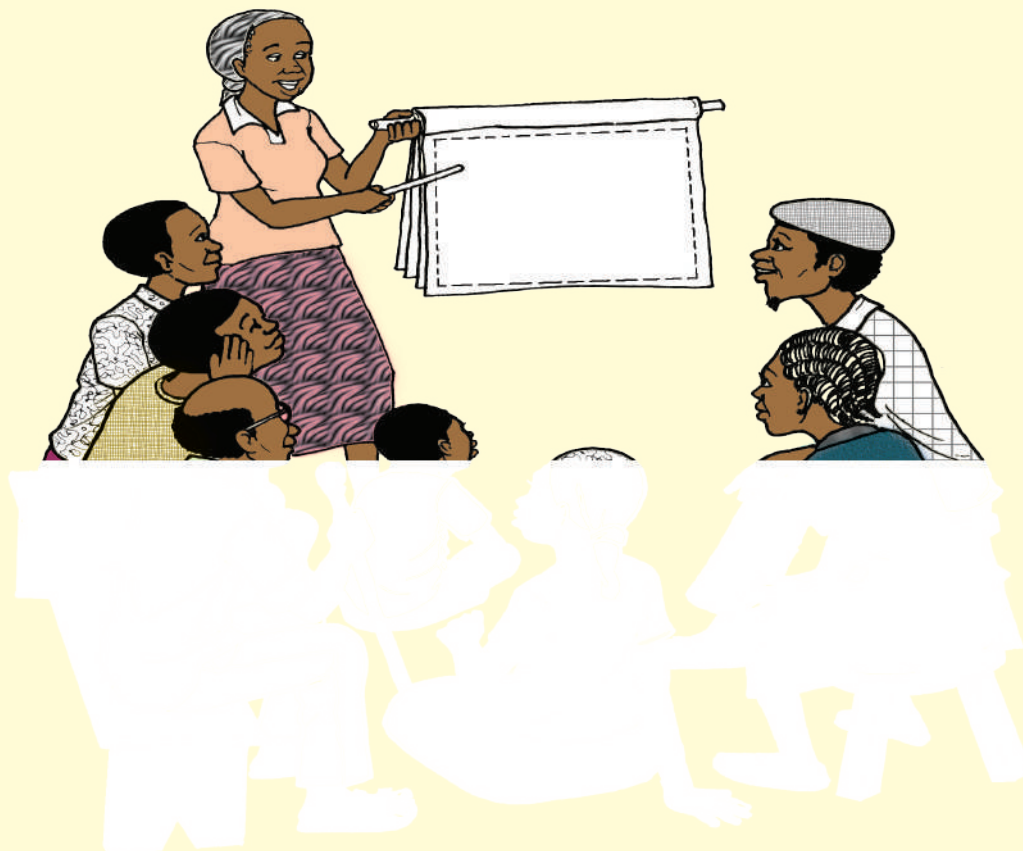




MINISTRY OF AGRICULTURE, ANIMAL
INDUSTRY AND FISHERIES

Uganda Training Materials for Coffee Production



Training Manual

First Edition 2014

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- 7.0 Environment and climate change
- 8.0 Social responsibility





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

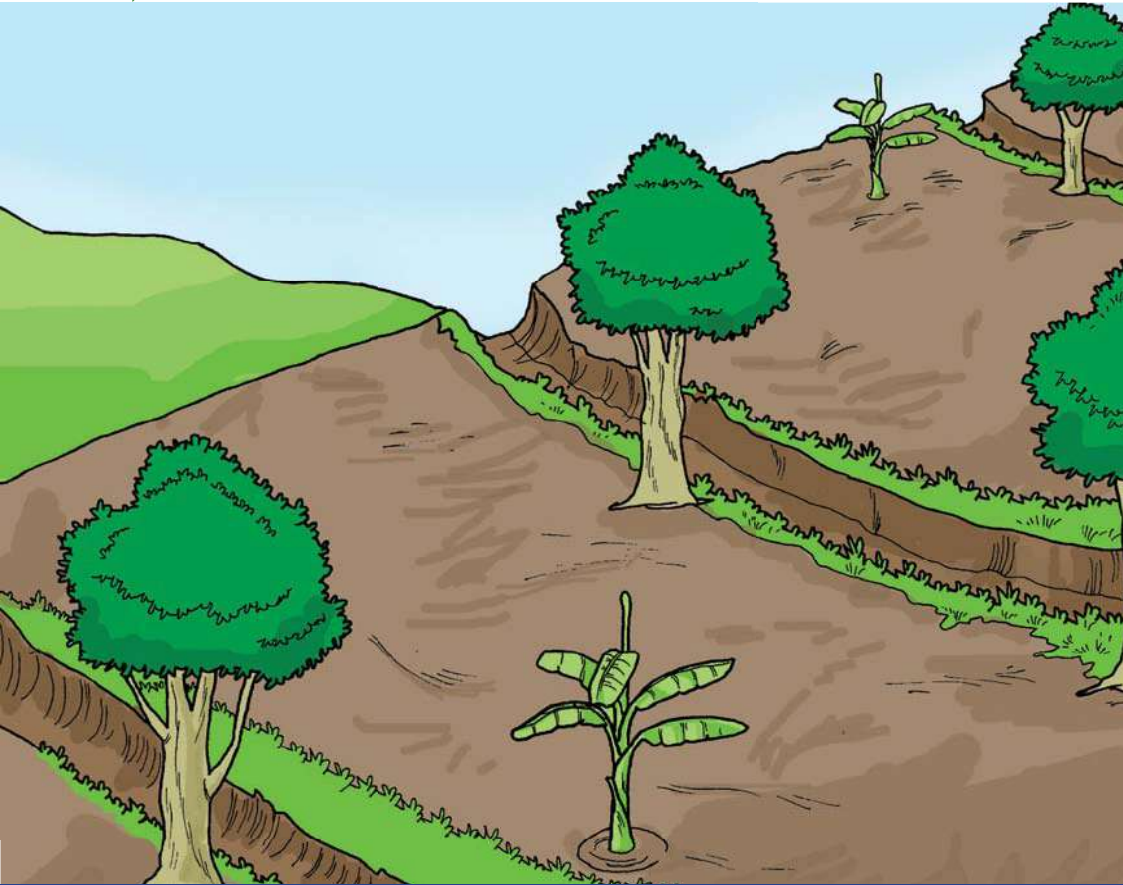
1.4 Hole preparation

1.5 Selecting planting materials

1.6 Planting coffee



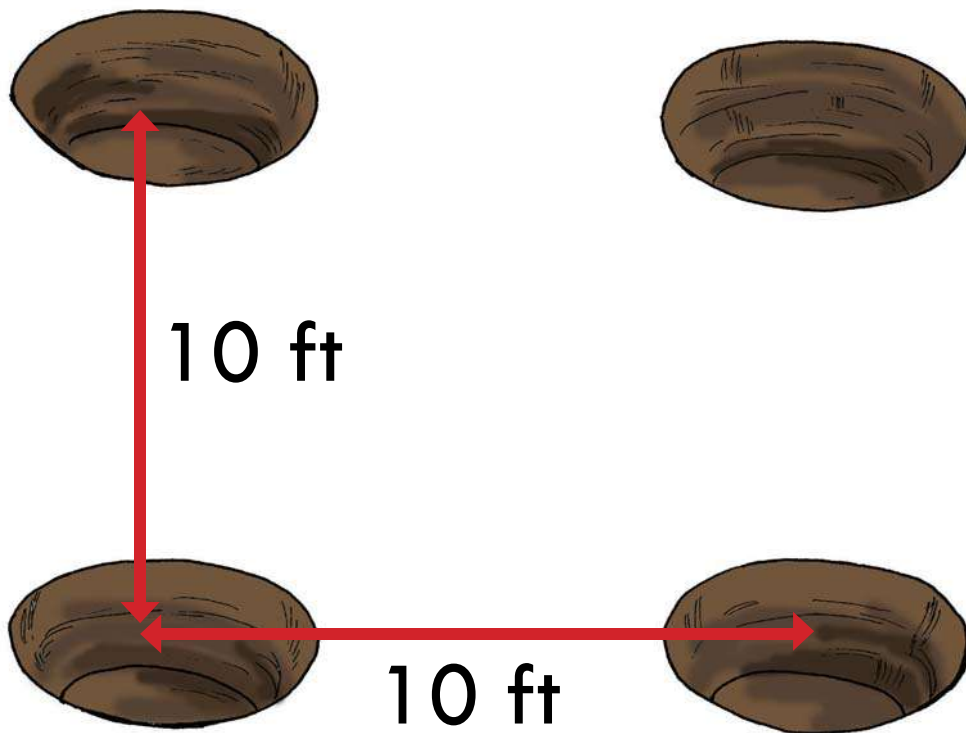
1.2 Preparing site for a coffee farm



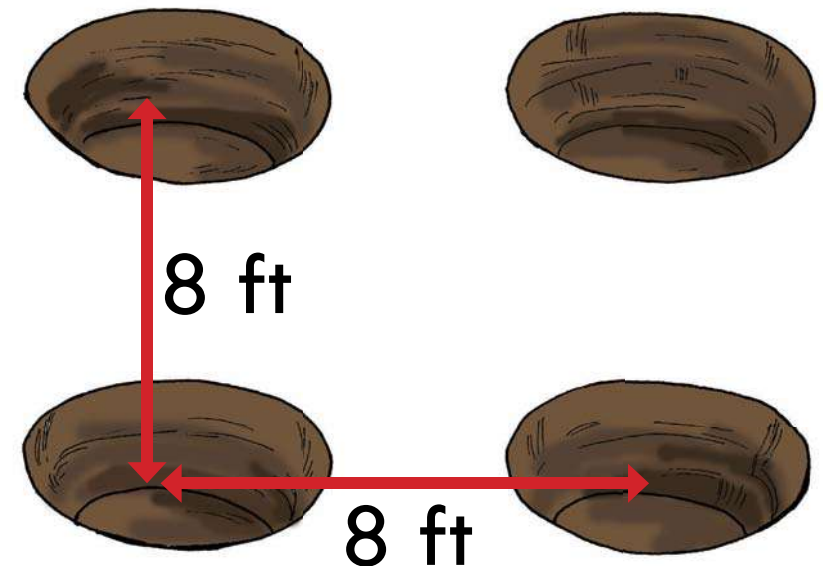
1. Prepare the land during dry season.
2. Remove excess trees and stumps. Leave some mature trees for shade.
3. Remove weeds by digging, hand picking perennial weeds or applying herbicides.
4. Build contour terraces, bands, grass strips and cut-off drains to prevent soil erosion.

1.3 Plant spacing

Robusta coffee



Arabica coffee

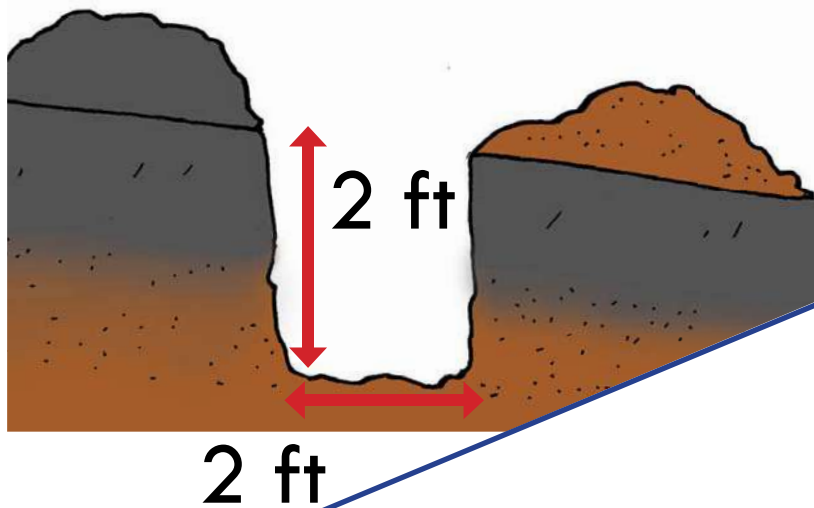


Marking field and digging holes for planting coffee

1. Plant Robusta coffee in lines at a spacing of 10ft x 10ft (450 trees per acre).
2. Plant Arabica coffee in lines at a spacing of 8ft x 8ft (680 trees per acre).

1.4 Hole preparation

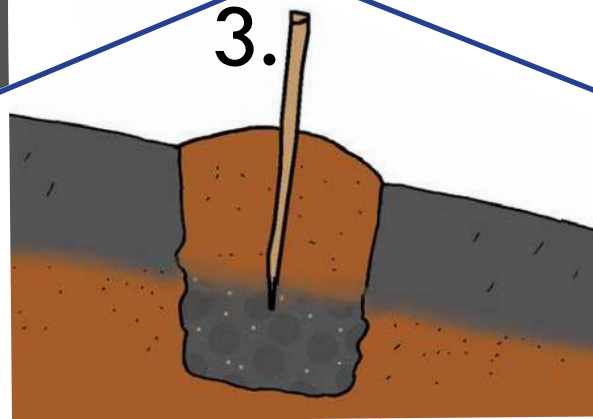
1.



2.



3.



Marking field and digging holes for planting coffee

1. Dig round holes.
2. Heap the fertile topsoil separate from the subsoil.
3. Refill the holes with topsoil mixed with a basin of manure and a handful of DAP or SSP fertilizer.
4. Heap the soil above the ground level to allow for sinking when the soil settles.
5. Mark positions where the coffee plants will be planted with pegs.

1.5 Selecting planting materials



Selecting planting materials

1. Obtain all planting materials from a UCDA-certified source.
2. Farmers may raise their own seedlings using seeds or cuttings from a certified source.
3. Plant coffee seedlings with between 6-8 leaves.

1.6 Planting coffee

1. Plant 2-4 weeks after the onset of rains.



2. Trim off roots protruding beyond the polythene pots.

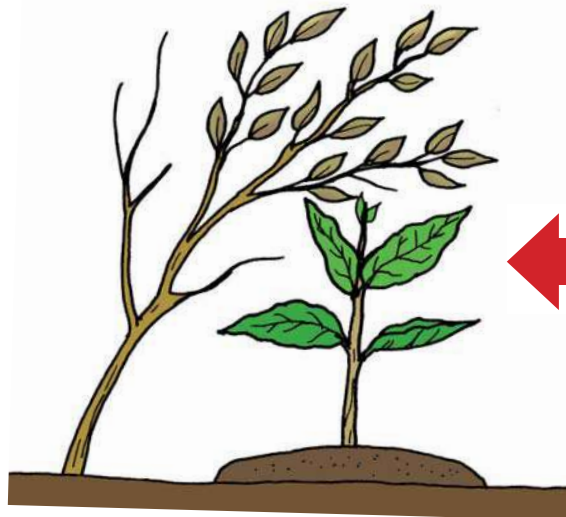
3. Remove polythene pots from potted plants before planting.



5. Place the plant in the opening with the collar of the plant at level with the surrounding soil.

6. Provide shade for new planted seedlings.

shade



4. Open up the centre of the filled holes sufficiently to fit the size of the potted soil.

5. Add basin full of manure at planting.



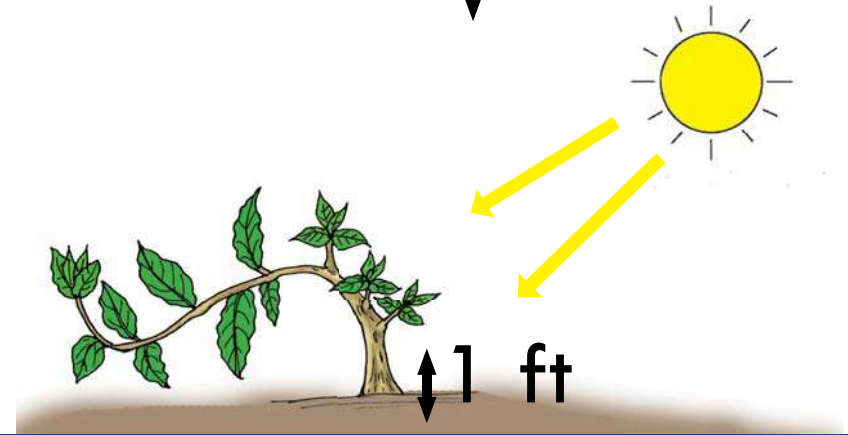
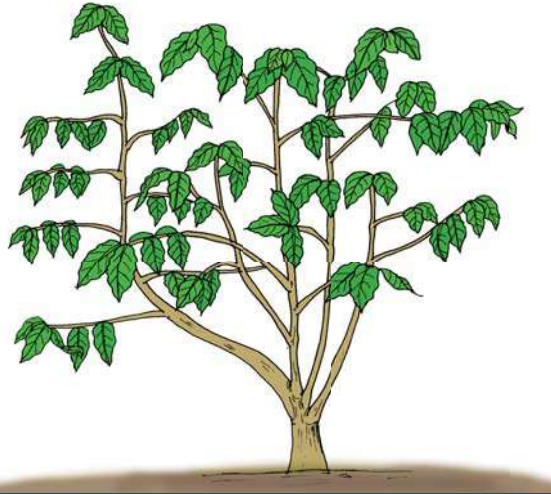
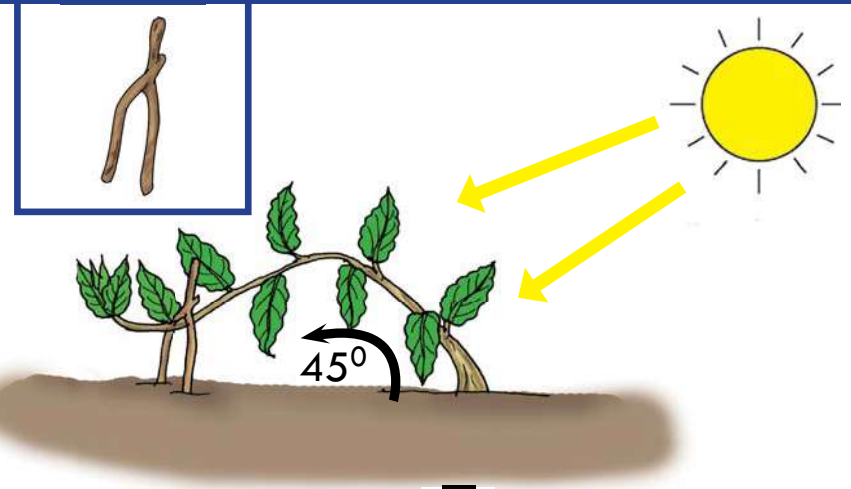
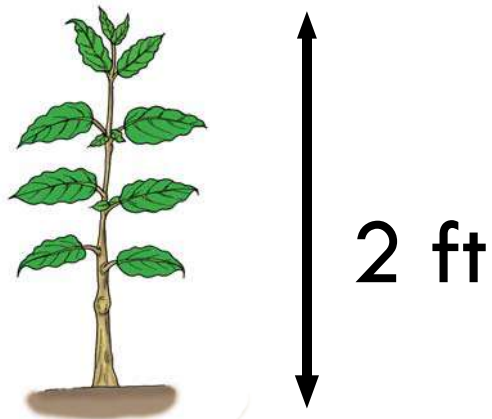


2.0 Management of a coffee farm

- 2.1 Training/bending a coffee tree
- 2.2 Weed control/management
- 2.3 Managing soil fertility 1
- 2.4 Managing soil fertility 2
- 2.5 Pruning and desuckering
- 2.6 Stumping
- 2.7 Mulching
- 2.8 Soil and water conservation



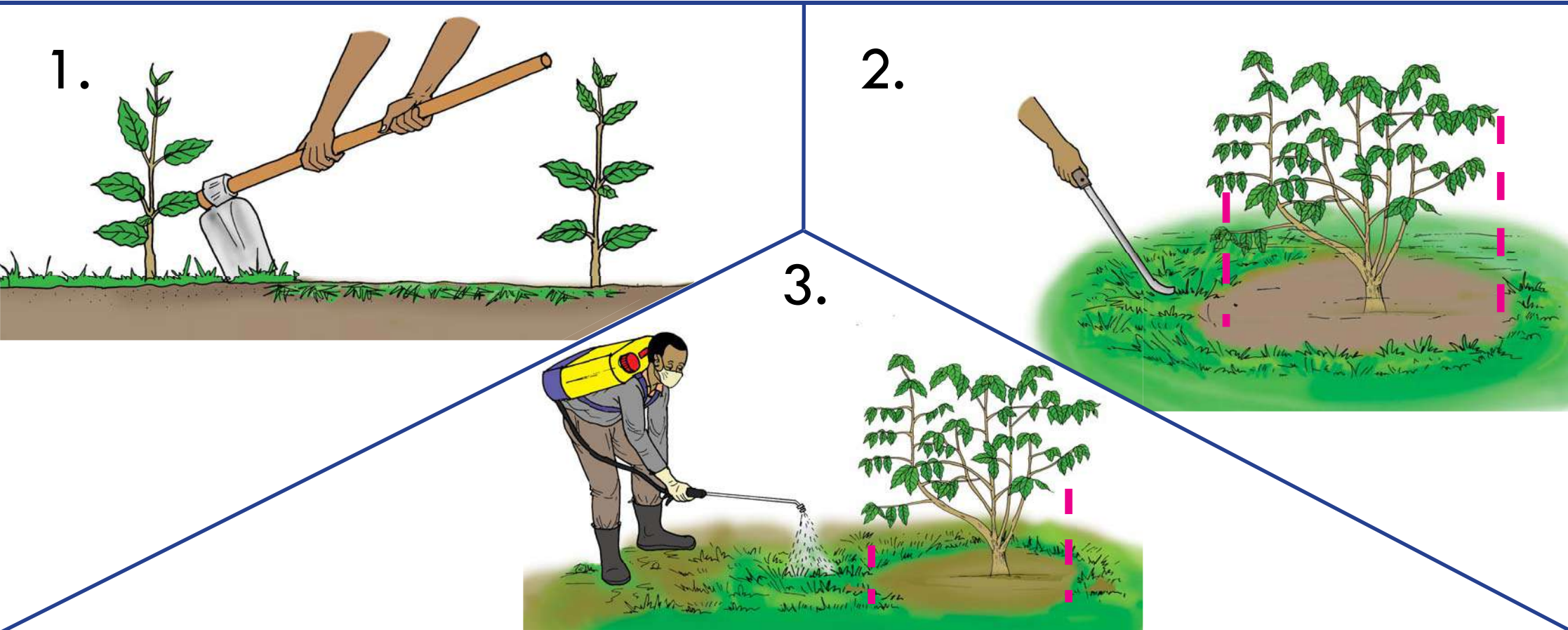
2.1 Training/bending a coffee tree



Training/bending coffee tree

1. Bend the 6 month old coffee plants up to 45 degrees and along rows to stimulate growth of suckers.
2. Allow only 2-4 healthy looking suckers which originate at about 0.5-1 foot from the base of the trained plant to grow.

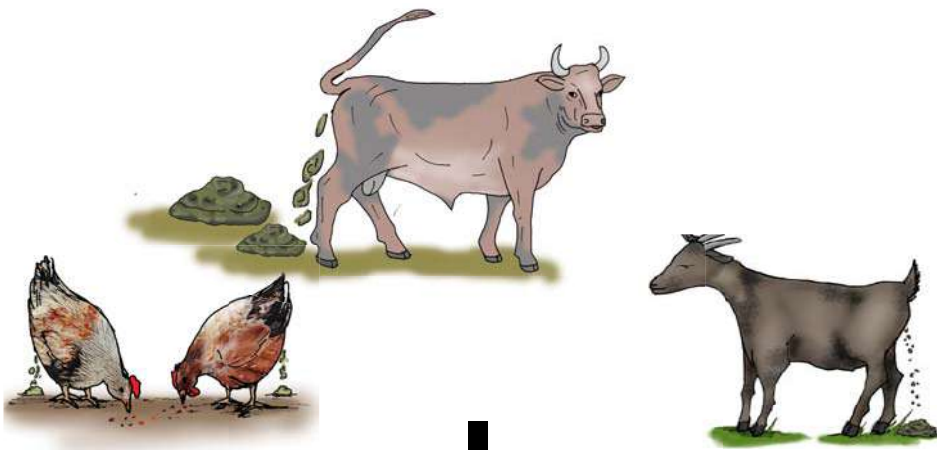
2.2 Weed control/management



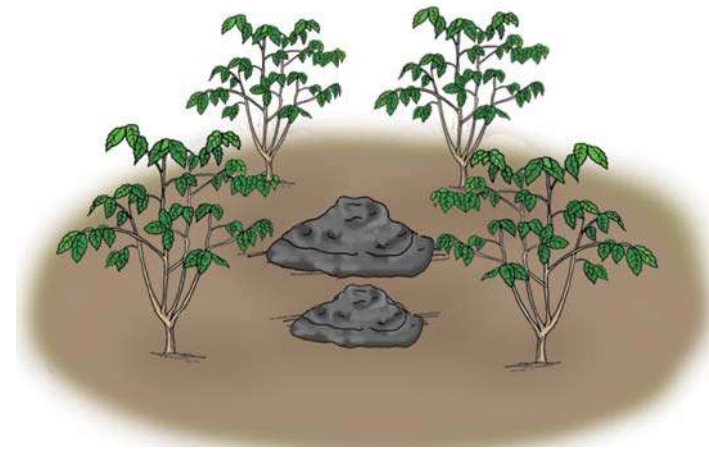
Managing weeds in a coffee farm

1. Remove weeds in gardens of young coffee of up to a year old by digging and slashing or mulching.
2. Remove weeds in old coffee gardens by mulching, or alternating digging and slashing with herbicide spraying outside the canopy.
3. Ring weed below the canopy to avoid damage to the plant (during slashing or spraying).
4. Spray herbicides outside the canopy using manufacturers' rates or get help from the extension staff or a knowledgeable farmer.
5. Avoid spraying on the coffee leaves as this can kill the plant.

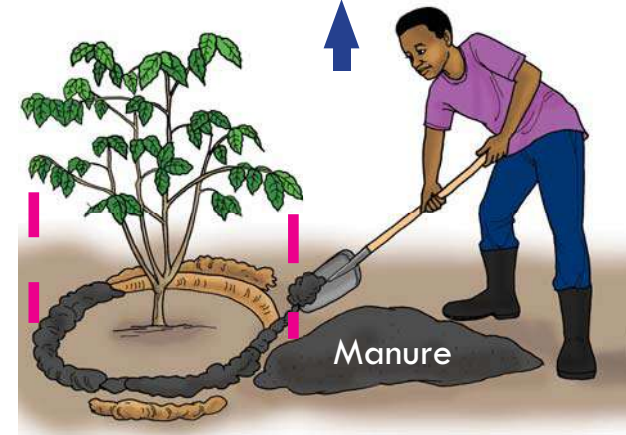
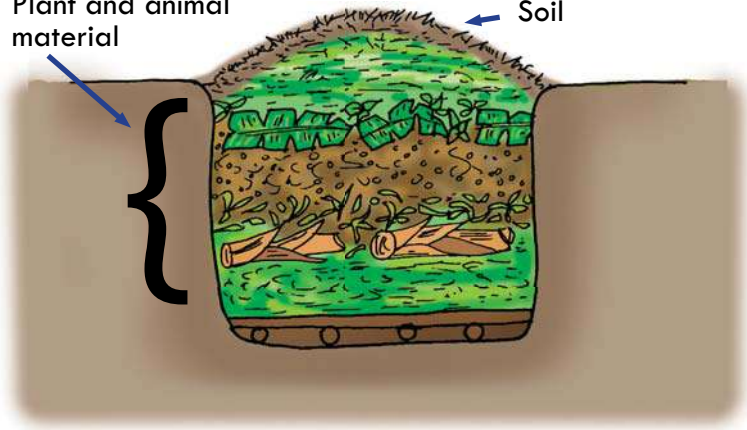
2.3 Managing soil fertility 1



X



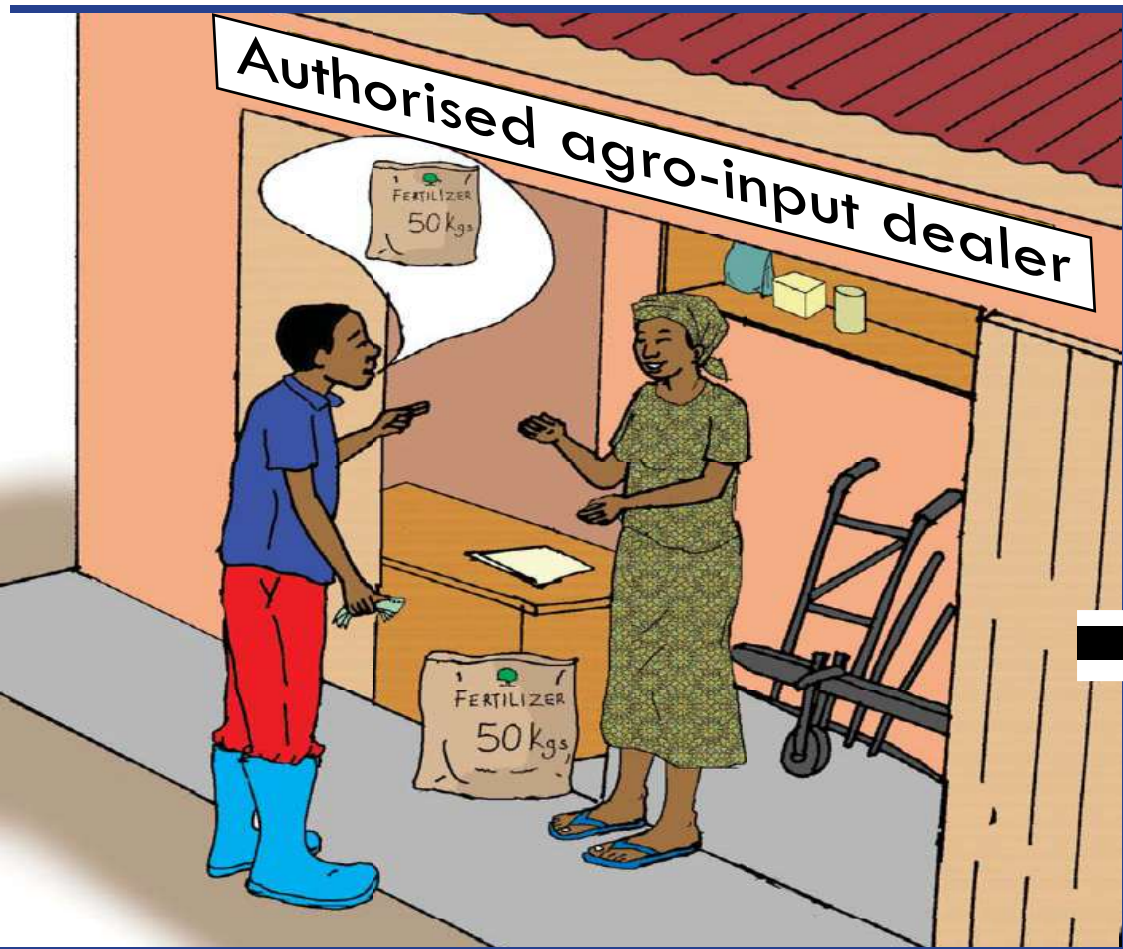
Plant and animal material



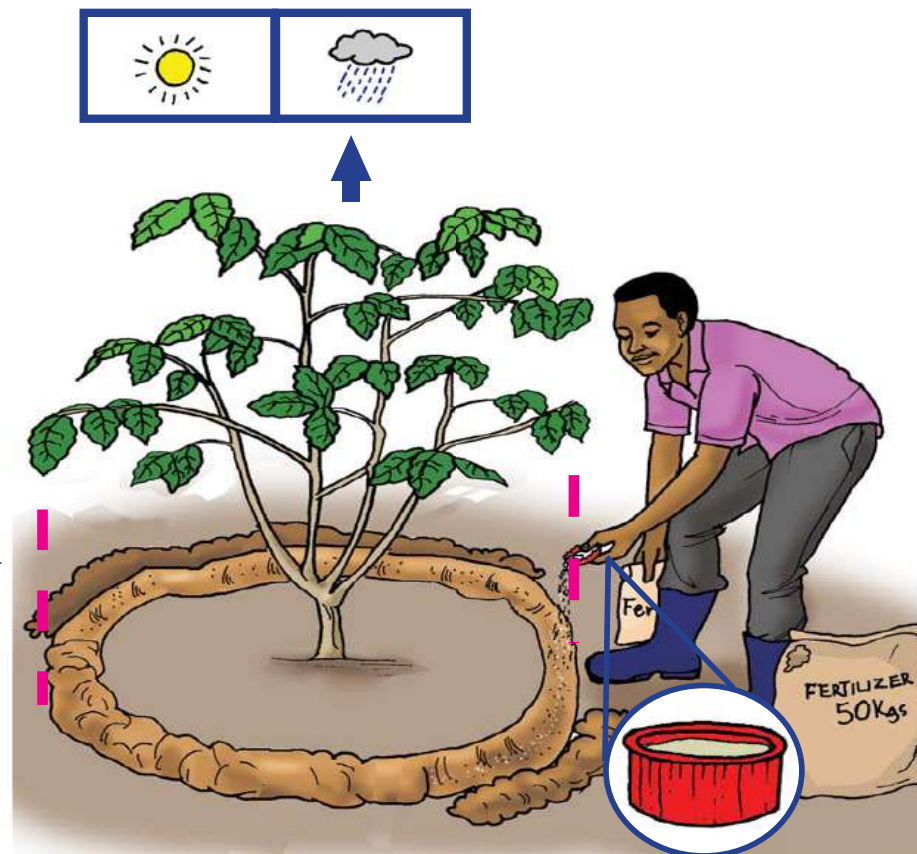
Managing soil fertility in a coffee farm

1. Coffee requires fertile soils with high levels of nitrogen, phosphorus and potassium.
2. Mulch and apply about 3-5kg of organic manure around each coffee plant to improve plant growth and yield, once a year at the beginning of the rains.
3. Prepare compost in a pit 6 months prior to planting.

2.4 Managing soil fertility 2



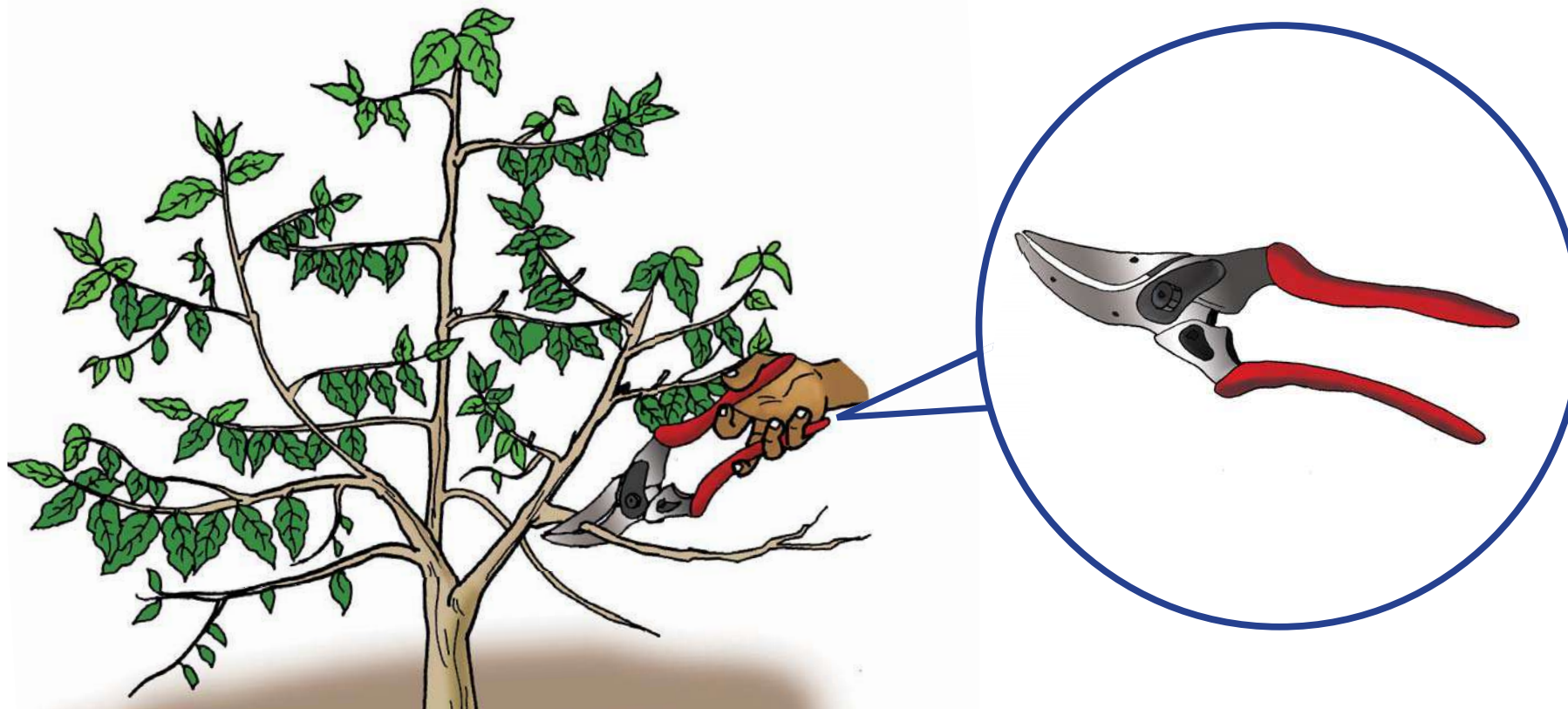
Apply fertilizer at the onset of the rainy season



Managing soil fertility in a coffee farm

1. To improve the soil fertility add inorganic fertilizer at the beginning of the rainy season (check recommended formulations and application rates).
2. Get help from the extension staff or a knowledgeable farmer when applying inorganic fertilizer for the first time.
3. Apply fertilizer within the rooting zone (under the tree canopy).

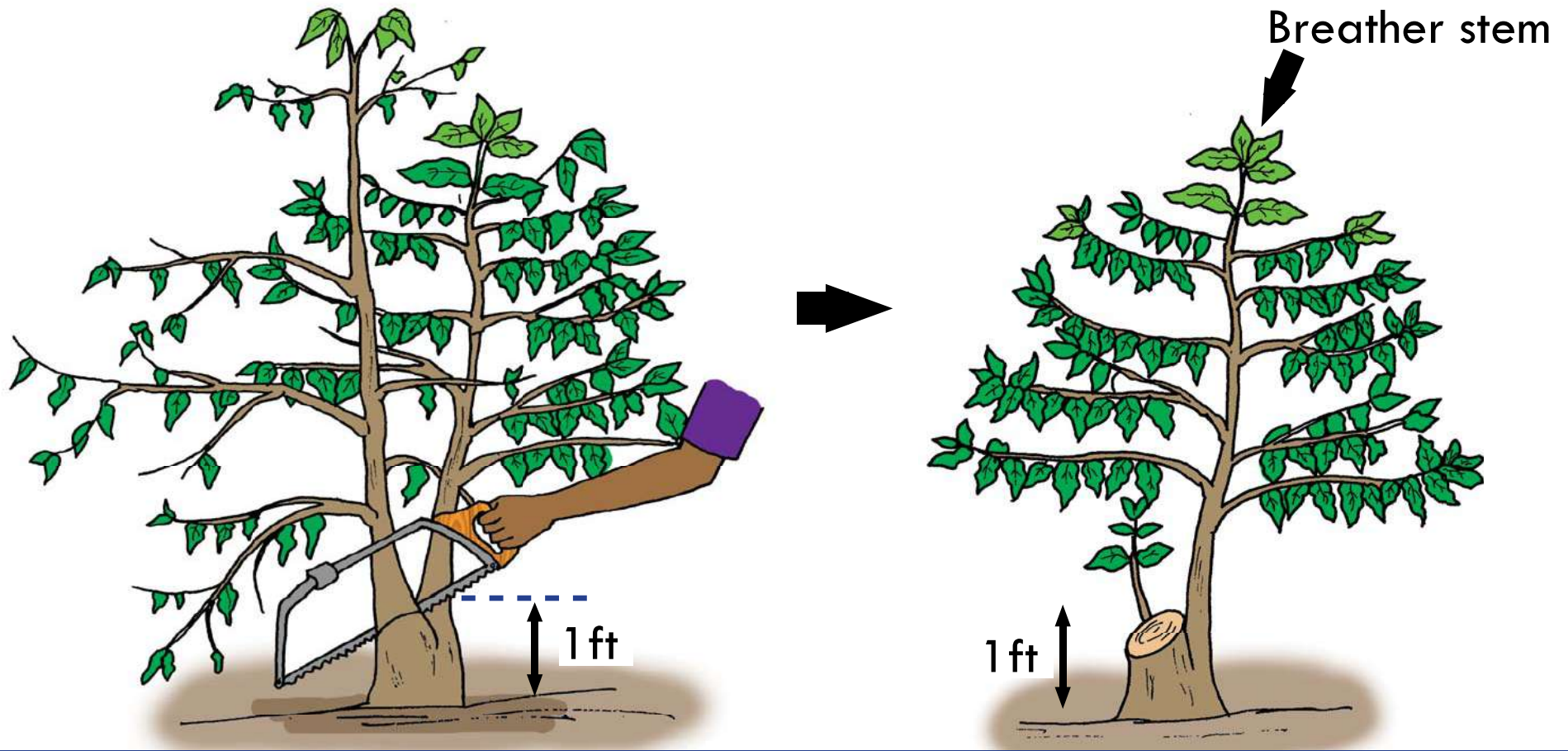
2.5 Pruning and desuckering



Pruning and desuckering

1. Remove unwanted stems and suckers, and dead, weak and unproductive branches using secateurs or pruning saws. This encourages new growth and improves productivity.
2. Also remove:
 - a. Broken stems or unproductive whole or part stems, using a pruning saw.
 - b. This reduces pest infestation from the soil.

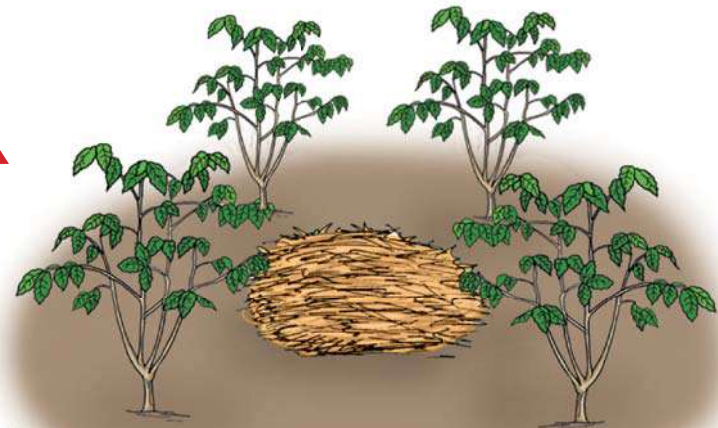
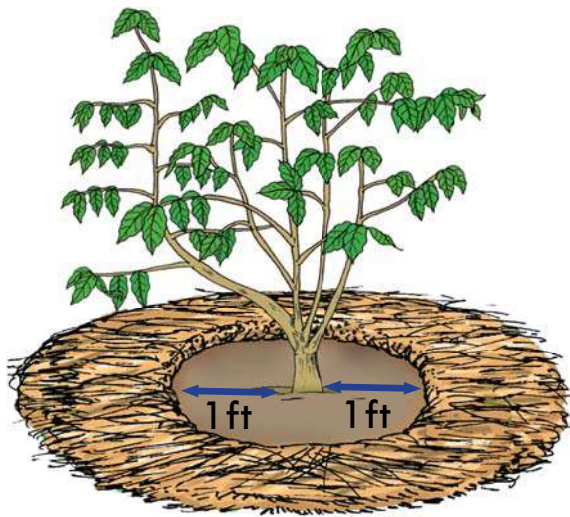
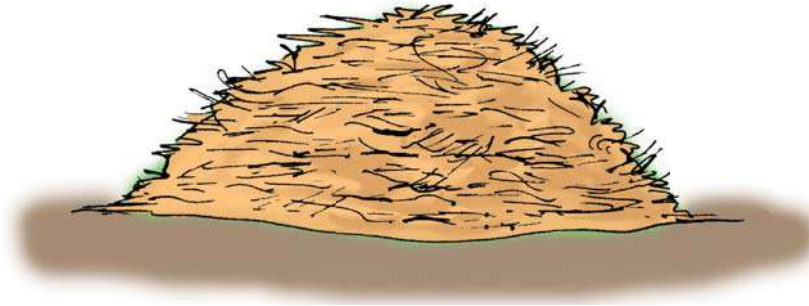
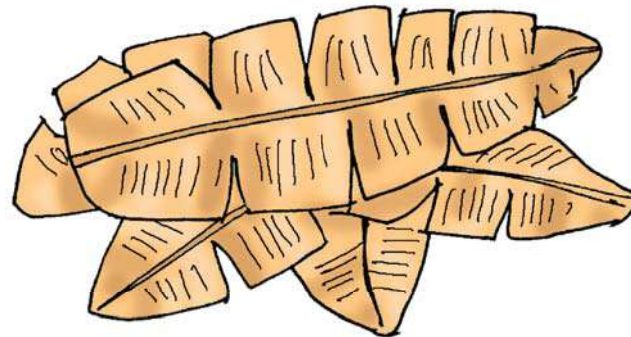
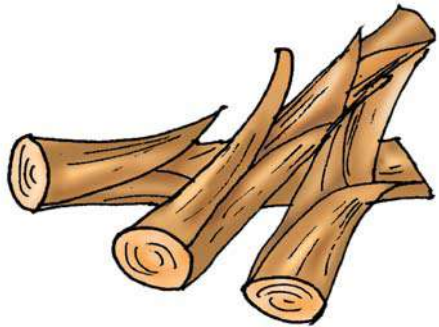
2.6 Stumping



Stumping coffee

1. Stump coffee after 7-9 years to renew the stem cycle and improve productivity.
2. Leave a breather stem which should be removed 6 months after stumping.
3. Stumping can be either staggered or clean stumping. If staggered, stump 1 in 3 trees every year so the entire garden is stumped over a 3 year period.
4. Get help from the extension staff or a knowledgeable farmer when stumping coffee for the first time.
5. The stumping should be at least 45° and sloping away from the breather stem.

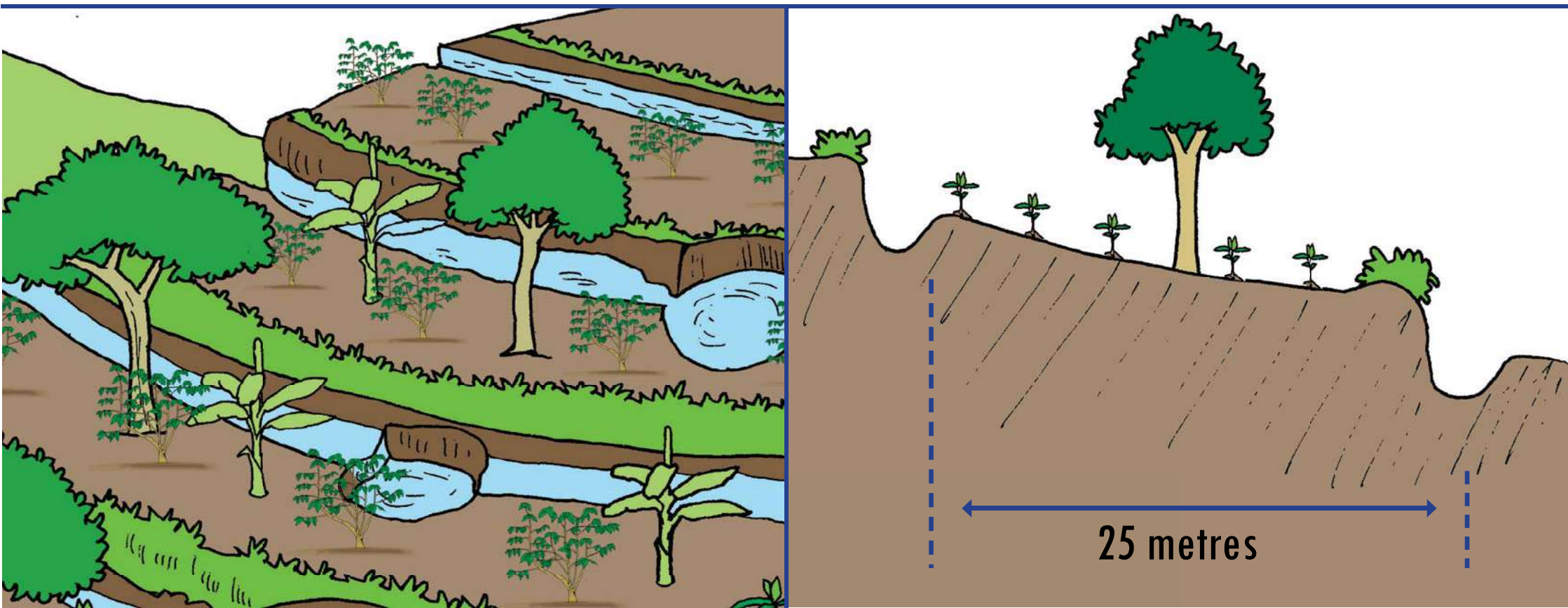
2.7 Mulching



Mulching a coffee farm

1. Mulch coffee gardens with up to 6 inches of maize straw, bean trash, banana leaves, grasses or any other dead plant materials to conserve moisture, control weeds and soil erosion, and add nutrients to the soil.
2. Place the mulch 1 ft from the coffee stem to prevent infection from collar rot or attack from ants and termites.

2.8 Soil and water conservation



Soil and water conservation

1. Digging pits/troughs at some points of the terrace preserves rain water. Add a small amount of oil to the water trapped in the pits/troughs to prevent breeding of mosquitoes.
2. Mulch coffee to prevent soil erosion and retain soil moisture.
3. Plant cover crops such as Mucuna, Phaseolus beans, lablab and groundnuts.
4. Plant grass at the edges of the gardens and ridges/terraces/contour bands.
5. Plant shade trees and/or bananas.



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



Uganda Coffee
Development Authority

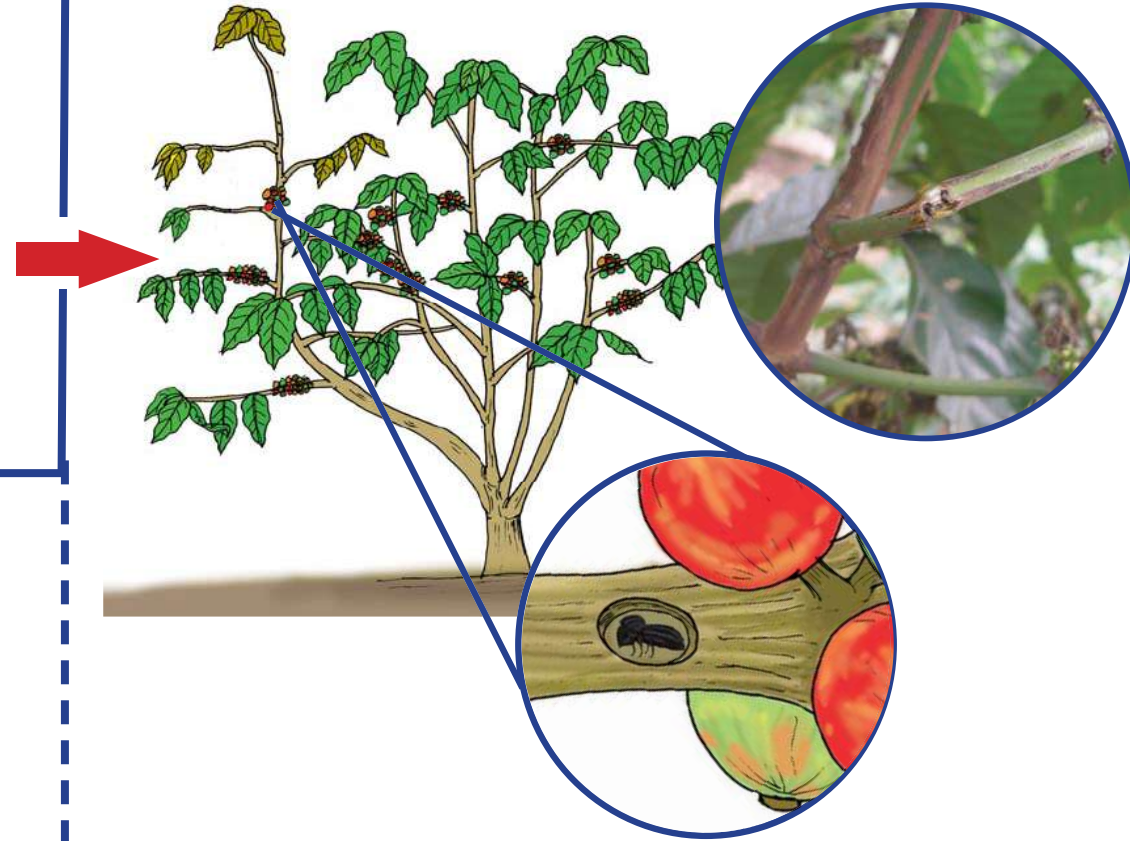
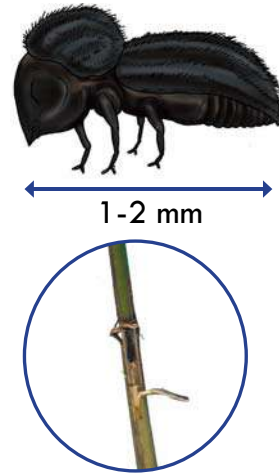
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3.1 Black twig borer (mainly Robusta)

Black twig borer (BTB) is a small beetle that bores into primary branches and young stems, killing them.

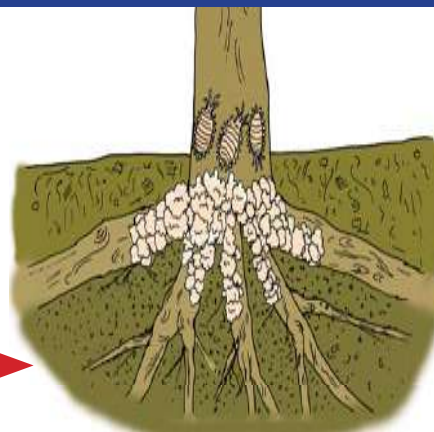
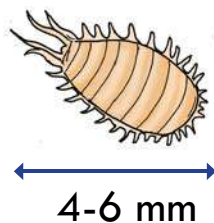


To control:

1. Prune affected parts and burn them.
2. Clean weed by digging to bury any of the pests harboured in ground surface litter.
3. Apply systemic insecticides such as Imax where necessary.
4. Stump the coffee trees if infestation is extreme.
5. Reduce excessive shade as it is conducive for the survival of BTB.

3.2 Root mealy bug

1. Root mealy bugs are sucking insects on the roots of the plants.
2. They sip sap from the roots and thereby reduce movement of water and nutrients to the trees.
3. This causes yellowing and drooping of leaves and death of entire trees.

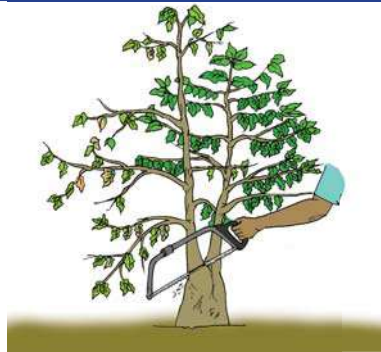
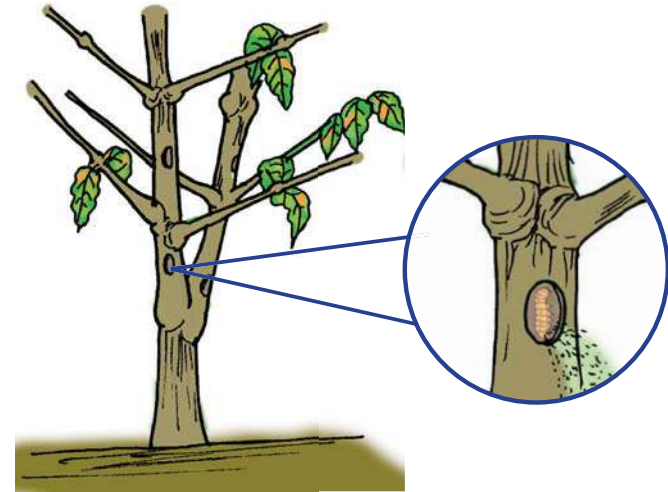
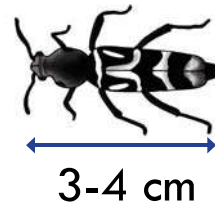
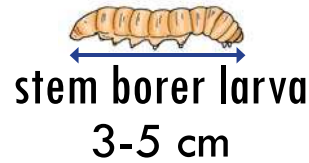


To control:

1. Uproot and burn affected or dead trees.
2. Trees showing early signs of attack and surrounding ones should be treated with Dursban mixed into soil around the tree or with Actara.

3.3 White stem borer (mainly Arabica)

1. Adult female stem borers lay eggs inside crevices on the bark of the stem.
2. The larvae bore into the main stem of the coffee tree. You can see wood shavings at the base of the tree.
3. The damage causes yellowing of foliage, easy breaking of the stem and eventual death of trees.

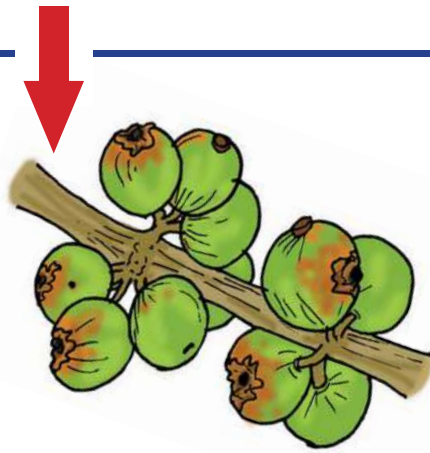
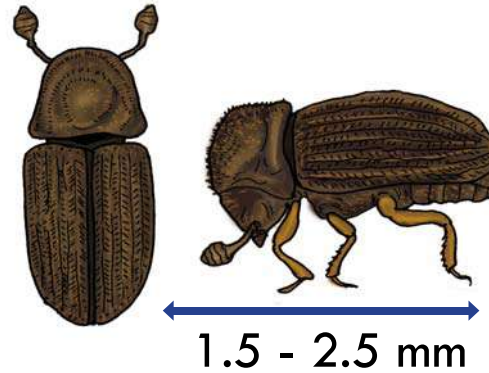


To control:

1. Band tree stems with Dursban using brush from collar level to height of 0.5 metres.
2. Push a bicycle spoke/any wire into the tunnel to kill larvae.
3. Stuff the insect hole with cotton wool or paper soaked with Dursban or Super Sumithion to kill the larvae.
4. Smoothen tree bark up to 0.5 metres using a maize cob or cloth to prevent laying of eggs.

3.4 Coffee berry borer

Coffee berry borer (CBB) is a small beetle that bores into coffee berries, damaging beans and reducing yield and quality.



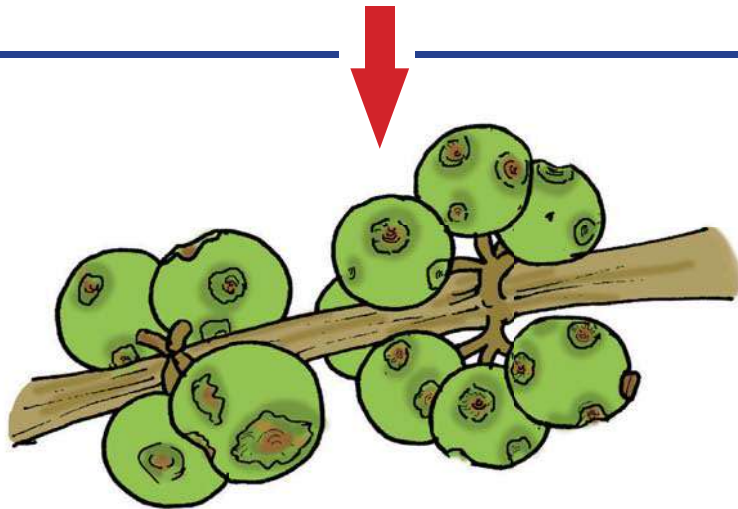
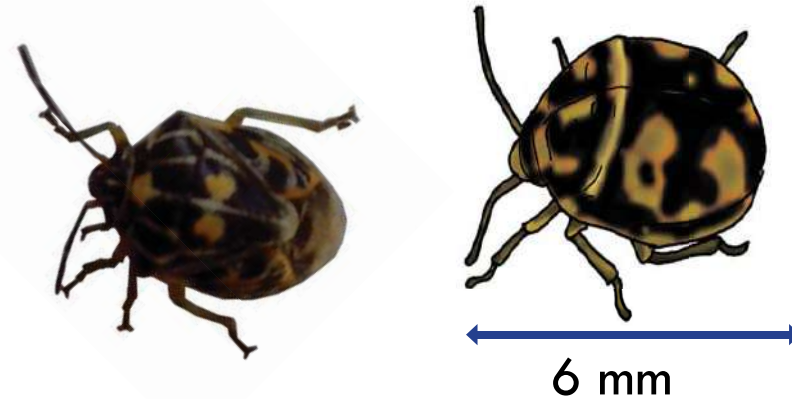
To control:

1. Prune coffee and shade trees to open up canopy and promote natural control by birds.
2. Pick all ripe cherries frequently and regularly.
3. Remove and burn cherries that have fallen on the ground to prevent crossover to new harvest.

4. If more than 2-3% of cherries are infected, spray with Super Sumithion.
5. Get help from the extension staff or a knowledgeable farmer when the situation becomes unmanageable.

3.5 Antestia bug (Arabica only)

Cause damage through sucking sap from flower buds, flowers, berries, leaves and soft stems which cause flower and berry abortion, cracking (Zebra marks) and rotting of beans, multiple branching (witches broom), and shortening of internodes.



To control:

1. Prune coffee and shade trees to promote natural control by birds.

2. Monitor and spray with Super Sumithion when 2 bugs per tree are observed.

3.6 Coffee lace bug (Arabica only)

1. They suck on the underside of the leaves.
2. Heavy infestation causes general yellowing of leaves.
3. In severe cases, defoliation, berry abortion and dieback may occur.



To control:

1. Infestation disappears with onset of rain.
2. Apply manure/fertilizer regularly.
3. Only spray when infestation is heavy, using Super Sumithion.

3.7 Aphids, leaf mealy bug and scales

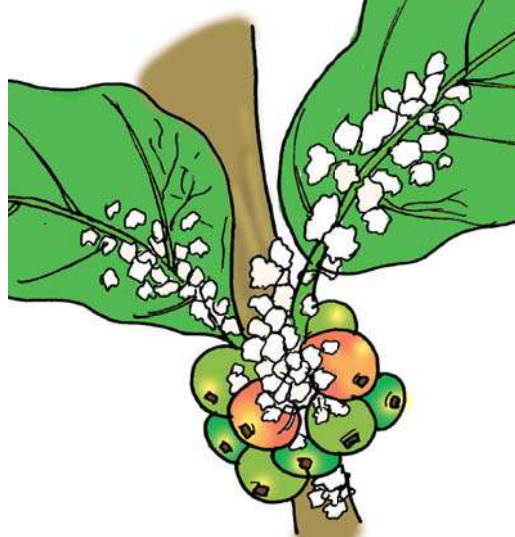
Sucking insects include:

- a) Green, brown and white waxy scales
- b) Aphids
- c) Leaf mealy bugs

Green scales



Leaf mealy bugs



Chewing insects:

Chewing insects include leaf miners, tailed caterpillars and leaf skeletonisers.

1. Their larvae damage coffee leaves.
2. Heavy attacks result in leaf-fall leading to reduced crop yield.

Tailed caterpillar



To control:

1. Regularly monitor coffee fields for infestation by sucking and chewing insects.
2. Focus chemical control on affected trees.
3. Paint a band of at least 15cm with Dursban to reduce attendant ants on affected trees.

4. Spot apply contact insecticides such as dimethoate, fenitrothion or cypermethrin based products.
5. Spot apply systemic insecticides such as Actara as a soil drench.
6. Healthy coffee trees withstand pest damage better.



4.0 Main diseases of coffee

4.1 Coffee wilt disease (Robusta only)

4.2 Leaf rust (mainly Arabica)

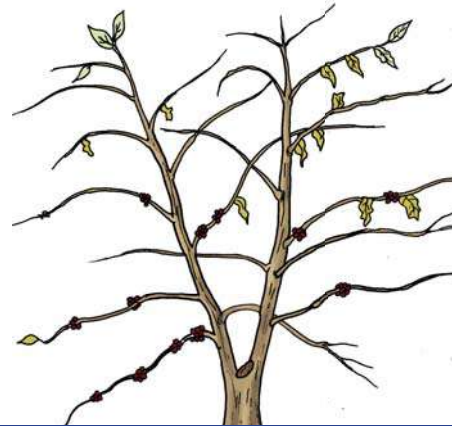
4.3 Coffee berry disease (Arabica only)

4.4 Red blister disease



4.1 Coffee wilt disease (Robusta only)

1. Coffee wilt disease (CWD) is caused by a fungus.
2. In Uganda, it affects only Robusta trees.
3. There is no cure. Once infected, a tree will die.

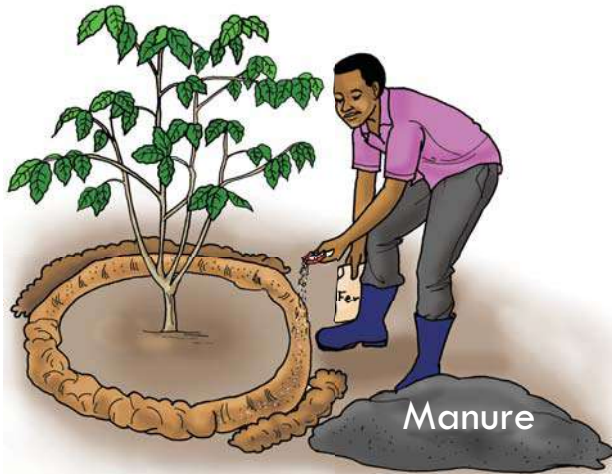
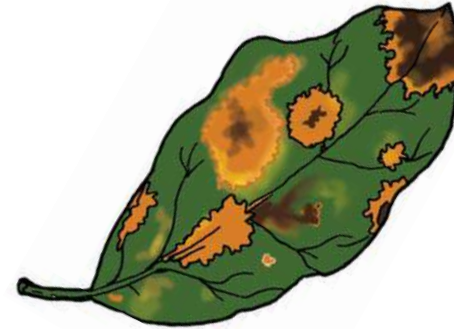


To control:

1. Uproot and burn infected coffee trees on site as soon as symptoms are seen.
2. Disinfect farm tools that have been used in an infected garden with fire flames or Jik solution (5%).
3. Plant resistant varieties.
4. Get help from extension staff or a knowledgeable farmer.

4.2 Leaf rust (mainly Arabica)

1. Caused by a fungus.
2. Manifests as orange spots or areas on the underside of leaves.
3. Affects mainly Arabica coffee grown in low to medium altitude.
4. Severe attack results in premature leaf-fall and dieback. This causes significant yield losses and quality problems.



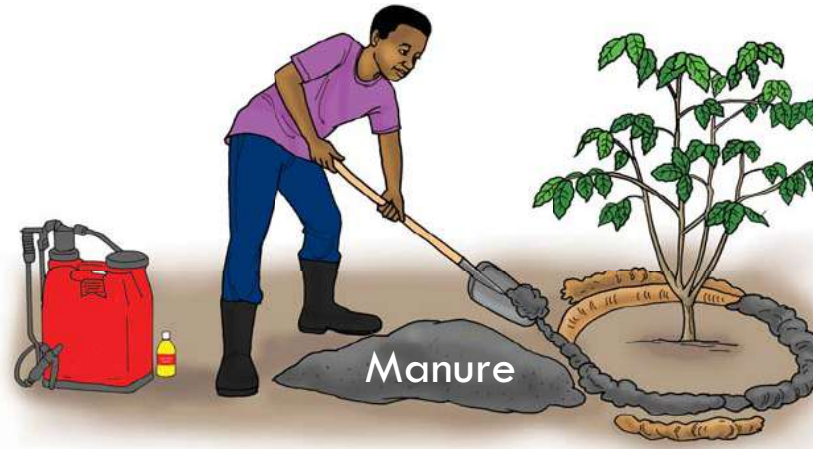
To control:

1. Good agronomic practices such as pruning, weeding and managing soil fertility.
2. Timely spraying on underside of leaves with copper-based fungicides or curative systemic fungicides.

3. Plant tolerant varieties (KP423).
4. Get help from the extension staff or a knowledgeable farmer when applying fungicides for the first time.

4.3 Coffee berry disease (Arabica only)

1. Coffee berry disease is caused by a fungus.
2. Affects only Arabica coffee grown at altitudes above 1,600 metres above sea level (masl), temperatures of 17-22°C and humidity.
3. It attacks flowers and fruits at all stages of growth, but especially the green stage.

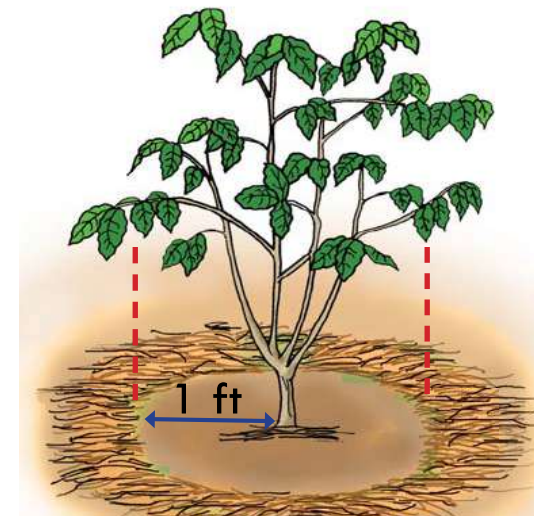


To control:

1. Plant tolerant varieties (SL 14).
2. Good field hygiene:
 - a. Regularly harvest all ripe cherries.
 - b. At the end of the harvest, remove all remaining dried or ripe cherries from the tree and the ground.
3. Prune coffee and shade trees to reduce humidity levels.
4. Improve soil fertility management.
5. Spray with copper-based fungicides such as Copper Nordox 75%.
6. Get help from the extension staff or a knowledgeable farmer when applying fungicides for the first time.

4.4 Red blister disease

Red blister disease, also known as eyespot, is caused by a fungus.



To control:

Controlled by planting resistant varieties, pruning fields, and applying adequate nitrogen and potassium fertilizer to the soil.



5.0 Harvesting and post-harvest handling of coffee

5.1 Harvesting

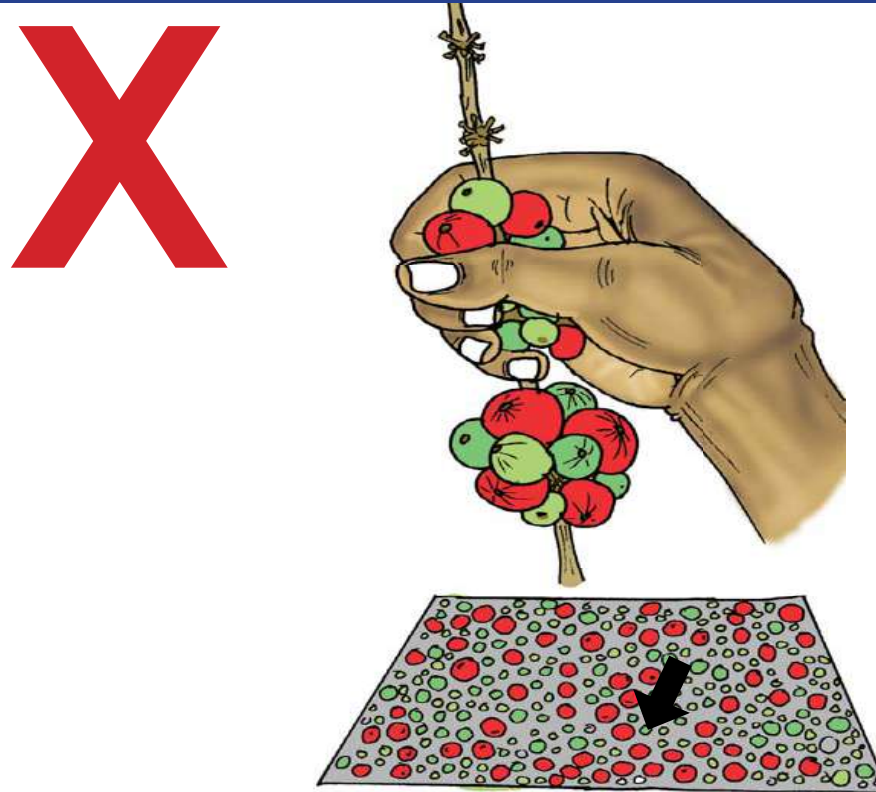
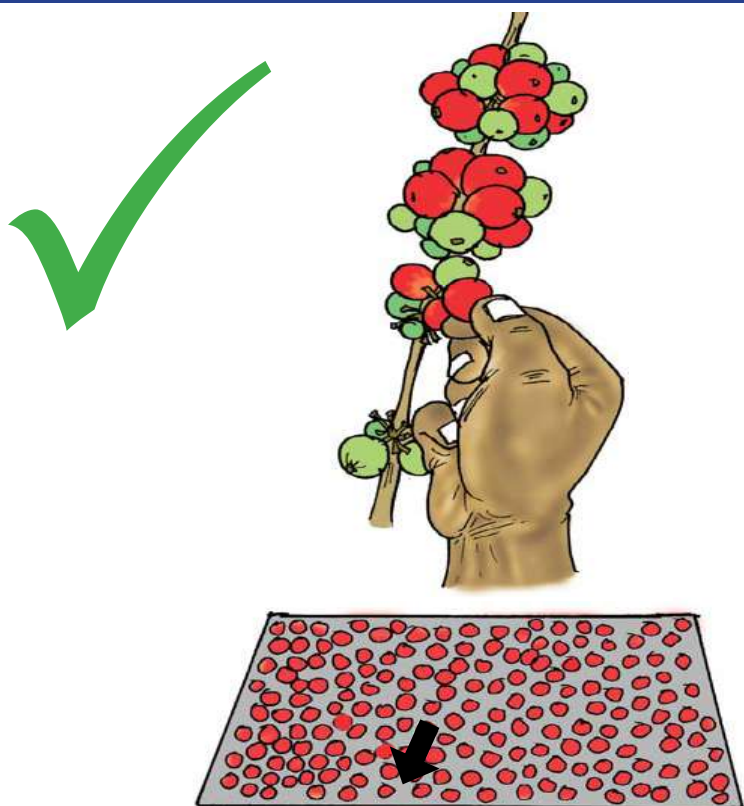
5.2 Wet processing

5.3 Dry processing

5.4 Storage



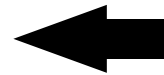
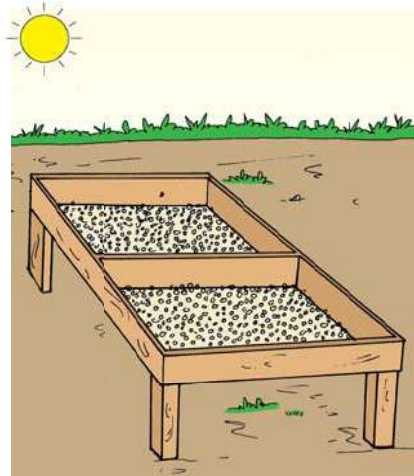
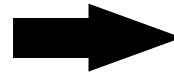
5.1 Harvesting



1. Do not strip all cherries off the branch.
2. Harvest only fully ripe (brick red) cherries because green/unripe cherries will form black beans. Overripe cherries give defects such as discoloured coffee beans, fermented and off flavours to the coffee cup. Ripe cherries give better quality coffee and therefore more money.
4. Keep harvested coffee cherries in containers such as baskets.

5. Do not dry the coffee on bare earth as this results in earthy smells and soil microbial contamination.
6. Sort out immature, diseased, pest infested, overripe cherries and process them separately.
7. Remove all extraneous materials such as twigs, leaves, stems and stones.

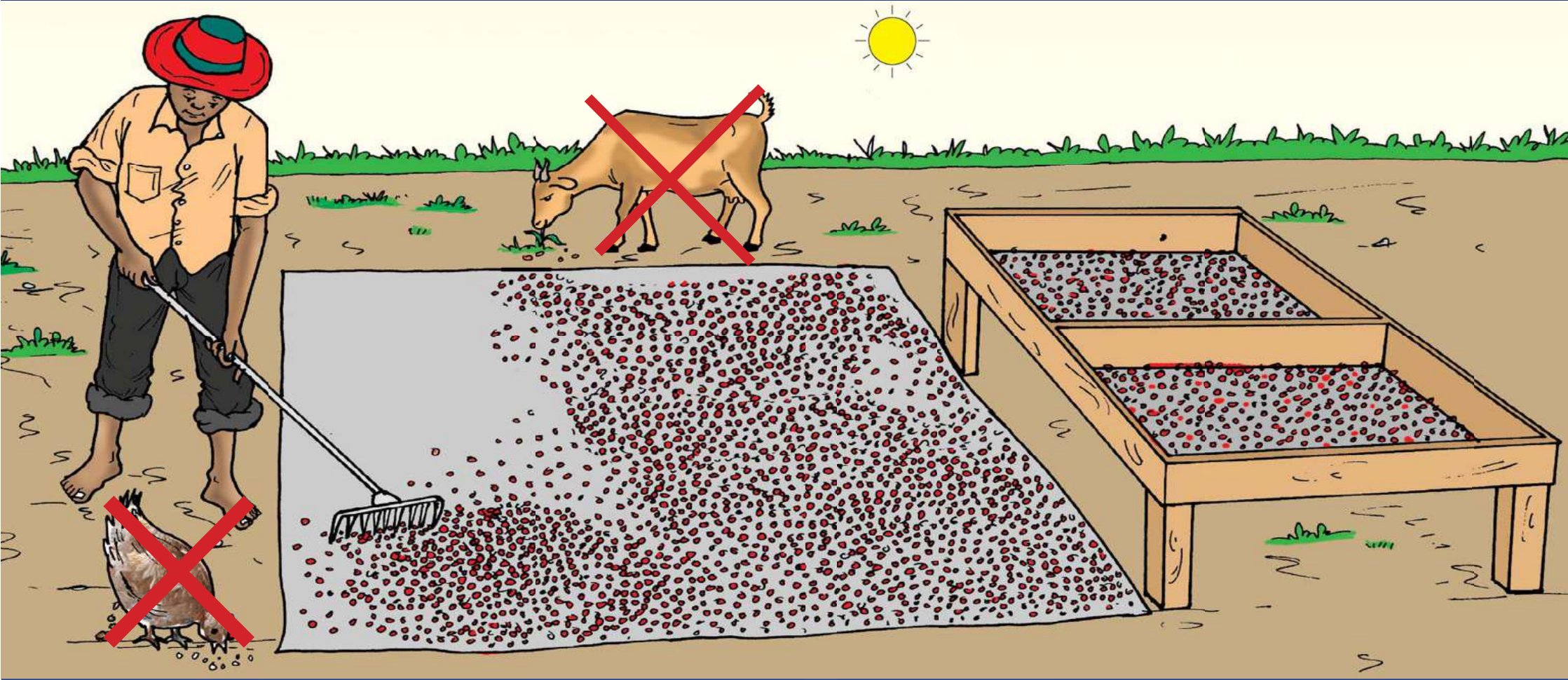
5.2 Wet processing



1. Put freshly harvested cherries into sufficient water to float unfilled fruits and extraneous materials.
2. Remove the floats and pulp the clean cherries.
3. Pulp cherries within 12 hours after harvesting using pulpers, to separate pulp from parchment.

4. Keep freshly pulped coffee beans in container for 12-24 hours to allow fermentation.
5. Wash the fermented coffee thoroughly to remove mucilage from the parchment.
6. Dry washed parchment on wire trays or tarpaulin.

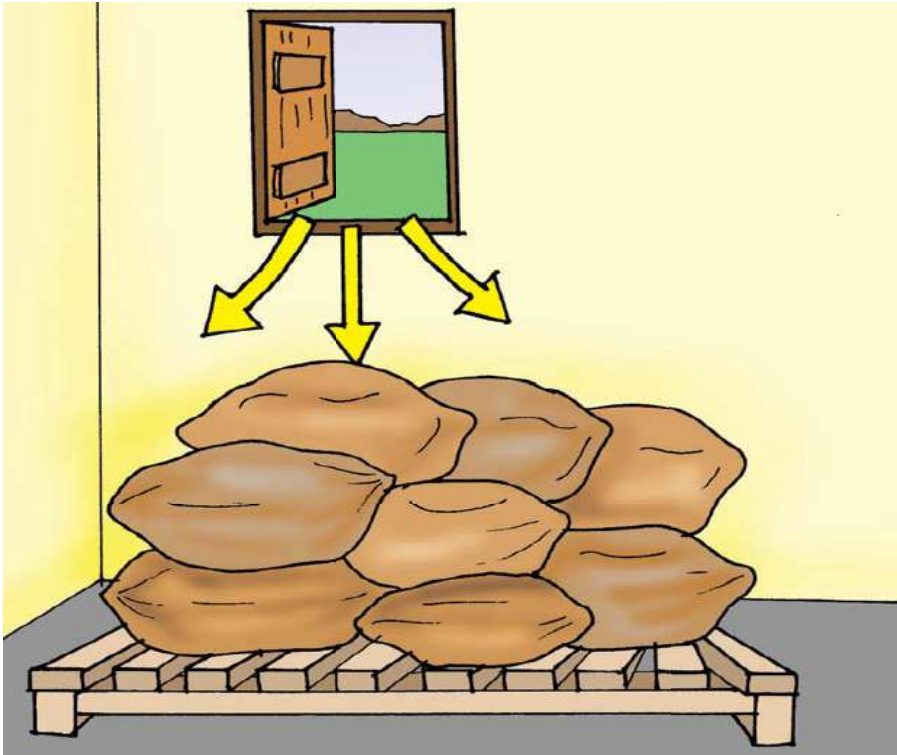
5.3 Dry processing



1. This involves drying cherries without removing the pulp.
2. Dry the cherries immediately after harvesting.
3. Dry cherries on a tarpaulin or concrete floor but not on bare ground.

4. At night, stack trays in a store or house. Do not leave wet coffee heaped or it will develop mould.
5. Dry coffee to 11-13% moisture content.

5.4 Storage



1. Store only dry coffee in bags.
2. Place the coffee bags on pallets raised to at least 15cm to avoid wetting by ground moisture.
3. Keep stacked bags at least 30cm away from the walls and ceiling.



4. Preferably do not store coffee in the same store with other farm produce.
5. Do not store coffee in the same store with agro-chemicals and oil products. Do not use fertilizer or fish bags for storage.
6. Storage rooms should be well ventilated and leak proof.



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










6.1 Why grow coffee?



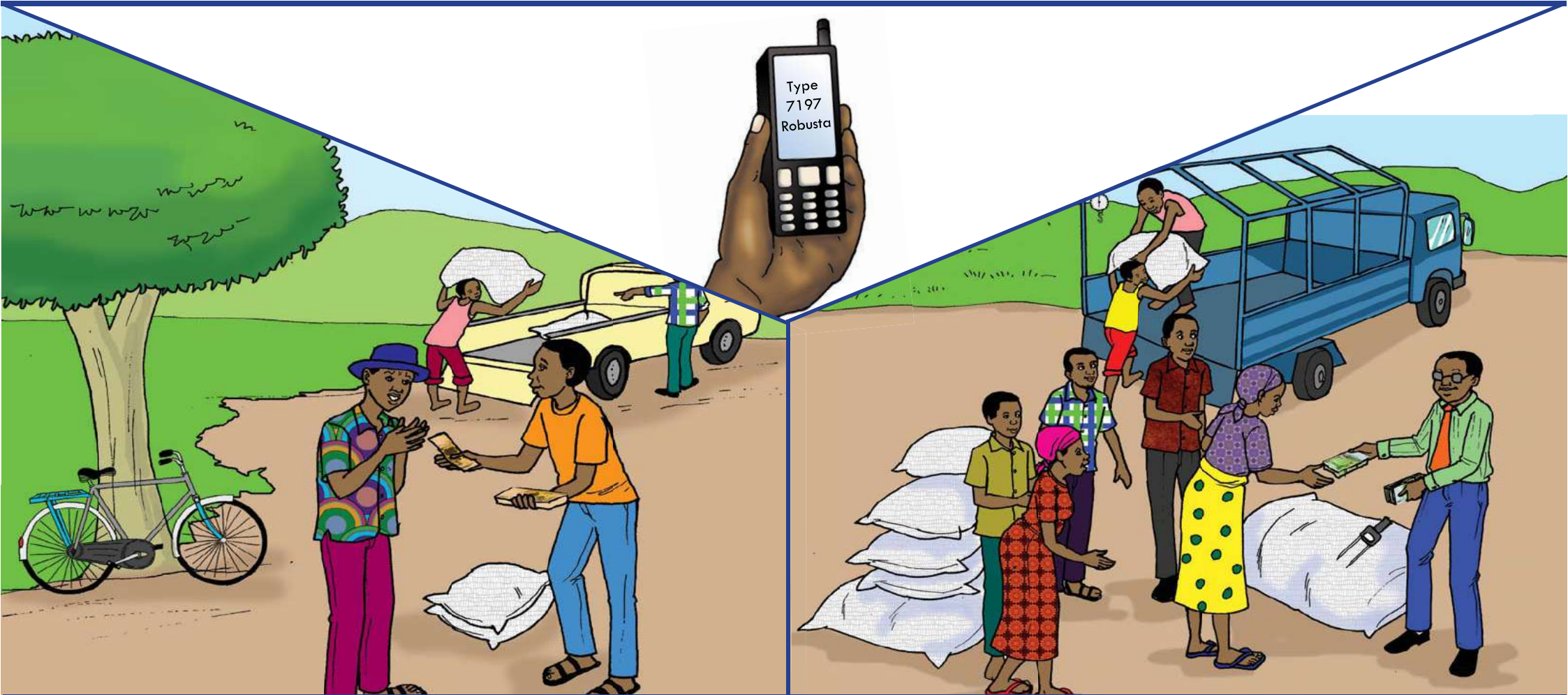
1. Coffee farming is a profitable and sustainable source of income for improving livelihoods for the whole family.
2. The profitability of coffee farming increases with productivity, which increases when farmers use the best farming practices.
3. Good harvesting and proper post-harvest handling improves the quality of the coffee.
4. Good quality fetches better prices.

6.2 Farm record keeping

	Quantity	Unit price	Total
	3	5,000	15,000
	50kgs	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

1. Keep records of expenditure on coffee.
2. Keep records of production.
3. Keep records of income from coffee.

6.3 Marketing



1. Aim at maximising earnings from your coffee by maximising volume (quantity) and quality so that you can get a higher price.
2. Small scale coffee dealers/brokers offer low prices.
3. Farmers should form groups and bulk their coffee together. Bulked coffee fetches a higher price.
4. Separate different qualities of coffee before bulking.
5. To get the market price of coffee, type Robusta or Arabica and send text message to 7197.

6.4 Sustainable farming practices



1. Improve productivity and quality to make your coffee economically sustainable through:
 - a) good agricultural practices
 - b) good harvest and post-harvest practices
 - c) adopting new technologies
2. Adopt environmentally friendly farming practices and use protective gear when using chemicals.
3. Ensure good conditions for both families and workers.

6.5 Certification/verification



If you want to sell your coffee as certified or verified, get information from the different standards organisations.

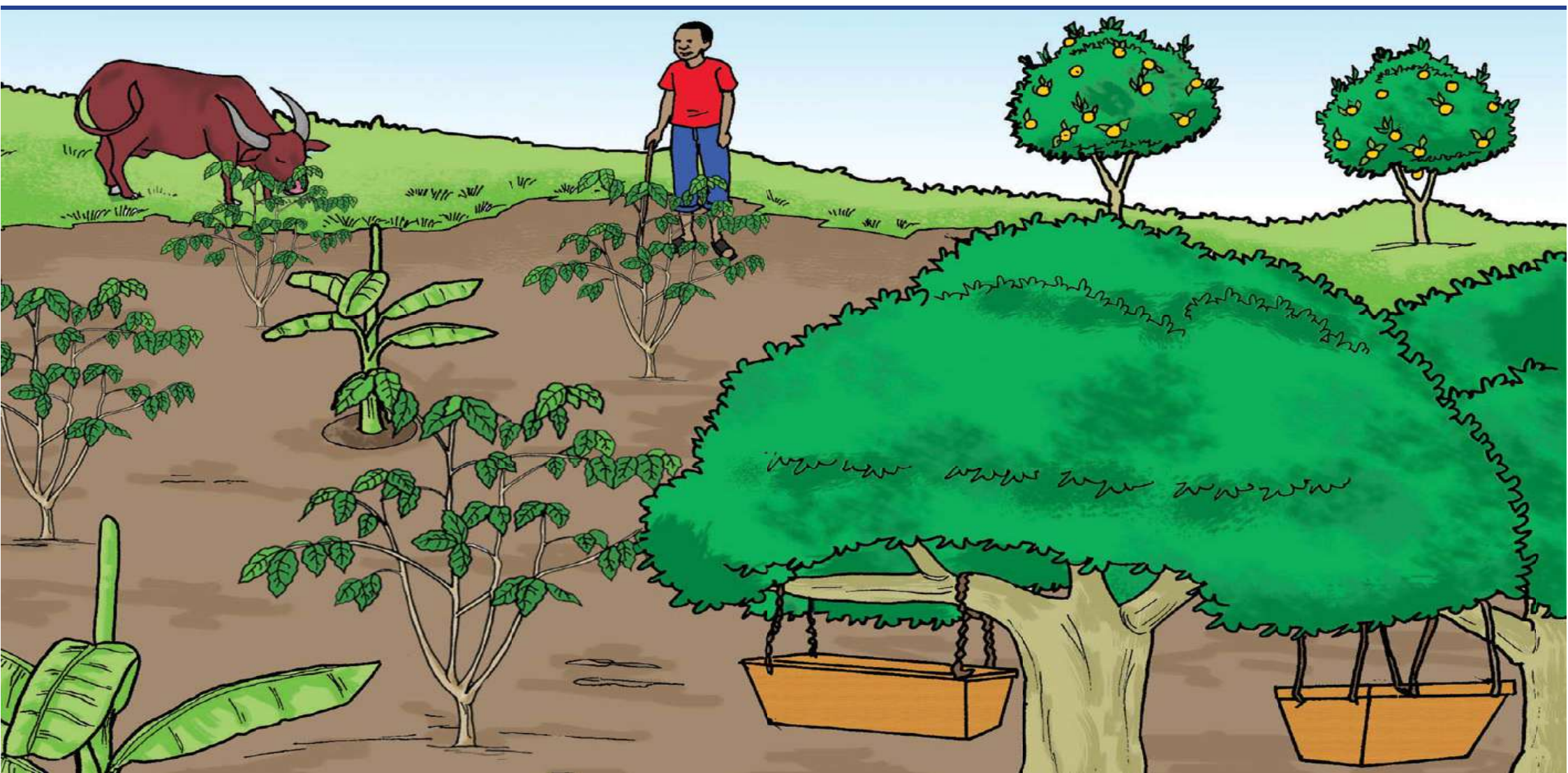
6.6 Access to finance



1. Farmers may get access to finance through:
 - a) Own savings
 - b) VSLAs
 - c) SACCOs
 - d) Banks

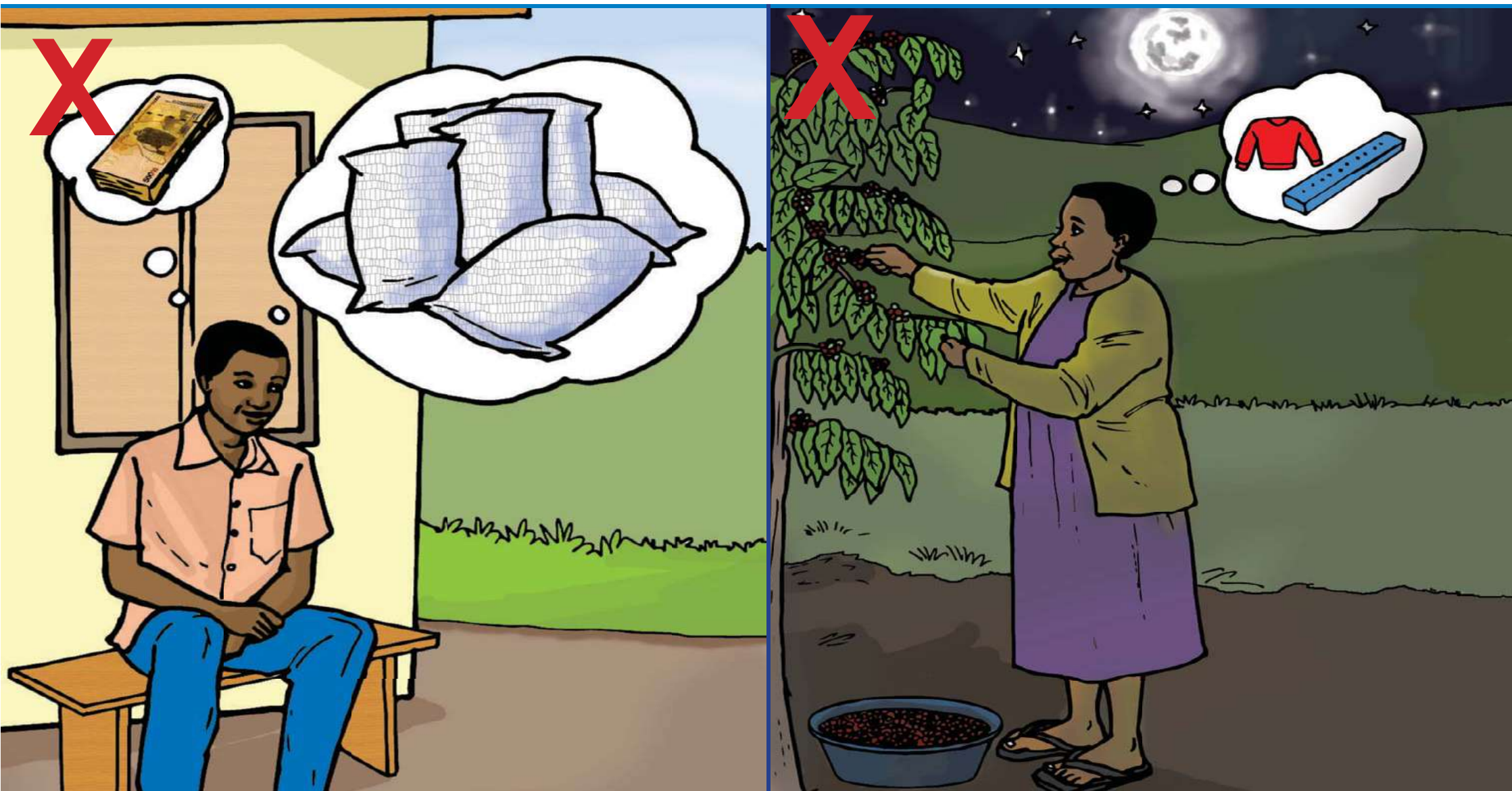
2. Farmer groups/associations are encouraged to create their own savings scheme, which can be a source of loans to member farmers.
3. Use farmer associations to recommend individual farmers to obtain loans from financial institutions.

6.7 Enterprises supporting coffee production



Grow other crops; keep poultry, apiary, cattle and goats; and do trading businesses to boost your earnings and cushion your income during the bad times of coffee farming and between seasons.

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



Involve the whole family in discussions about the use of coffee earnings for:

- a) school fees
- b) health care
- c) investment in the farm
- d) home care, e.g. soap and clothes
- e) food security
- f) savings



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

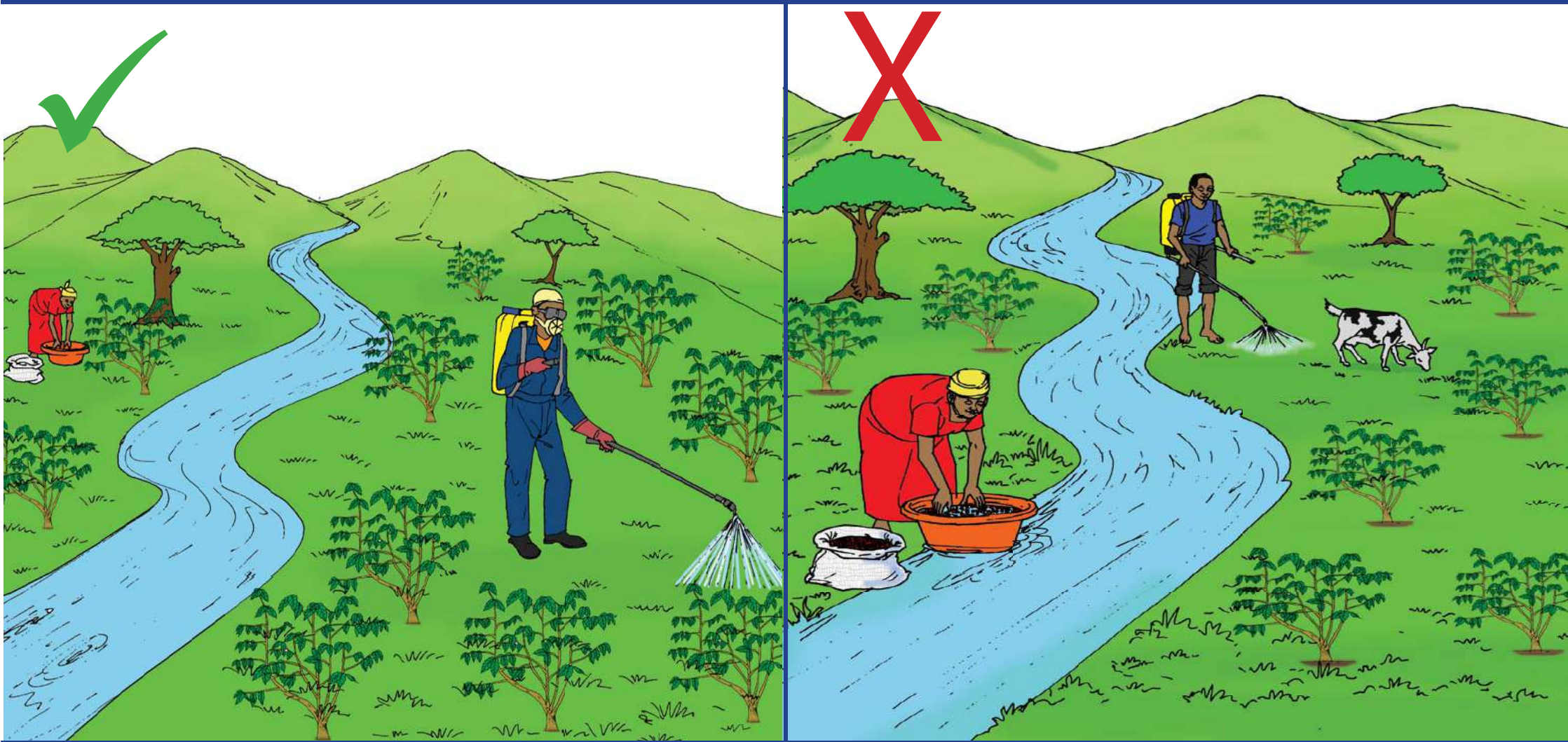
7.5 Disposal of annual crop residues

7.6 What is climate change?

7.7 Adaptation to climate change



7.1 Prevention of water pollution



1. Wash your coffee in a container away from a water source. Only spray away from a water source. This prevents water pollution.
2. Do not wash your coffee in the river. Do not spray close to a water source.

7.2 Waste management



1. Separate organic waste to make compost.
2. Separate plastic and metal waste in a pit and sell if possible. Puncture all chemical containers to prevent reuse.

7.3 Avoid the use of banned agro-chemicals

Example

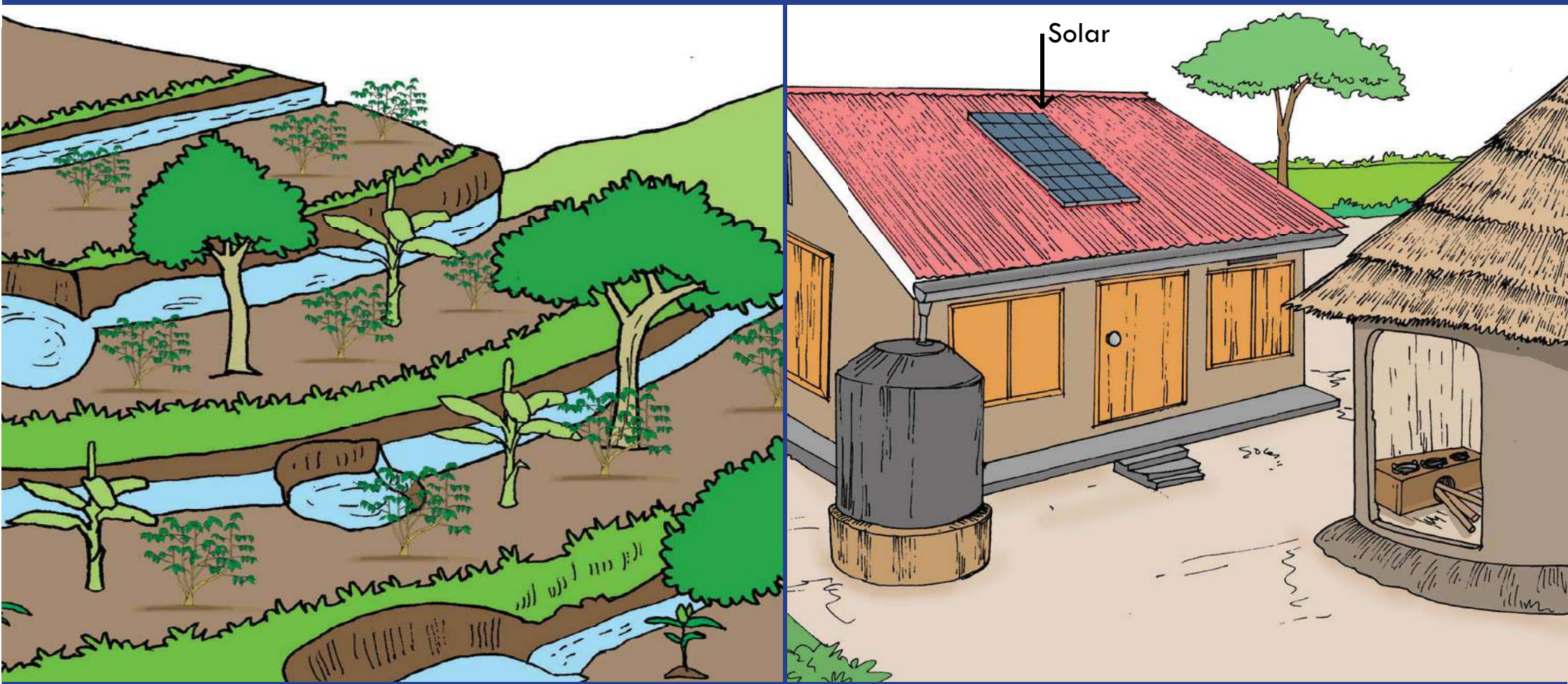


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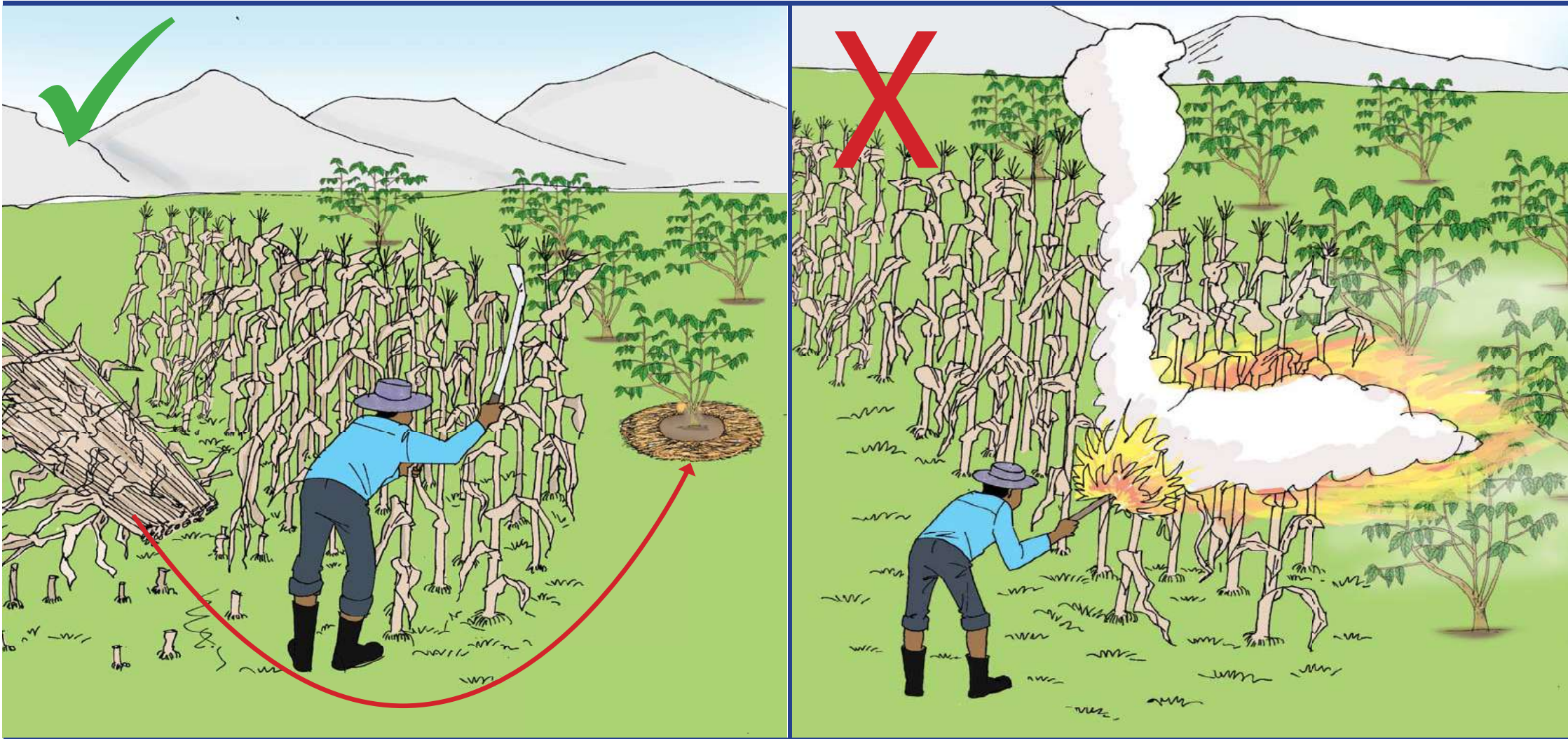
Uganda Training Materials for Coffee Production.

7.4 Energy conservation and water harvesting



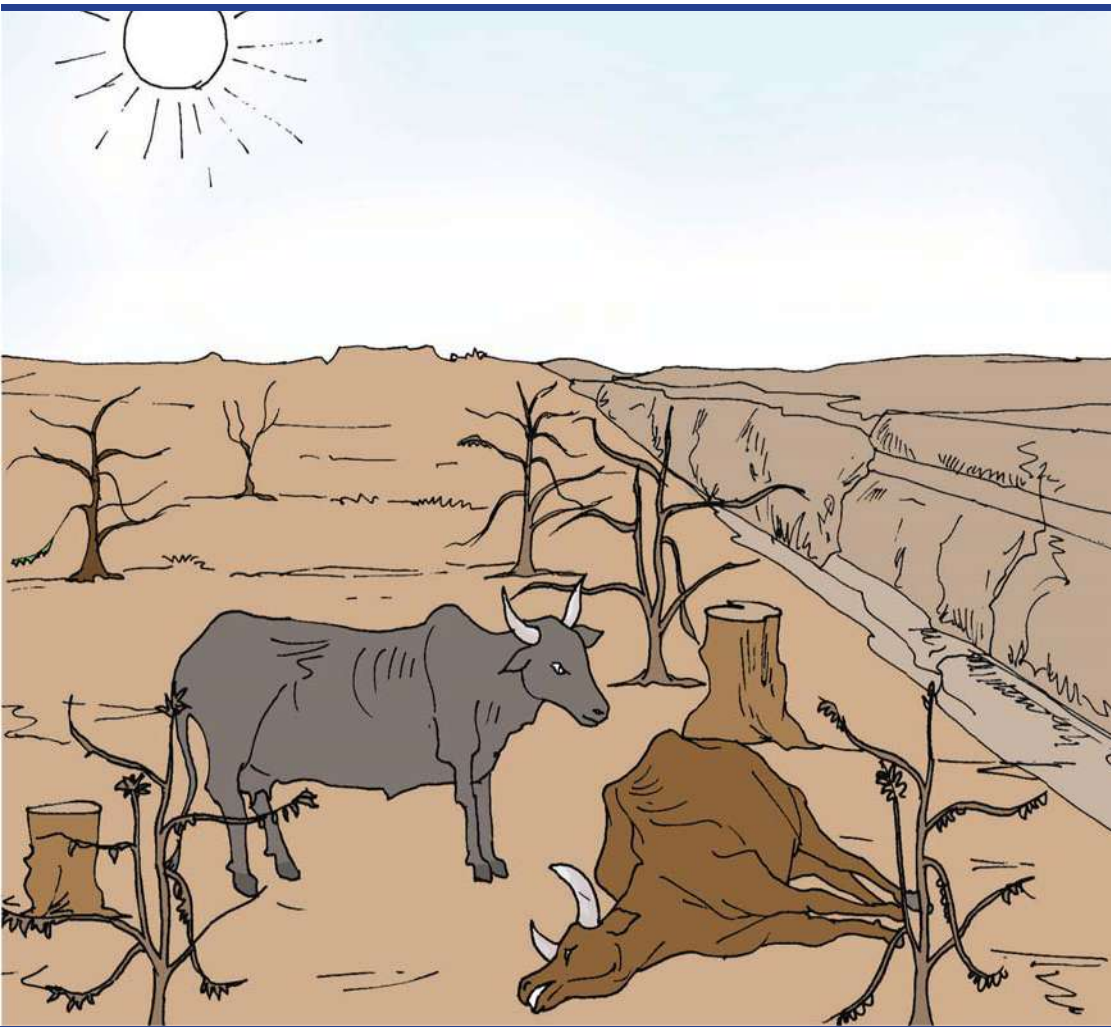
1. Plant multipurpose trees for shade and fuel use. Harvest water to retain moisture in the soil.
2. Harvest water for home use. Use solar energy and fuel saving stoves.

7.5 Disposal of annual crop residues



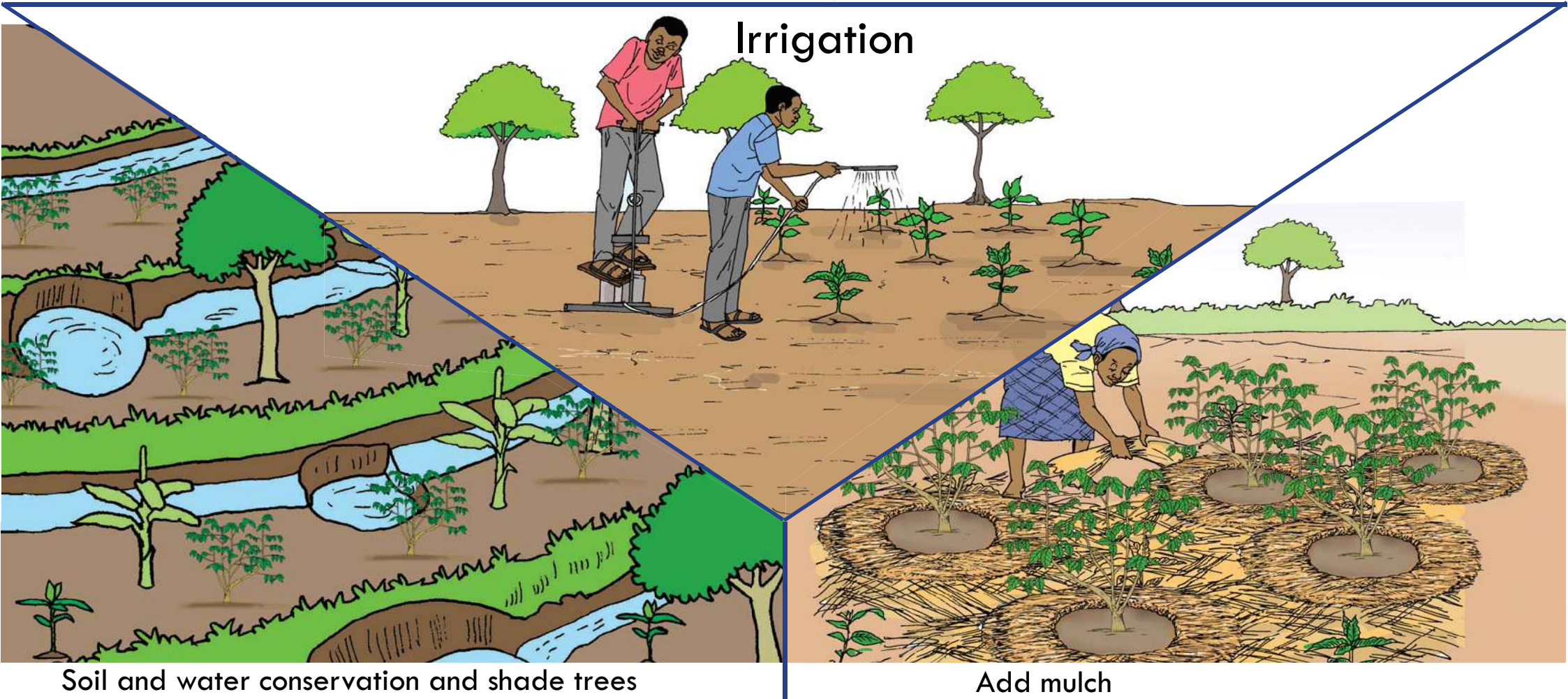
1. Use the crop residue to mulch your coffee or other crops.
2. Avoid burning annual crop fields as this could cause damage.

7.6 What is climate change?



Climate change is frequent and prolonged droughts; frequent floods, hailstorms, landslides and thunder storms; and erratic and unreliable rainfall affecting all farmers.

7.7 Adaptation to climate change



Irrigation

Soil and water conservation and shade trees

Add mulch

1. Use good practices such as planting shade trees and cover crops in coffee, mulching, applying organic manure and inorganic fertilizer, digging trenches, gully traps and constructing terraces to minimise the effects of erosion.
2. Use integrated pests and diseases management practices (biological, chemical, cultural) to control pests and diseases.
3. Where possible, irrigate coffee gardens because of erratic rainfall and drought to mitigate effects of climate change on coffee production.
4. Get help from extension staff on how to get the appropriate and cost effective adaptation practices.



8.0 Social responsibility

8.1 Children should attend school

8.2 Safe use of agro-chemicals

8.3 Safe storage of agro-chemicals

8.4 Good treatment of workers

8.5 Good hygiene and health

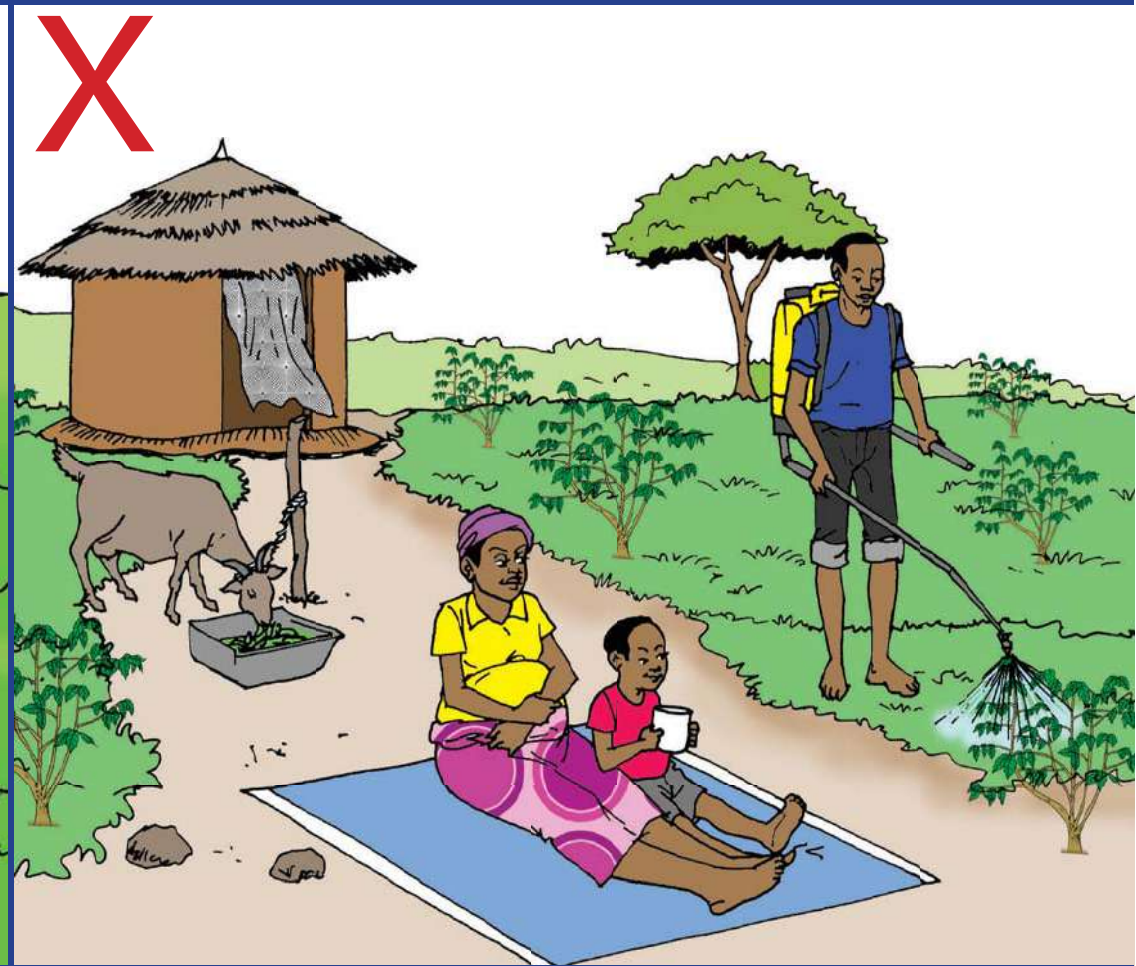
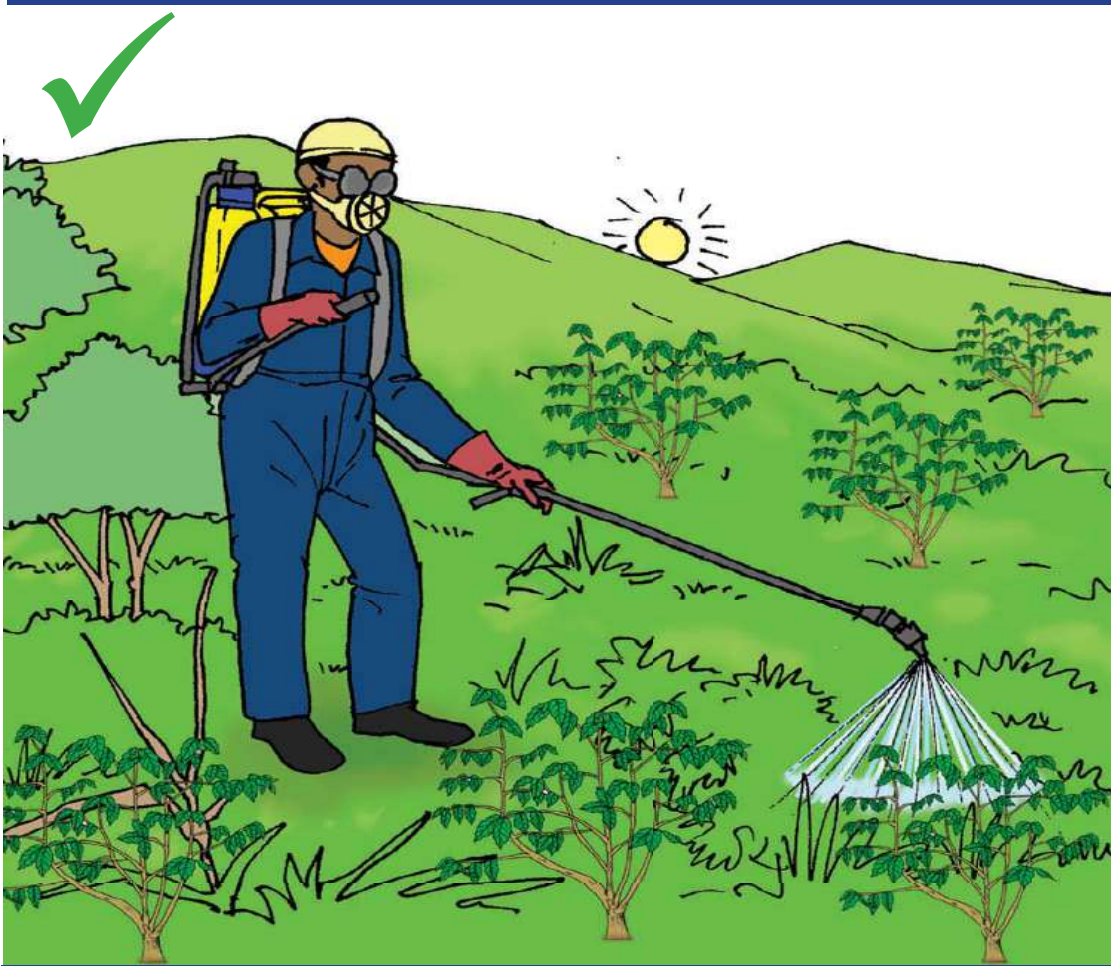


8.1 Children should attend school



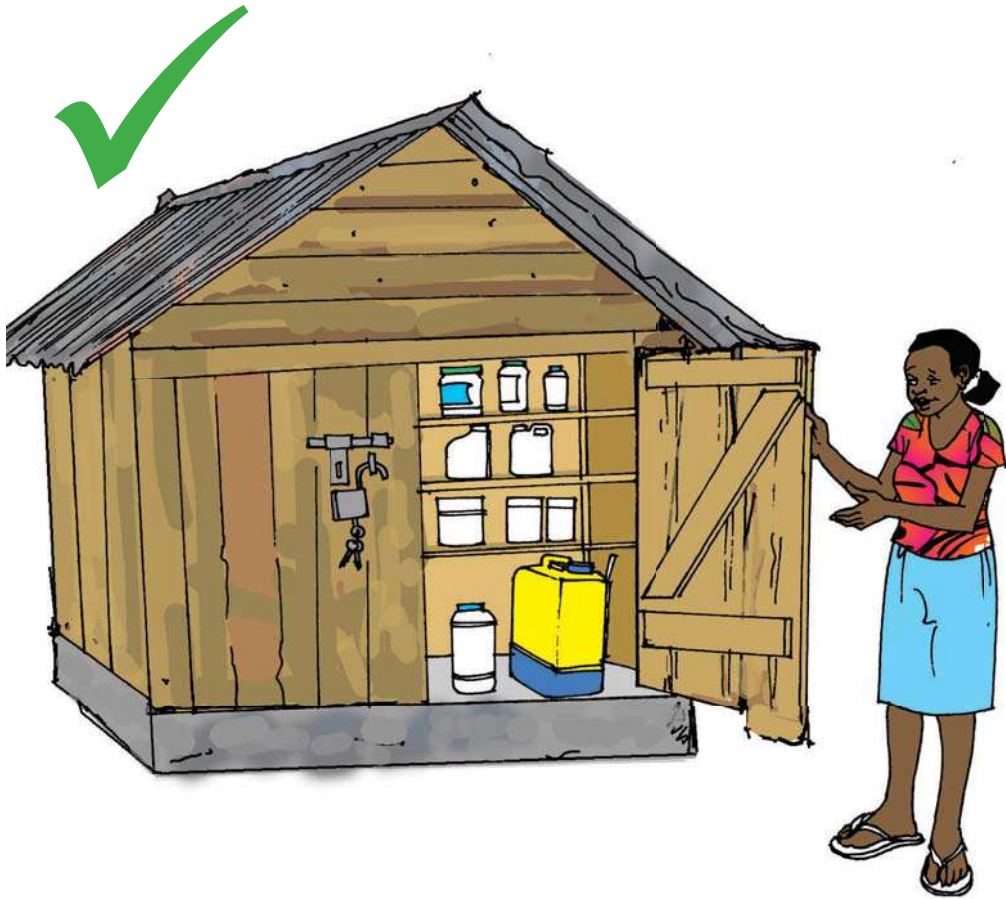
School-age children should go to school. Outside school hours it is ok for children to help their families on the farm with supervised light work, but they must not spray chemicals or carry heavy loads.

8.2 Safe use of agro-chemicals



1. Wear full protective gear when spraying.
2. Avoid spraying without protective gear, near other people or livestock.
3. Seek for advice from the extension staff on safe use of agro-chemicals.

8.3 Safe storage of agro-chemicals



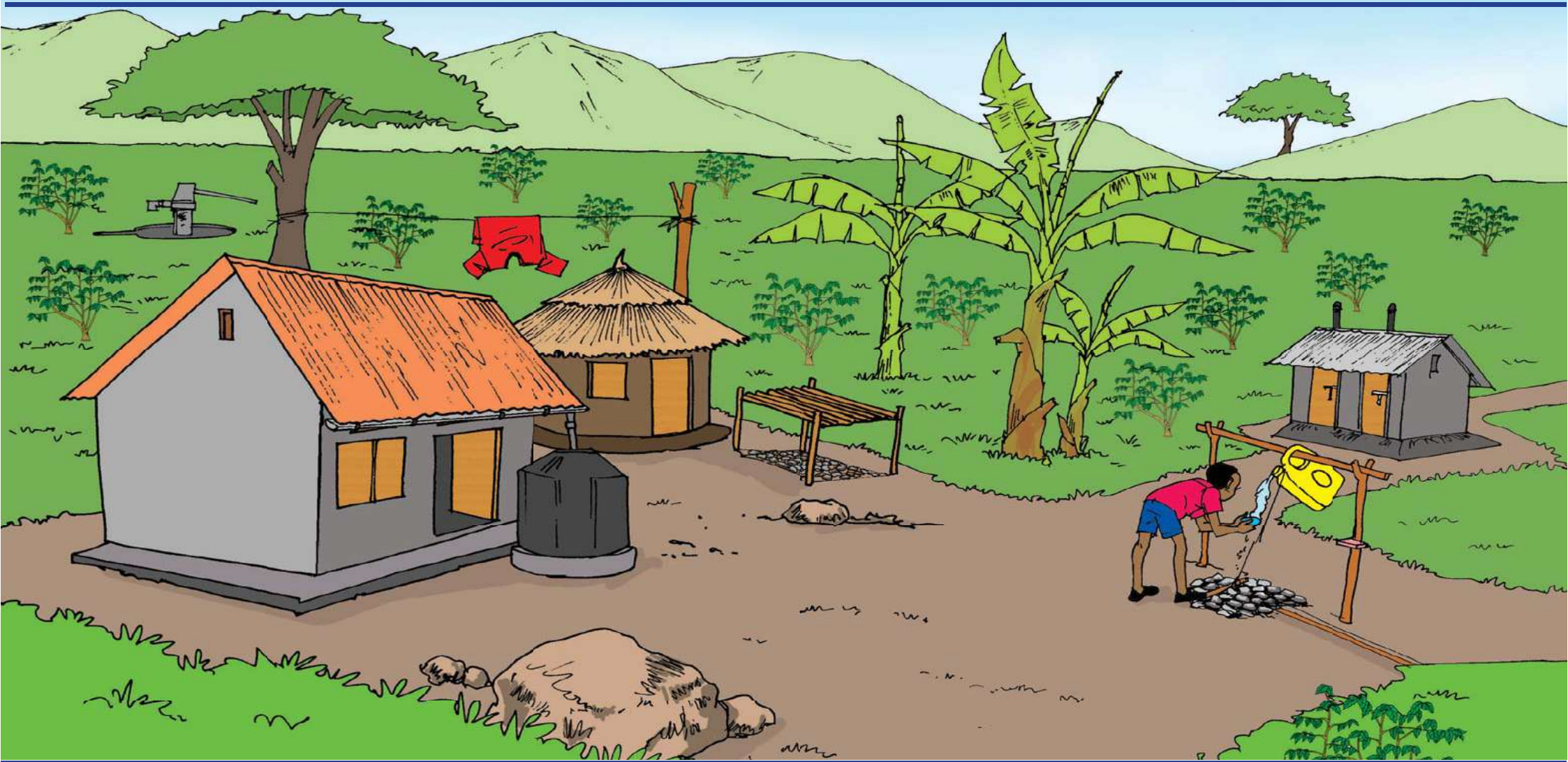
1. Keep all chemicals locked away out of reach of children and away from food and stored crops.
2. Do not store agro-chemicals under the bed – it is dangerous.

8.4 Good treatment of workers



1. Pay workers the agreed fair rate when work is completed. Record the payments.
2. Provide clean drinking water and protective equipment where necessary.

8.5 Good hygiene and health



You and your family can stay healthy by keeping your compound clean, sleeping under a treated mosquito net, drinking safe water, using a clean latrine and washing your hands regularly.

National Steering Committee of the National Coffee Platform



Development of the Uganda Training Materials for Coffee Production Supported By:



Drawings by:-

