into your garden.
- Do not buy seedlings if the roots protrude far beyond the polythene pots because the taproot may be damaged.

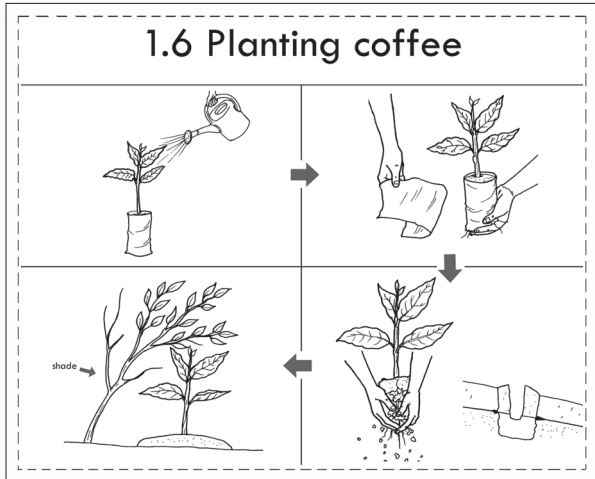
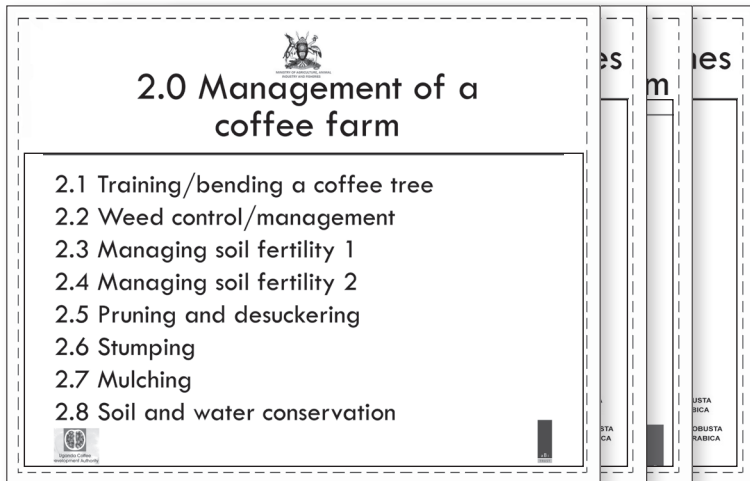


CHART 1.6: Planting coffee

- Plant coffee plants 2 to 4 weeks after the onset of the rainy season.
- Roots protruding beyond the polythene pots should be trimmed before planting.
- Open up the centre of the filled holes sufficiently to fit the size of the potted plant.
- Remove polythene pots.
- Carefully loosen caked soil around the roots to ease water uptake and root development.
- Place the plant in the hole with the collar at level with the surrounding soil or slightly higher to allow for some sinking when soil settles.
- Water the seedling before and immediately after planting.
- Regularly inspect the planted field to identify dead plants and replace them as soon as possible.
- Protect each seedling from sunshine by providing shade (tree branch).

Training Module 2.0 Management of a Robusta and Arabica Coffee Farm



Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Identify the different techniques used to manage coffee plants starting from planting and continuing through its entire growth cycle.
- Know how to control weeds and manage soil fertility for a coffee farm.

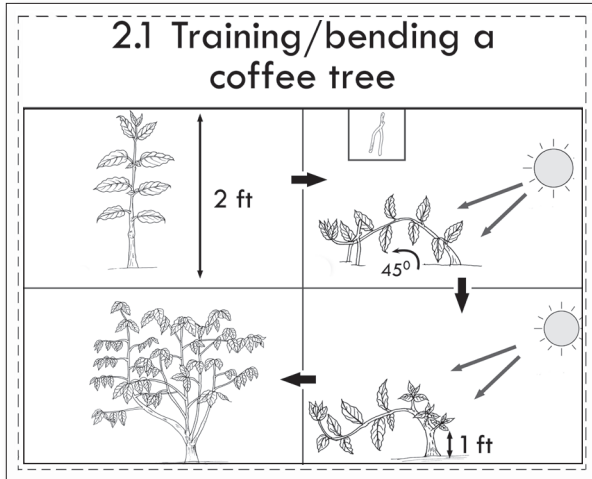


CHART 2.1: Training / bending a coffee tree

Coffee is trained in a multiple system by bending and pegging down 6-month-old plants at about 45 degrees to stimulate sucker production. To do this, the farmer should:

- Bend the coffee plants so that they all bend in the same direction along the row.
- Select 3 suckers to form the future bearing stems from the base of the trained plant. The first selected sucker should be at about 20cm (6 inches - 1 foot) from ground level and the others at the next nodes.
- Remove the peg when the selected suckers are about 30cm (1 foot) tall.
- This allows the bent stem to develop upwards.

Alternatively, newly planted coffee plants of 4-6 months are capped at a height of 15 – 40cm (6 – 16 inches) above the ground. This is done by removing the stem tips to encourage development of multiple stems which are then selected as described above.

Note: Capping is less effective than bending for inducing suckers.

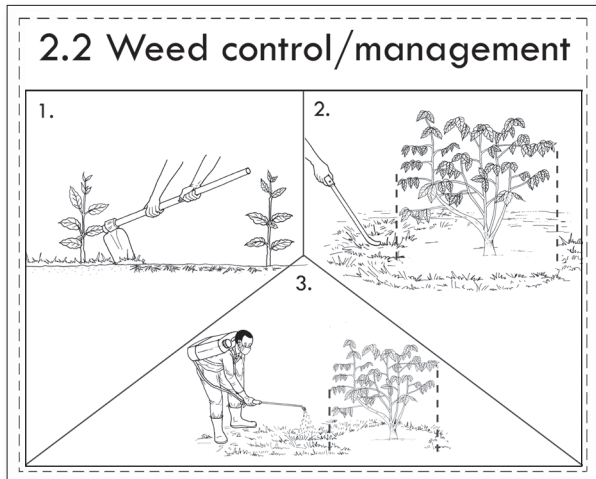


CHART 2.2: Weed control / management

Weeds compete with plants for water and nutrients and can lead to reduced crop growth, low yields and poor quality coffee beans if allowed to grow. Weeds in young coffee gardens (up to a year old) should be controlled by mechanical methods such as digging with a hand hoe and slashing with a machete or slasher, or by cultural methods such as mulching.

Weeds in old coffee gardens are controlled by mulching or alternating mechanical methods with chemical/herbicide spraying. When using herbicides, follow the manufacturers' instructions on the label or get help from an extension officer or a more knowledgeable farmer colleague.

Ring weed below the canopy to avoid damage to the plant during slashing or spraying.

Avoid spraying the coffee leaves as this may kill or cause retarded growth.

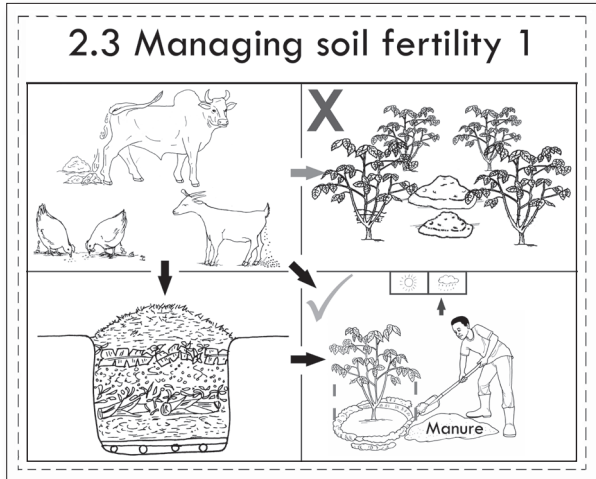


CHART 2.3: Managing soil fertility 1

Coffee requires fertile soils with high levels of nitrogen, phosphorus and potassium. The fertilizer requirements are dependent on the inherent soil fertility status, soil pH, level of production and usage of cultural farming practices like mulching, using manure and irrigation.

One 20-litre basin of decomposed manure (cow dung, chicken litter, household waste, compost) should be added to the soil when planting to improve soil fertility.

For existing coffee trees, 3-5kg of manure should be added around each tree once a year. Do not heap manure between the trees.

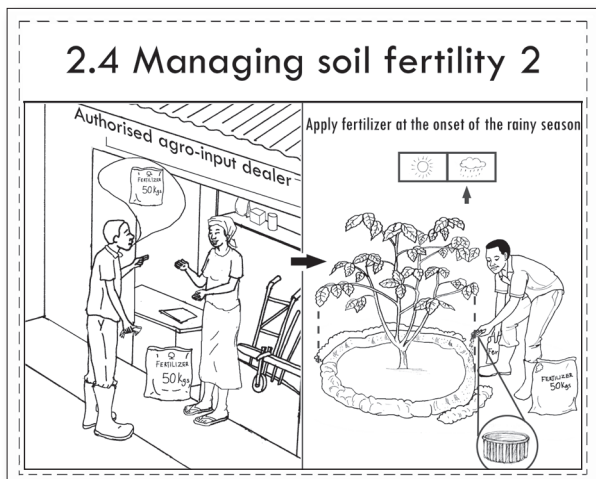


CHART 2.4: Managing soil fertility 2

At the beginning of the rainy season, apply inorganic fertilizer around the tree within the rooting zone but do not allow it to touch any part of the coffee plant, especially the leaves.

For trees that are up to two years old, apply 75g of fertilizer per tree per rainy season. Apply 250g per tree per rainy season for Robusta coffee trees that are more than 2 years old and 200g per tree per rainy season for mature Arabica coffee trees.

For Robusta, apply: NPK 25:5:5"

For Arabica, apply: CAN N=26% or CAN N=27%

2.5 Pruning and de-suckering

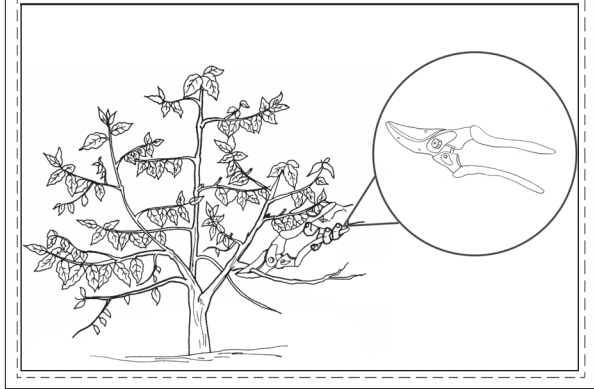


CHART 2.5: Pruning and de-suckering

Use secateurs (or a pruning saw) to remove dead, weak or unproductive branches and small suckers.

Also remove tertiary branches, dead primary branches and the skirt of lower primary branches that touch the soil surface to avoid infestation from the soil.

Pruning encourages new growth and improves productivity.

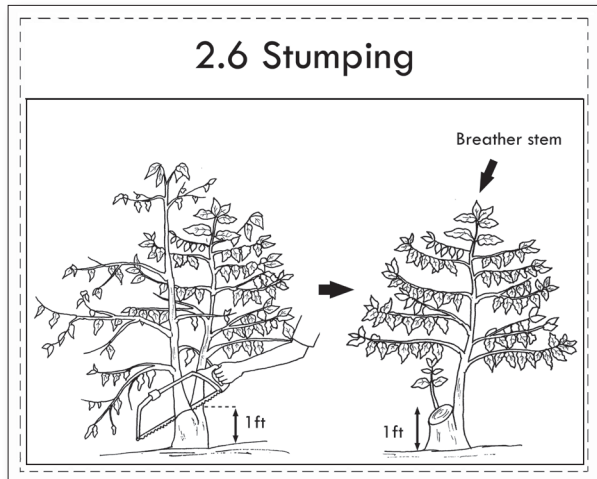


CHART 2.6: Stumping

Stump coffee to renew the stem cycle either by clean or staggered stumping.

- Staggered stumping involves cutting down non-productive stems at the end of every season.
- Clean stumping involves cutting down all coffee stems after 7-9 years, starting by leaving one breather stem which should be removed after about 6 months, soon after suckers have sprouted from the stumped stems.
- Clean stumping can be carried out at once in an entire coffee garden if the farmer has alternative income. Stumped coffee fields can be intercropped with cover crops like beans, groundnuts, and peas to earn some income, to add nitrogen to the soil and to improve productivity.
- Staggered stumping involves cutting down part of the coffee garden. If a farmer needs to harvest a crop every year, part of the coffee garden can be stumped every year. In this case, 1 in 3 coffee trees should be stumped.
- Stumping should be at least 45° and sloping away from the breather stem.

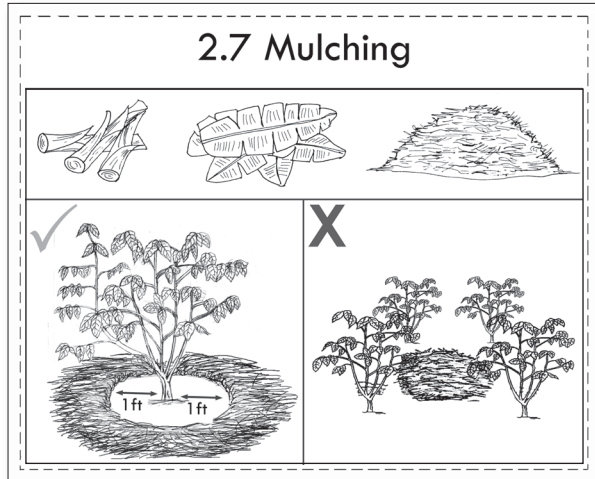


CHART 2.7: Mulching

Mulch a coffee garden with maize straw, bean trash, banana leaves, coffee pulp, grasses or any other dead plant material. Form a loose layer of mulch on top of the soil that is no more than 6 inches deep.

Place the mulch 1 foot from the coffee stem to prevent infection with collar rot or attack from ants and termites. Do not heap the mulch between the trees.

The benefits of mulching are many. It conserves moisture, keeps the weeds away, adds nutrients to the soil, controls soil erosion and improves the soil structure and water retaining ability.

2.8 Soil and water conservation

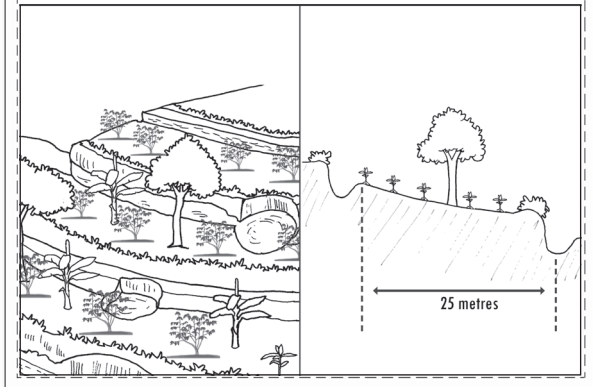


CHART 2.8: Soil and water conservation

Apply soil and water conservation practices to minimise loss of soil fertility through erosion and retain moisture for the coffee, especially in the dry periods. The following techniques can be very valuable to the coffee farmer:

- Terracing along contours reduces soil erosion by minimising rainwater runoff.
- Digging pits/troughs at some points of the terrace preserves rain water. The water drips through slowly to the neighbouring coffee trees and can preserve trees during the dry period. Add a small amount of oil to the trapped water to prevent breeding of mosquitoes.
- Planting cover crops such as mucuna, phaseolus beans, lablab and groundnuts, as well as mulching, prevents soil erosion and retains soil moisture.
- Planting grass such as *tithoria diversitalia* at the edges of the gardens and ridges of terraces/contour bunds reduces soil erosion.
- Shade from shade trees also reduces soil erosion and leakage of minerals/soil nutrients to a deeper ground level beyond the reach of coffee roots.

Training Module 3.0 Common Insect Pests of Robusta and Arabica Coffee Plants

3.0 Main insect pests of coffee

- 3.1 Black twig borer (mainly Robusta)
- 3.2 Root mealy bug
- 3.3 White stem borer (mainly Arabica)
- 3.4 Coffee berry borer
- 3.5 Antestia bug (Arabica only)
- 3.6 Coffee lace bug (Arabica only)
- 3.7 Aphids, leaf mealy bug and scales

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Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Identify the common insect pests in Robusta and Arabica.
- Know the treatment measures for the different pests.

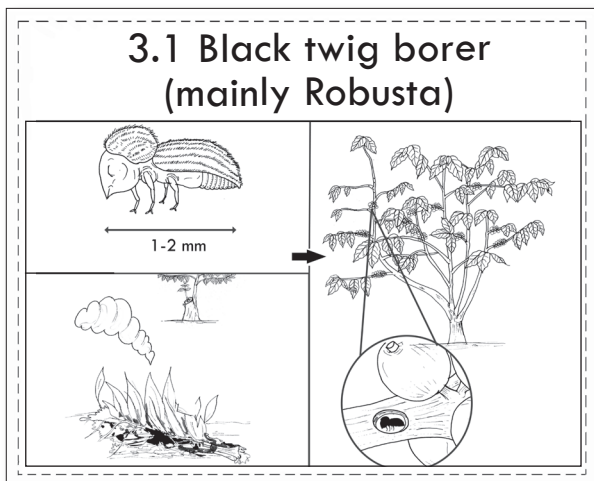


CHART 3.1: Black twig borer (mainly Robusta)

Xylosandrus compactus (Eichhoff)

The black coffee twig borer (BTB) is a small beetle belonging to the same family as the coffee berry borer, but it bores mostly into primary branches and sometimes into the main stems. It kills affected branches and stems, leading to considerable yield losses.

BTB mainly devastates Robusta coffee varieties but it is also known to attack over 240 tree species including Arabica coffee trees, some shade trees on coffee farms such as albizia, fruit trees such as mango and avocado, and other crops such as eggplants.

Control measures:

- Regularly monitor fields for infestation.
- Trim off and burn infected branches.
- Practise clean weeding to bury any of the pests harboured in ground surface litter.

- Spray infested field with Imax (Imidacropid) pesticide at 4mls per litre of water in the sprayer tank.
- For heavily affected fields beyond 15% infestation, encourage farmers to seek expert advice from extension staff or UCDA/ NaCORI.
- Advise your neighbours to also control BTB to prevent reinfestation of your field.
- Stump the coffee trees if infestation is extreme.
- Reduce excessive shade as it is conducive for the survival of BTB.
- Encourage farmers to get help from the extension staff or a knowledgeable farmer when the situation becomes unmanageable.

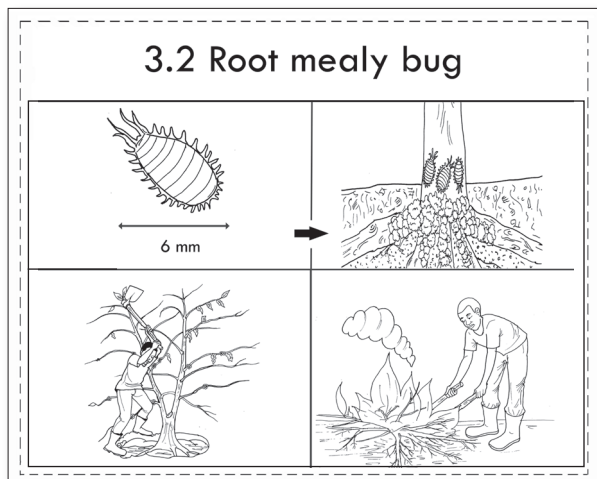


CHART 3.2: Root mealy bug

Planococcus

Root mealy bugs are sucking insects found on the roots of both Robusta and Arabica trees.

Root mealy bugs attack the roots of coffee plants just below the soil level. They siphon sap from the plant, causing it to suffocate from lack of nutrients and water.

The open wounds caused by root mealy bugs allow fungal diseases and pests to damage the plant. This causes yellowing and drooping of leaves and, in severe cases, death of entire trees. A whitish fungus that accompanies infestation aggravates the damage by affecting normal root activities and cutting off absorption of water and nutrients from the soil into the roots.

Root mealy bugs will often affect only part of a field. If the whole field is yellowing, soil fertility may be low.

Control measures

- Uproot heavily affected or dead trees and burn them. They will not recover.
- Treat trees showing early signs of attack and surrounding ones with 10g of Dursban powder (Chloryrifas) mixed into soil around the tree or Actara (Thiamethosin; 16gs per 20 litres of water) as a soil drench.

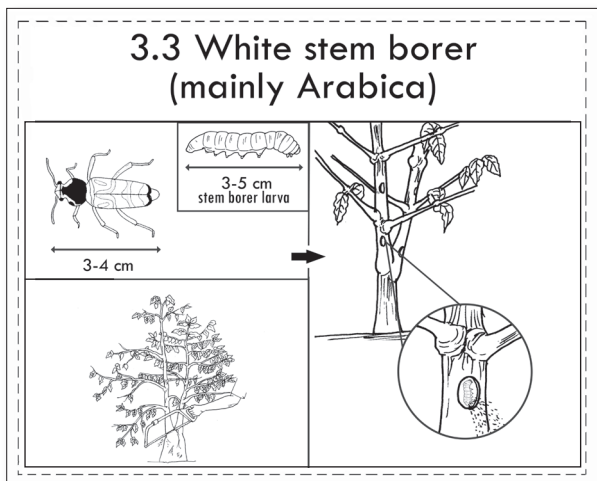


CHART 3.3: White stem borer (mainly Arabica)

Xylotrechus quadripes

White stem borers are the larvae of large brownish insects with white patches and a long antenna. Adult females lay eggs inside crevices on the bark of the stem. The larvae bore into the main stem of the coffee tree, expelling wood shavings which are seen at the base of the tree. The extensive damage to the main stem causes yellowing of foliage, easy stem breakage and eventual death of trees. It mainly attacks Arabica coffee plants.

Control measures

- Band tree stems with Dursban (Chloropyrifos) using a brush from collar level to a height of 0.5 metres.
- Push a bicycle spoke or any wire into the tunnel created by the white stem borer to kill its larvae.
- Stuff the insect hole with cotton wool or paper saturated with Dursban (Chloropyrifos) or Super Sumithion (Fenitrothion) to kill the larvae.
- Smooth tree bark up to 0.5m with maize cob or cloth to prevent egg laying.

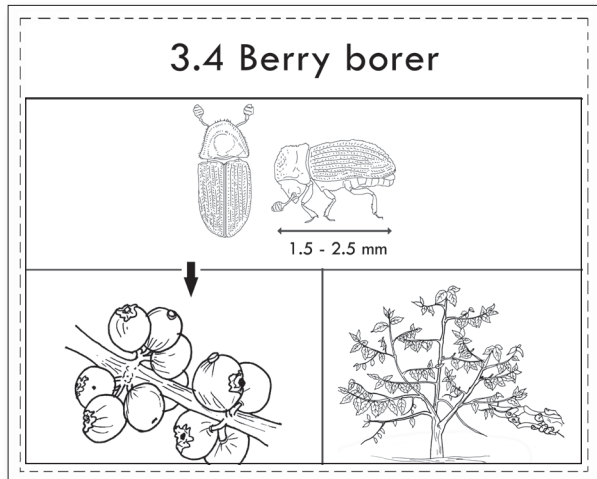


CHART 3.4: Coffee berry borer

Hypothenemus hampei

The coffee berry borer (CBB) is a small beetle that bores into coffee berries and damages beans. Its infestation rates are normally low as it has a lot of natural enemies in Uganda.

Control measures:

Good field hygiene is the best control strategy for CBB. This includes:

- Pruning coffee and shade trees to open up the canopy and promote control by natural enemies
- Picking all ripe cherries frequently and regularly
- Removing and burning any cherries that have fallen on the ground.
- At the end of the season, removing all remaining mature cherries from the tree and processing them separately to prevent cross-over to the new harvest.
- Monitoring CBB infestation rates weekly between 3-4 months after flowering as this is the key period for infestation.

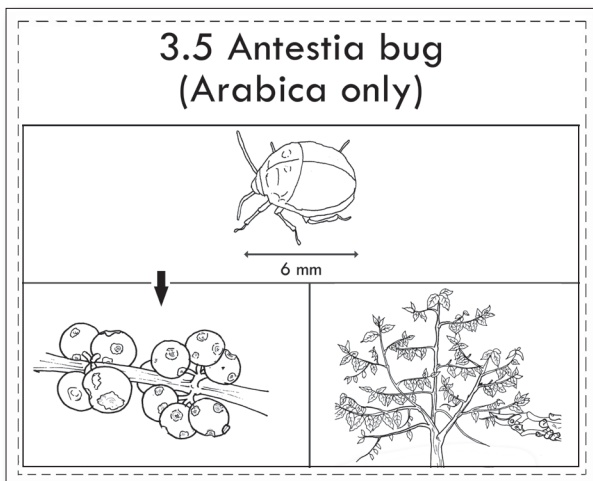


CHART 3.5: Antestia bug (Arabica only)

Antestiopsis

The Antestia bug is a brown or bronze insect with yellow-orange patterns. They cause damage mainly in Arabica coffee through sucking sap from flower buds, flowers, berries, leaves and soft stems. This results in flower and berry abortion, cracking (zebra marks), rotting of beans, multiple branching (witches broom), and shortening of internodes. Antestia bugs prefer shaded conditions.

Control measures

- Prune coffee and shade trees to reduce hiding places for Antestia bugs and to promote natural predation by birds.
- Monitor and spray when 2 bugs per tree are observed. Use Super Sumithion (Fenithrothion) or Cypermethrin (2ml per litre) or Dimethoate-based products (1ml per litre).

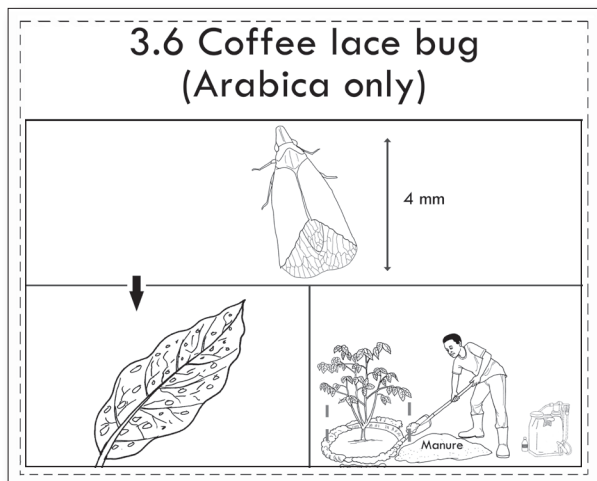


CHART 3.6: Coffee lace bug (Arabica only)

Habrochila

These are small fly-like insects with a light green colour and lace wings. They are usually found sucking on the underside of the leaves, leaving shiny black droppings and brown feeding marks.

Heavy infestation causes general yellowing of leaves and can result in defoliation, berry abortion and die-back. Outbreaks may occur during prolonged dry periods and when natural enemies have been killed by pesticides. Insects disappear at the onset of the rains. Strong healthy trees withstand infection much better.

Control measures:

Only if the infestation is heavy, spray with Super Sumithion at 1.25ml per litre of water regularly and fertilize coffee trees with manure and/or inorganic fertilizers.

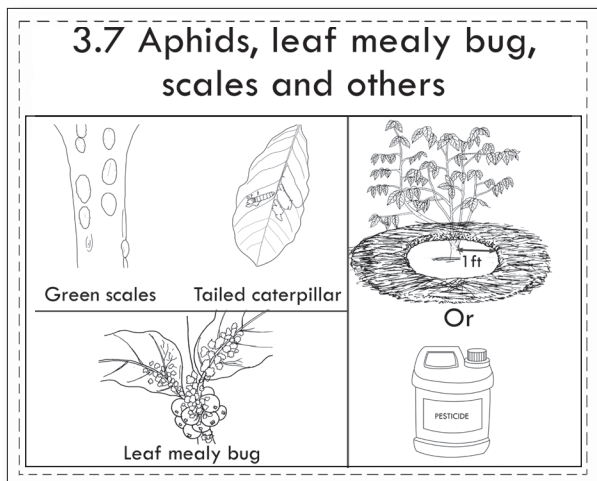


CHART 3.7: Aphids, leaf mealy bug, scales and others

Sucking insects:

There are ranges of sucking insects that affect coffee:

- a) Green, brown or white waxy scales (*Coccoidea*)
- b) Aphids (*Toxoptera aurantii*)
- c) Leaf mealy bug (*Planococcus*)

Sucking insects are normally found feeding on the lower side of the leaves, on young branches or on cherries. As a result of their feeding, leaves may yellow and cherries will not fill, causing a lot of floaters and brown beans.

All sucking insects are accompanied by ants.

Chewing insects:

Include:

- a) Leaf miners (*Leucoptera coffeina*)
- b) Tailed caterpillar (*Epicampoptera andersoni*)
- c) Leaf skeletoniser (*Leucoplema dohertyi*)

Control measures:

Monitor coffee fields regularly for infestation by sucking and chewing insects.

Focus chemical control on affected trees:

- Paint a band of at least 15cm of Dursban to reduce attendant ants on affected trees.
- Spot apply contact insecticides such as dimethoate, fenitrothion or cypermethrin-based products.
- Spot apply systemic insecticides such as Actara as a soil drench.

Healthy coffee trees withstand pest damage better so farmers should be encouraged to use good agricultural practices such as pruning and mulching.

Training Module 4.0: Main Diseases of Robusta and Arabica Coffee and Their Control

4.0 Main diseases of coffee

- 4.1 Coffee wilt disease (Robusta only)
- 4.2 Leaf rust (mainly Arabica)
- 4.3 Coffee berry disease (Arabica only)
- 4.4 Red blister disease

ARABICA
ROBUSTA
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Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Identify the different diseases that affect coffee plants.
- Know the treatment measures for the different coffee plant diseases.

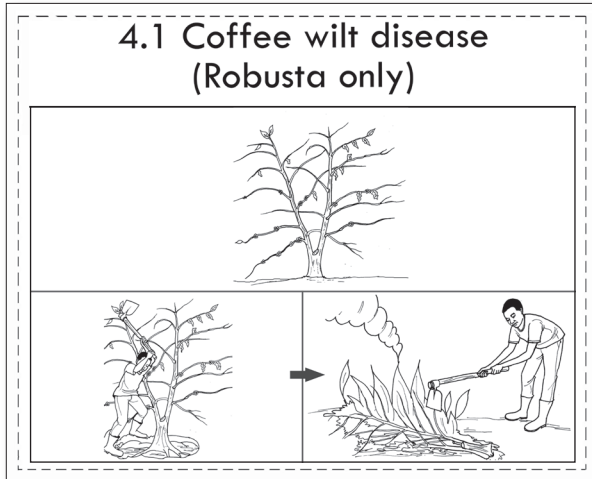


CHART 4.1: Coffee wilt disease (Robusta only)

Coffee wilt disease (CWD) is a fungal disease. It is a serious production problem for Robusta coffee varieties. This disease spreads quickly and widely and can normally threaten entire Robusta coffee production zones. It spreads through infected coffee plant debris, infected farm tools and soil. There is no cure. Once infected, a tree will die.

Control measures:

- Uproot and burn infected coffee trees on site as soon as symptoms are seen.
- Disinfect farm tools that have been used in an infected garden using flames or Jik solution (5%).
- Plant resistant varieties.
- Encourage farmers to get help from extension staff or a knowledgeable farmer.

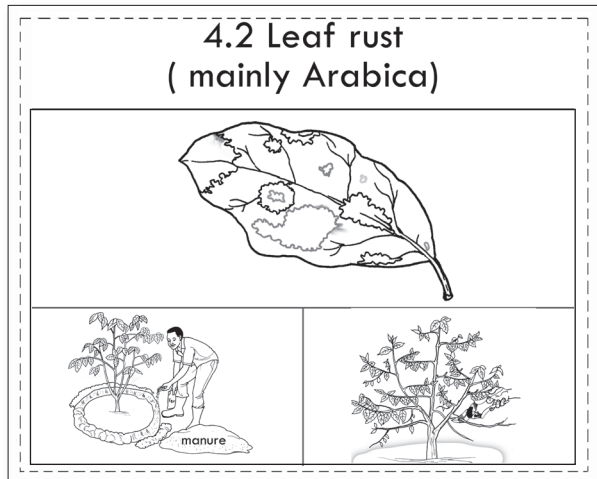


CHART 4.2: Leaf rust (mainly Arabica)

Coffee leaf rust is a fungus that likes humid conditions and temperatures between 20-25⁰C. It therefore affects coffee grown at low and medium altitudes. The disease affects all coffee trees but is more severe on Arabica trees. It manifests as orange spots or areas on the underside of leaves.

All commercial Arabica varieties, such as SL14 and KP423, are susceptible to leaf rust. However, KP423 is more tolerant, so it is better for medium to low altitudes, where leaf rust is more prevalent. A severe attack by the disease results in premature leaf fall, unfilled mature cherries and severe die-back. This causes loss in yield and quality.

Control measures:

Cultural strategies include:

- Open pruning to reduce humid conditions
- Regular stumping

- Good weeding and soil fertility management to ensure strong and healthy trees
- To supplement the cultural practices, apply copper-based fungicides (2.5g per litre of water) every 3 weeks starting at the onset of rains for a maximum of 5 sprays per season. Alternatively, apply curative or systemic fungicides; spray the underside of the leaves as well.
- If unclear how to control this disease, please consult the extension staff for technical advice.
- Encourage farmers to consult extension staff for technical advice if they are unclear how to control this disease.

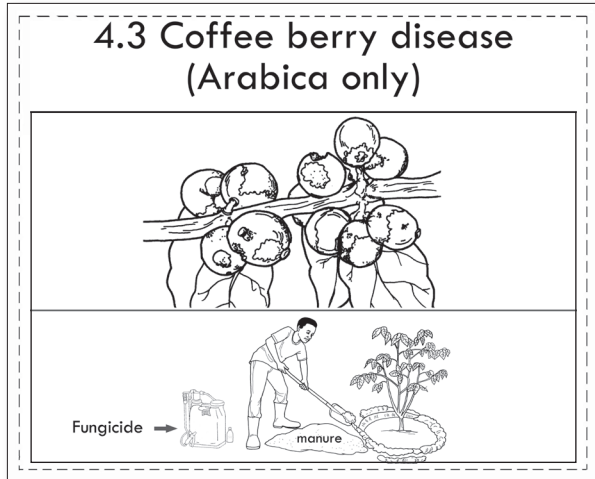


CHART 4.3: Coffee berry disease (Arabica only)

Coffee berry disease is caused by a fungus and appears on Arabica coffee at altitudes of more than 1,600m above sea level where there are low temperatures (17-22^oC), and wet and humid conditions prevail.

It devastates coffee flowers and fruits at all stages of growth, but especially the green stage. The young green berries die on the plant even though the plant remains healthy and green. Extensive black/brown sunken lesions are observed on both green and red berries which then drop prematurely.

The fungus survives on old cherries and the tree bark.

Control measures:

- Plant tolerant varieties (SL14).
- Practise good field hygiene by:
 - Regularly harvesting all ripe cherries

- Removing all remaining dried or ripe cherries from the tree or the ground at the end of the harvest
- Pruning coffee and shade trees to reduce humidity levels
- Improving soil fertility management
- Spray with copper-based fungicides such as Copper Nordox 75% (140g/CP20), to effectively control the disease.
 - Spray at the onset of rain in well-pruned and weeded plots and continue at 4 week intervals until the crop attains physiological maturity.
 - Encourage farmers to get help from extension staff or a knowledgeable farmer when applying fungicides for the first time.

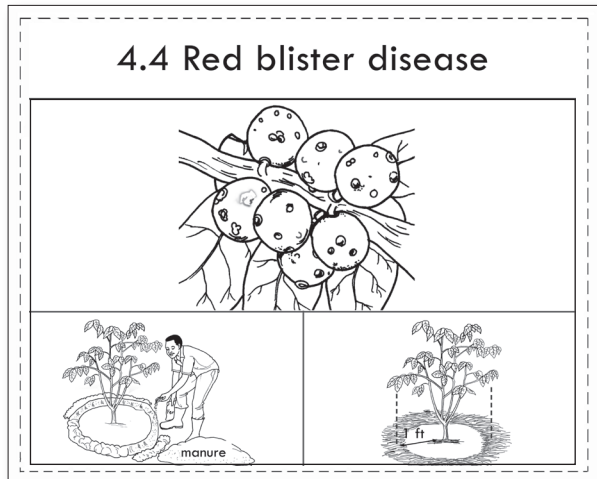


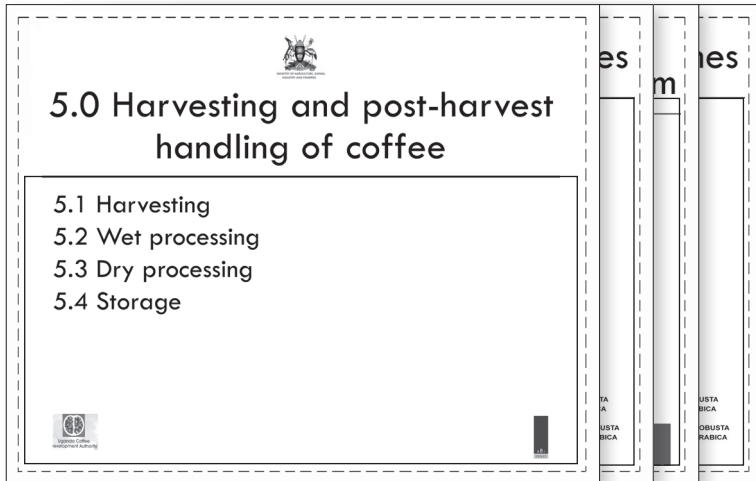
CHART 4.4: Red blister disease

Red blister disease is caused by the fungus *Cercospora coffeicola* and mainly affects Robusta varieties but can also affect Arabica plants. Red blister disease forms small red and slightly raised spots on both green and ripening cherries. The spots enlarge and join, forming unsightly red blisters. Centres of the lesions dry up and turn black. Infected cherries do not ripen properly and don't pulp properly which leads to loss of yield and quality.

Control measures:

- Plant only resistant varieties obtained from recommended nurseries. The new CWD-resistant Robusta coffee varieties Kituuza R1 to R7 are also resistant to red blister disease.
- Add nitrogen and potassium fertilizer and manage the field well.

Training Module 5.0: Harvesting and Post- Harvest Coffee Handling



Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Understand the best practices for harvesting coffee
- Know the different ways to process coffee
- Have improved knowledge about coffee storage

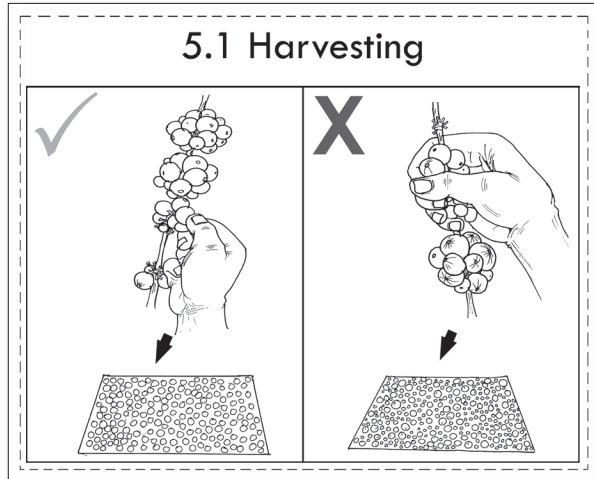


CHART 5.1: Harvesting

- Do not strip all cherries off the branch.
- Harvest only fully ripe (brick red) cherries. Including unripe cherries results in black coffee beans. Overripe cherries can result in discoloured coffee beans and fermented flavours when the coffee is brewed. Ripe cherries give better quality coffee and therefore more money.
- At the end of the season, harvest all remaining mature cherries and process separately.
- Keep harvested coffee cherries in containers such as baskets.
- Do not dry the coffee on bare earth because this causes the coffee to acquire an earthy smell and soil microbial contamination.
- Sort out immature, diseased, pest infested or overripe cherries and process them separately. Remove all extraneous materials such as twigs, leaves, stems and stones.

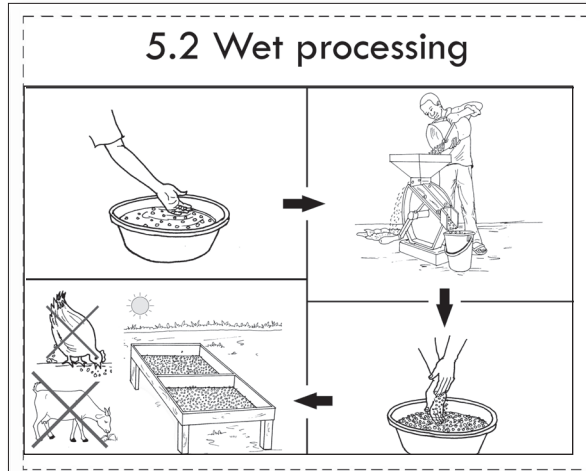


CHART 5.2: Wet processing

The ripe cherry is either wet processed or dry processed for both Arabica and Robusta. Wet processing involves floating, washing and pulping the cherry to separate the pulp from the parchment.

- Float the freshly harvested cherries in water to remove unfilled fruits and extraneous materials. Remove floats and pulp clean cherry only. This must be done within 12 hours after harvesting.
- Keep freshly pulped coffee beans in a container for 12-24 hours to allow fermentation. Next, wash the fermented coffee thoroughly to remove mucilage from the parchment and dry washed parchment on wire trays or a tarpaulin.
- Ripe cherries can be pulped using small manual or large power-driven pulpers.
 - Large scale pulpers are able to remove mucilage during pulping and therefore the fermentation process may not be necessary.
 - Most of the Arabica coffee in Uganda is wet processed using small manual pulpers.
 - Robusta coffee is wet processed by a few large coffee producers.
 - Wet processed coffee is thought to have superior cup quality compared to dry processed coffee.

5.3 Dry processing

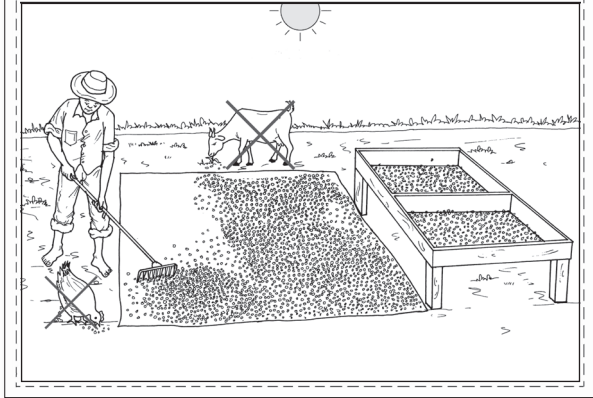


CHART 5.3: Dry processing

Dry processing involves drying the cherries without removing the pulp. It can be used to process both Arabica and Robusta coffee. The cherry should be dried immediately after harvesting. The bulk of Ugandan Robusta coffee and small quantities of Arabica coffee are dry processed.

- Dry cherries on tarpaulins or concrete floor at a thickness of 7-8cm but not on bare ground. Turn the coffee regularly by raking. At night, stack trays in a store or house. Do not leave wet coffee heaped or it will develop mould.
- Coffee must be dried to an acceptable moisture content of 11-13%

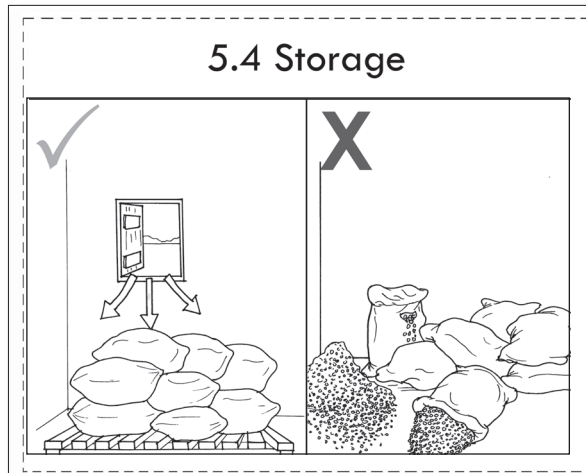




CHART 5.4: Storage

- Make sure you only store dry coffee in bags which are free from any bad smells. Do not use fertilizer or fish bags for storage.
- Place the coffee bags on pallets raised to at least 15cm and at least 30cm away from the walls and ceiling so as to avoid any moisture entering the bags.
- Coffee should preferably not be stored in the same store with other farm produce.
- Parchment and kiboko coffee should be stored separately.
- Never store coffee in the same store with agro-chemicals and oil products.
- Storage rooms should be well-ventilated and leak-proof.

Training Module 6.0: Robusta and Arabica Coffee Farming as a Business


6.0 Coffee farming as a business

- 6.1 Why grow coffee?
- 6.2 Farm record keeping
- 6.3 Marketing
- 6.4 Sustainable farming practices
- 6.5 Certification/verification
- 6.6 Access to finance
- 6.7 Enterprises supporting coffee production
- 6.8 Family decision making 1
- 6.9 Family decision making 2



| es | m | es |
|---------|---------|---------|
| ARABICA | ARABICA | ROBUSTA |
| ROBUSTA | | ARABICA |

Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Identify the need for growing coffee.
- Assess how profitable coffee farming can be.
- Know the sustainable farming practices.

6.1 Why grow coffee?

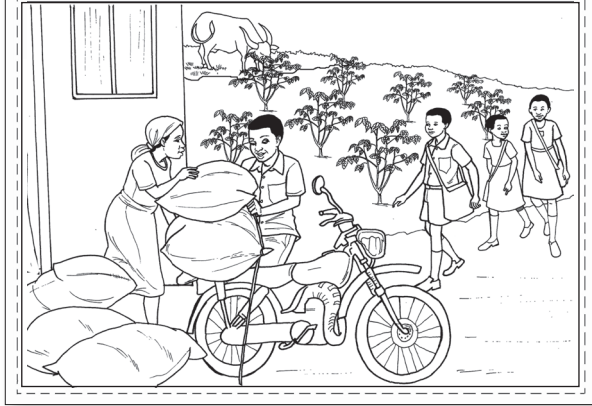


CHART 6.1: Why grow coffee?

- Coffee is grown by all types of farmers (men, women, and youth) who have land.
- Coffee is profitable depending on the yield per acre/hectare, the quality, the cost of farm inputs including tools, labour and transportation and the price at which farmers sell the coffee.
- In order to obtain high yields and better quality, the coffee farmer must know and follow the proper methods for growing coffee, which are explained in this training package.

6.2 Farm record keeping








| | Quantity | Unit price | Total |
|---|----------|------------|---------|
|  | 3 | 5,000 | 15,000 |
|  | 50 Kgs | 1,600 | 80,000 |
|  | 2 people | 20,000 | 40,000 |
|  | 2 people | 15,000 | 30,000 |
|  | 2 people | 50,000 | 100,000 |
|  | 2 people | 15,000 | 30,000 |
|  | 20 bags | 2,500 | 50,000 |
| Total | | | 345,000 |

CHART 6.2: Farm record keeping

Every farmer should keep records of all field operations, expenditures and income in order to assess the profitability of the farm and help plan for the future. Field activity records should be separated from farm sale records and both should have up-to-date information.

Farm Activity Record

Record information about the field/plot, the field activity done (land preparation, planting, weeding, mulching, fertilizing, crop protection, pruning, harvesting, etc.), the date of activity, the method of implementation, the number of workers and cost of labour, and the cost of materials.

Farm Sales/Income Record

Record information about the item sold (coffee, other crops, animals, etc.), the date of sale, the service rendered, the quantity sold, the unit price, the overall income from the transaction, the name and number of the buyer, and any other comments.

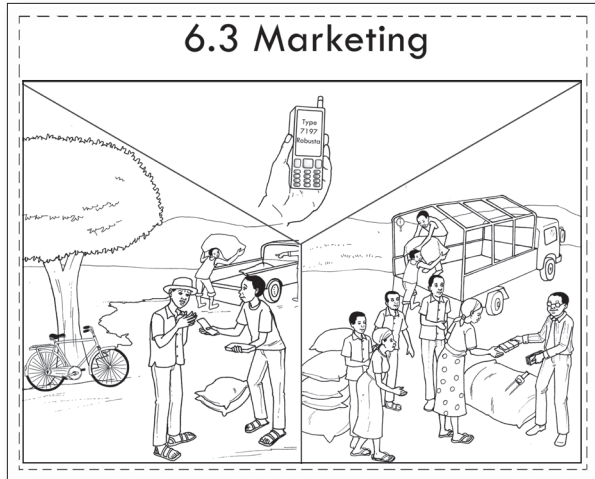


CHART 6.3: Marketing

Coffee is an important commodity in international trade. It plays an important role in the livelihoods and economies of many people and countries. Competition in the coffee market is between business men and women of all kinds, from small-scale dealers/brokers with small capital to those like exporters with large capital. Each of them has a different specialty and plays a different role in the coffee business.

- Brokers buy crops in the garden at flowering or fruiting stage. They may also buy freshly harvested cherry or parchment. They buy coffee at a very low price compared to the prevailing market.
- Brokers sell the coffee to traders who dry, bulk and sell it on to processors or exporters.
- Non-exporting processors sell the coffee to graders or exporters who take it to the external markets such as Europe and Sudan.

Because they are at the lowest level of the value chain, farmers lose out on the potential profitability of coffee growing. Small-

scale farmers can overcome this challenge by forming groups and bulking their coffee to process and market it in larger quantities and therefore get a better price.

Farmers should separate different qualities of coffee before bulking. Groups can also get better prices by buying inputs together in bulk.

Farmers can get market information from UCDA by sending a text message saying Robusta or Arabica to 7197 and they will get the market price in a return message.

6.4 Sustainable farming practices

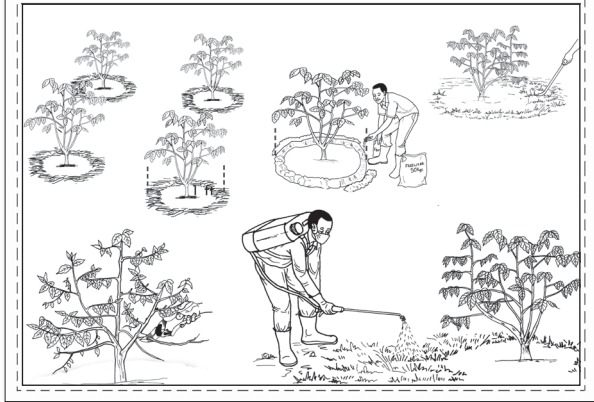


CHART 6.4: Sustainable farming practices

Sustainability has 3 main pillars:

- **Economic**- This aims to ensure economically viable farming for the farmer, proper access to markets for producers and market information. Farmers need to sustain productivity and quality at farm level as well as keep good records. This helps them to evaluate the impact of different good agricultural and post-harvest handling practices.
- **Social**- This includes giving appropriate respect and care to workers and families involved in coffee production and the supply chain.
- **Environmental**- This ensures adequate consideration for and protection of the natural environment. A farmer should think about the environment around his/her land and the long-term impact of his/her farming methods.



CHART 6.5: Certification/verification

Some markets require the coffee to be certified as sustainable. Access to these markets is an important reason to have a sustainable coffee farm.

Coffee certifying bodies have a set of standards, code of conduct and sustainability criteria designed to differentiate sources of consistent quality.

Coffee sustainability standards have verification and audit requirements so as to ensure all stakeholders conform to them. This includes a certain level of organisation and record keeping as well as an internal management system.

Certification is given only after passing an audit which verifies that the farm conforms to the required standards. This process is costly for smallholder farmers in many aspects, but they can be encouraged to associate and work collaboratively with other farmers to improve their yield and sustainable quality as they work towards attaining certification standards.

- **Certification bodies include:** Organic (IFOAM), FairTrade International, Rainforest Alliance, UTZ Certified and 4C (The Common Code for the Coffee Community)

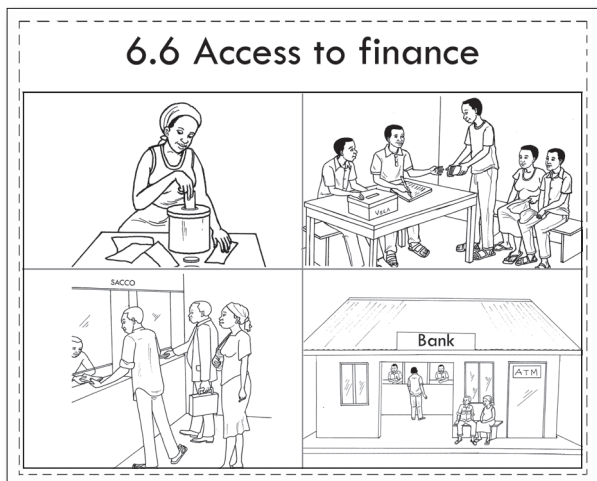


CHART 6.6: Access to finance

Farmers need money to meet daily demands. This may force them to sell their coffee prematurely at very low prices.

Farmers need to be able to borrow money on fair terms (low interest rates, and long gestation and loan recovery periods linked to the agricultural season).

Farmers can overcome these challenges by forming village saving and loan associations (VSLAs) or joining savings and credit cooperatives (SACCOs). These can serve as savings and loan schemes or can link farmers together to apply for farm loans from the larger banks.

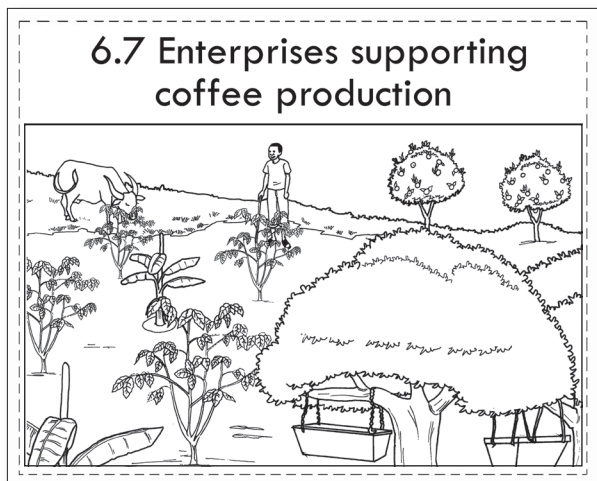


CHART 6.7: Enterprises supporting coffee production

Farmers should not rely solely on coffee for their income. Uncertainties like low yield and low prices can affect their income unexpectedly.

Farmers should keep cattle, goats, poultry and apiary as well as grow other food and cash crops to protect them from food insecurity. Animals also provide manure for the coffee farm.

Intercrop coffee with vanilla, bananas, beans, groundnuts and fruit trees such as mangos, jackfruit, passion fruit and avocado to provide food and additional income. Check with an extension worker before intercropping with other crops.

Plant crops like maize, soya beans, cassava and sweet potato on a separate piece of land (not intercropped with coffee) for food and cash.

Farmers may also be engaged in non-farm alternative enterprises such as owning retail or wholesale shops, making crafts and/or having formal employment, etc.

6.8 Family decision making 1

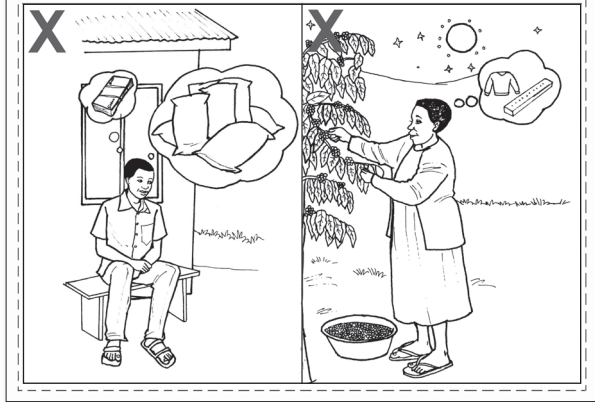


CHART 6.8: Family decision making 1

If the man in the household takes all the decisions on the use of coffee earnings, the woman may need to sell coffee secretly to cater for the family needs.

6.9 Family decision making 2

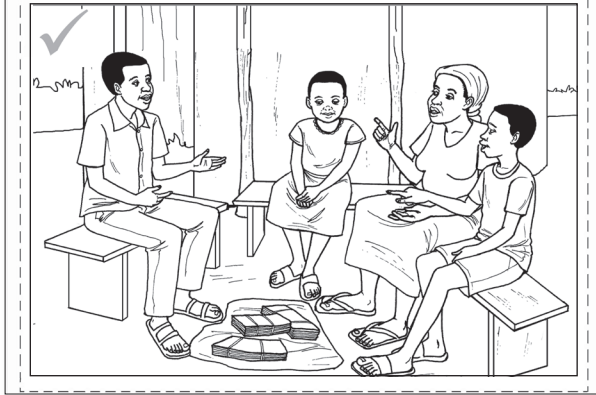


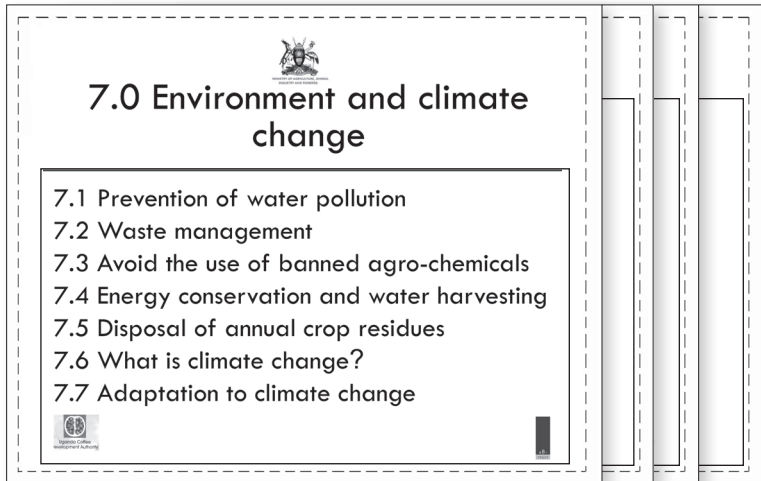
CHART 6.9: Family decision making 2


Successful coffee farming has many stages such as planning, production, processing, marketing and utilisation of profits to cater for family needs and to expand the business.

At all these stages, key decisions must be made. All decisions should be equitable, encourage participation of all family members (women, men, girls, and boys) and ensure that the farm benefits everyone involved. Coffee earnings may be used for school fees, health care, investment in the farm, home care (including soap and clothes), food security and savings.



A farm enterprise should clearly communicate roles and responsibilities, expectations, capabilities and entitlement for everyone involved. For example, children of school-going age should not work in coffee farms during school time, and all wages and working hours must comply with national employment policies.

Training Module 7.0: Environment and Climate Change




7.0 Environment and climate change

- 7.1 Prevention of water pollution
- 7.2 Waste management
- 7.3 Avoid the use of banned agro-chemicals
- 7.4 Energy conservation and water harvesting
- 7.5 Disposal of annual crop residues
- 7.6 What is climate change?
- 7.7 Adaptation to climate change

Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Understand the importance of protecting the environment and know some protection measures
- Understand important facts about climate change
- Know how to adapt a coffee farm to deal with climate change

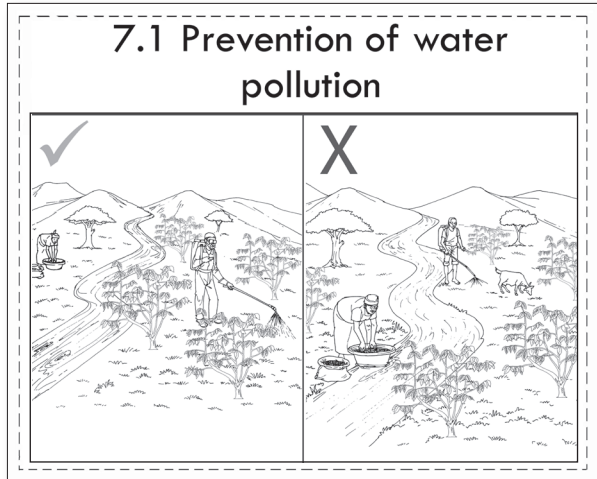


CHART 7.1: Prevention of water pollution

Our water sources belong to everyone and need to be protected to avoid pollution. If you wash your coffee in the river, you are spoiling the water for you and your neighbours downstream.

Wash your coffee in a container away from the water source. Dispose of the waste water carefully so it doesn't run back into the water source.

Use chemical sprays away from water sources, and do not wash sprayers or chemical containers in the river.

7.2 Waste management

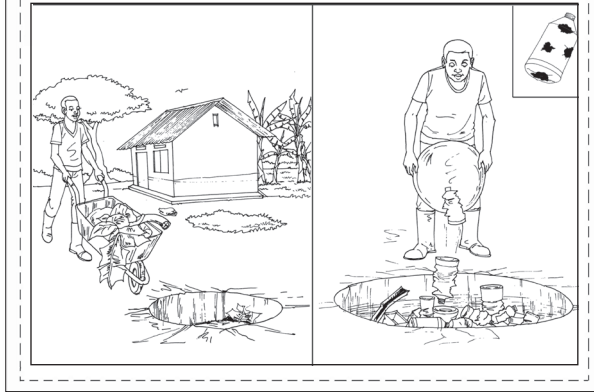


CHART 7.2: Waste management

It is important to separate organic and inorganic waste so that you can make compost from the organic waste to improve your soil.

Puncture all chemical containers to prevent re-use. Sell whatever plastic and metal you can. Keep the rest in a pit away from your house.

7.3 Avoid the use of banned agro-chemicals

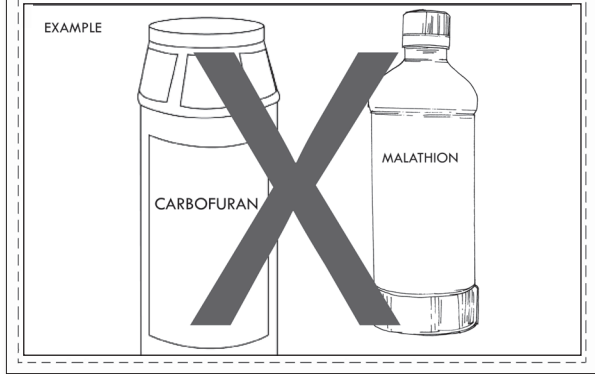


CHART 7.3: Banned chemicals

Do not use banned chemicals, which have been proven to be dangerous for humans, animals, birds and the environment in general.

Here is a table of chemicals which are banned. You should not use any of these. The table also contains alternatives that you should use

| No. | Product name | Active ingredient | Used to control | Alternative control |
|-----|----------------|-------------------|---|--|
| 1 | Furadan | Carbufuran | • Banana weevils white grubs, root mealy bugs | • Dursban (powder) |
| | | | • Nematodes | • Crop rotation; soil sterilisation - solar heating of nursery beds • Neem-based products |
| | | | • Animals & birds (poisoning) | • Do not poison animals |
| 2 | Endosulfan | Endosulfan | Coffee berry borer | • Crop hygiene: Harvest and bury all remaining cherries after final harvest |
| | | | Acaricide | • Biotic spot-on; Milbitraz; pye-grease |
| 3 | Paraquat | Paraquat | Herbicide | • Slashing or uprooting • Glyphosate-based products |
| 4 | Actellic Super | Permethrin | Grain storage insects | • Ash or Neem extracts • Clean stores + proper drying |
| | Ambush | | Field insects | • Cypermethrin (or chlorpyrifos) based products |

NB: FOR THOSE IN CERTIFICATION SCHEMES, YOU SHOULD CONTACT THE STANDARDS BODY, E.G. UTZ CERTIFIED, FOR A FULL LIST OF BANNED CHEMICALS

7.4 Energy conservation and water harvesting

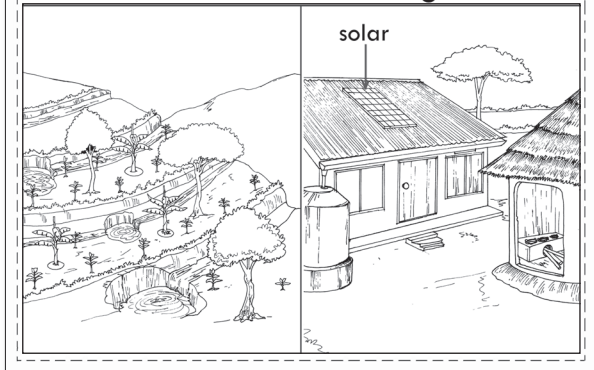


CHART 7.4: Energy conservation and water harvesting

Energy and water are precious resources and need to be used with care.

- Plant multi-purpose trees for shade and fuel supply. Collect run-off water in trenches or ponds for soil moisture retention.
- Use energy saving stoves. Use solar energy where possible. Explore the possibility of biogas production from livestock manure and other sources.

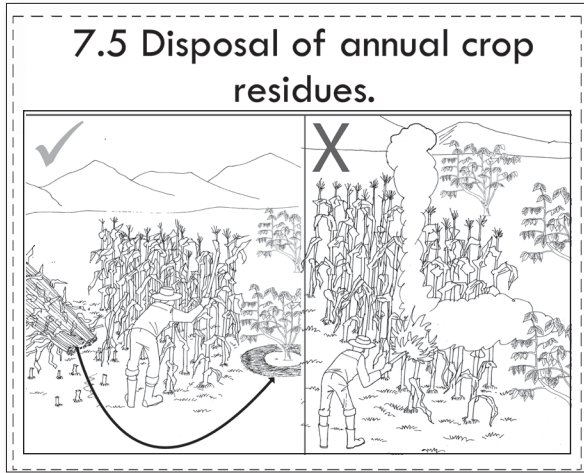


CHART 7.5: Disposal of annual crops residues

Annual food crops are often grown alongside your coffee. After harvest of the food crops, clearing the land may be a challenge.

- Avoid burning the crop residues in the field as the fire may spread to your coffee and also cause a loss of nutrients and living organisms.
- Crop residues should be used for mulching, composting or for livestock feed.

7.6 What is climate change?

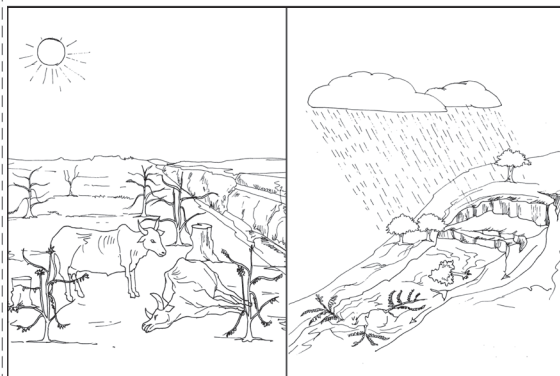


CHART 7.6: What is climate change?

Climate change is the change of the Earth's ecosystems due to an increase in the global temperature.

Greater levels of atmospheric carbondioxide (CO^2) and other greenhouse gases near the Earth's surface are part of the reason for this increase in temperature.

As a result of climate change, Uganda is witnessing ecosystem instability in the form of frequent and prolonged droughts, frequent floods, hailstorms, landslides, thunderstorms and erratic and unreliable rainfall. Such changes and instability in the ecosystem can disrupt agricultural productivity.

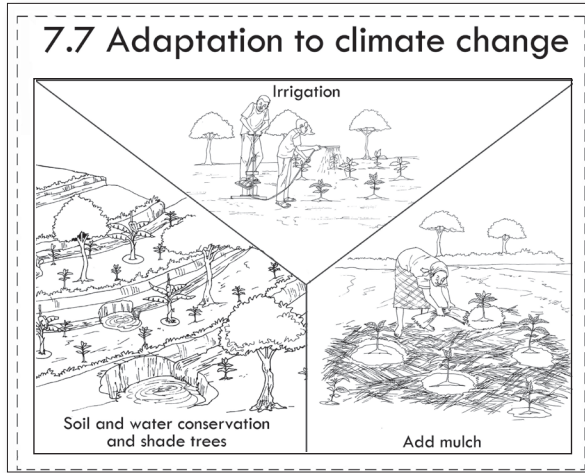


CHART 7.7: Adaptation to climate change

There are several agronomic practices the coffee farmer should be aware of that help to minimise the effect of climate change. These include:

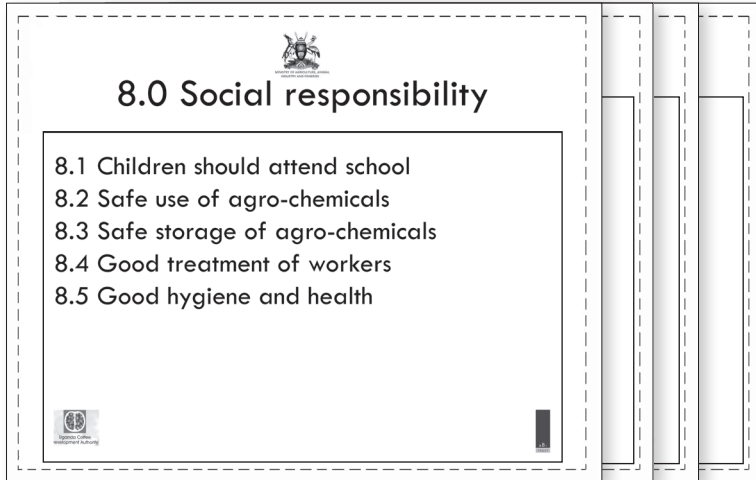
- Planting shade trees in coffee gardens
- Mulching
- Irrigating to ensure a continuous water supply to plants
- Using manure and inorganic fertilizers
- Managing (biological, chemical, cultural control) pest and disease infestation
- Using soil erosion control measures: (trenches, terraces, bands , gully traps) to prevent soil erosion
- Planting cover crops and trees

Here is a table of recommended shade trees:

| English name: | Scientific name: | Common names: | What does the tree bring besides shade: |
|---------------------------|-------------------------|-------------------------------------|--|
| Silk oak | Grevillea | Grevillea | Firewood, timber, mulch, apiculture |
| Markhamia* | Markhamia lutea | Nsambya, Lusola, Omusambya | Firewood, timber, mulch, apiculture, medicines |
| Umbrella tree* | Maesopsis emnii | Musizi | Firewood, timber |
| Bark cloth fig, Natal fig | Ficus spp. | Mutuba, Mukokowe, Mukunyu, Omutooma | Timber, fodder, bark cloth, medicines |
| Cordia | Cordia africana | Mukebu, Chikichikiri, Mujugangoma | Firewood, timber, mulch, apiculture |
| Silk tree* | Albizia chinensis | Lusubyu | Timber, fodder, rich mulch, soil fertility |

* These 3 trees are known to be hosts to Black Twig Borer so their use should be carefully managed. Encourage farmers to consult their extension workers for further advice.

Training Module 8.0 Social Responsibility



Objectives for the training

By the end of the training, participants should have acquired the knowledge and skills necessary to:

- Include children in coffee farming in a safe and responsible way
- Use and store agro-chemicals in a safe and responsible way
- Treat farm workers in a fair and ethical way
- Maintain good health and hygiene

8.1 Children should attend school

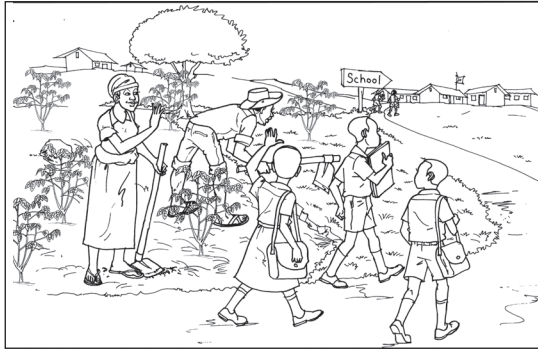


CHART 8.1: Children on the farm

All children should go to school.

Outside school hours, they may do light work on the farm under adult supervision. This helps the children learn about the farm and they can help with record keeping.

They must not spray chemicals or carry heavy loads.

8.2 Safe use of agro-chemicals

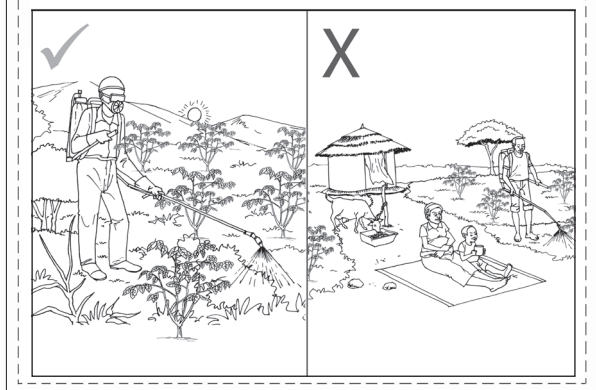


CHART 8.2: Safe use of agro-chemicals

Remember that agro-chemicals may be dangerous if not properly stored and used.

- Always wear full protective gear (cap, masks, overalls outside gumboots, goggles, gloves, boots) when handling or spraying agro-chemicals.
- Do not spray near other people, livestock or water sources.
- Do not spray when it is very windy. Never spray against the direction of the wind.
- Make sure you warn other people before and after spraying

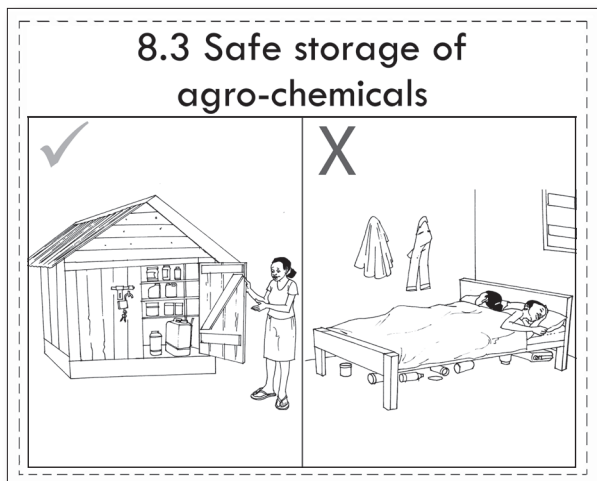


CHART 8.3: Safe storage of agro-chemicals

Chemicals should be kept in a locked place, out of reach of children and away from food and stored crops. Where possible, keep them in a separate store.

Do not store chemicals under the bed. Alternative safe storage is a locked tin trunk or locked wooden box.

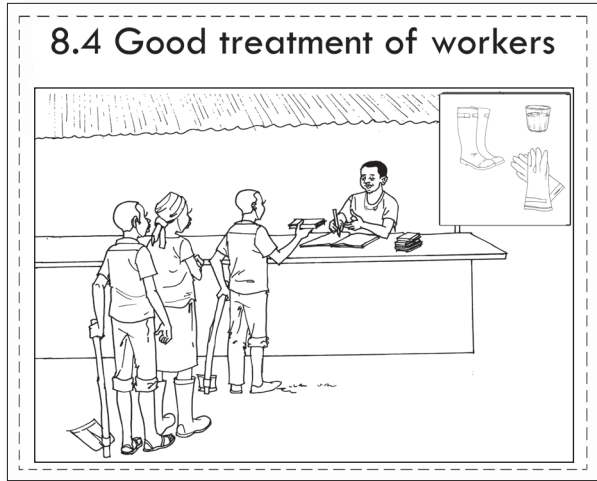


CHART 8.4: Good treatment of workers

All workers are important for your coffee farm and should be treated with respect.

- A fair rate for the job should be agreed, and paid when the work is completed or as agreed.
- All payments should be recorded.
- Reasonable working conditions, such as access to clean drinking water, toilets and protective gear should be provided.

8.5 Good hygiene and health

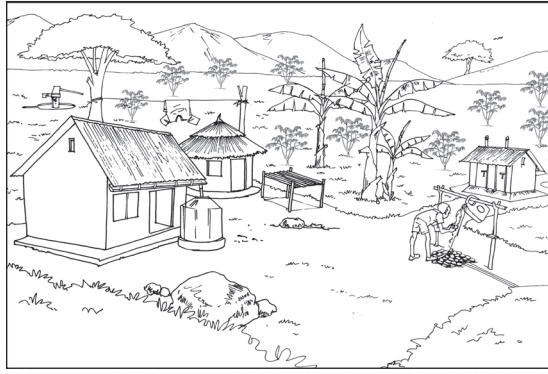


CHART 8.5: Good hygiene and health (personal)

Good hygiene is important for the health of you and your family.

- Keep your compound clean.
- Have a clean and functional pit latrine/toilet.
- Sleep under a treated mosquito net.
- Have a safe water source.
- Wash your hands regularly.

Trainers' Notes

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DEVELOPMENT OF THE COFFEE TRAINING MATERIALS SUPPORTED BY



1479 Naalya Road, Kiwatule, P.O. Box 25312, Kampala, Uganda
Tel: 256-312-263-263, Email: mangotree@mangotreeuganda.org
www.mangotreeuganda.org