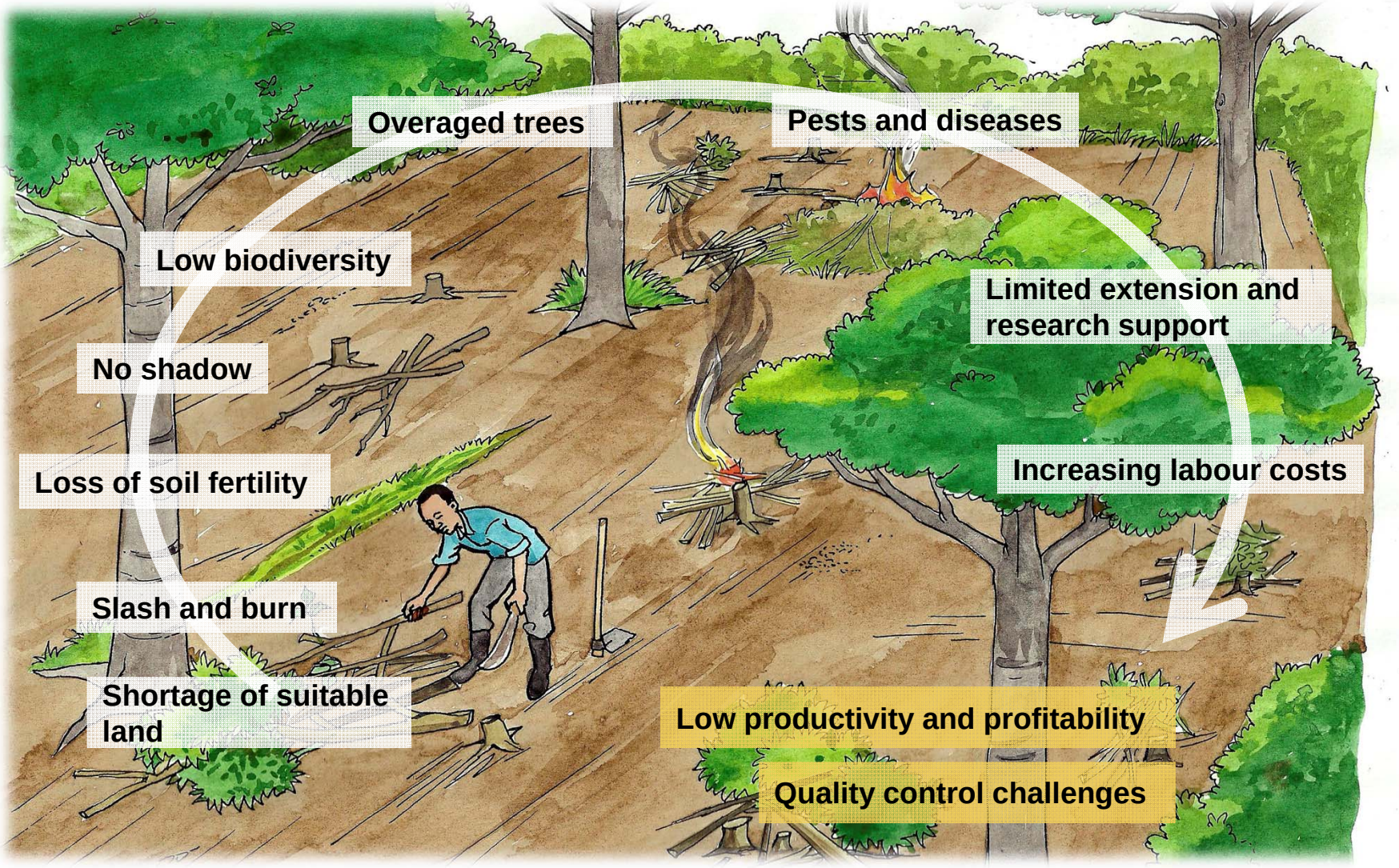
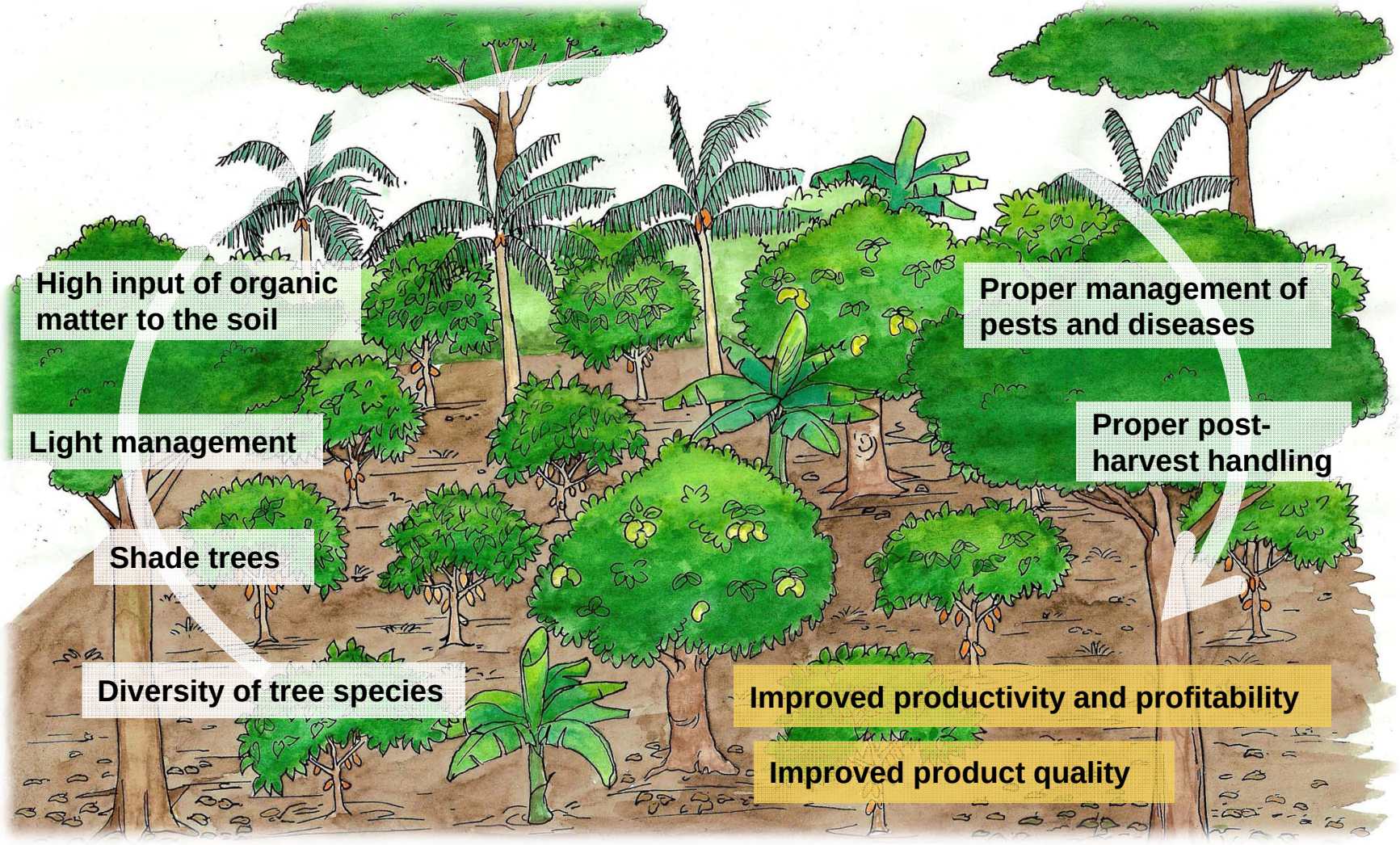
Traditional cocoa production



Improved cocoa agroforestry system

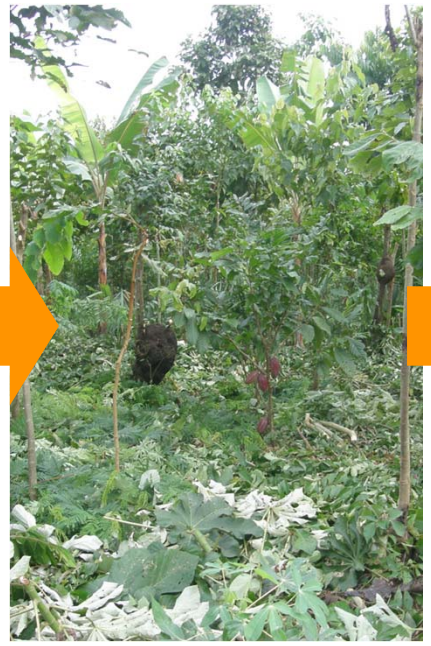


Development of a succession-based forest system

Phase 1

Pioneer plants cover the floor

Phase 2

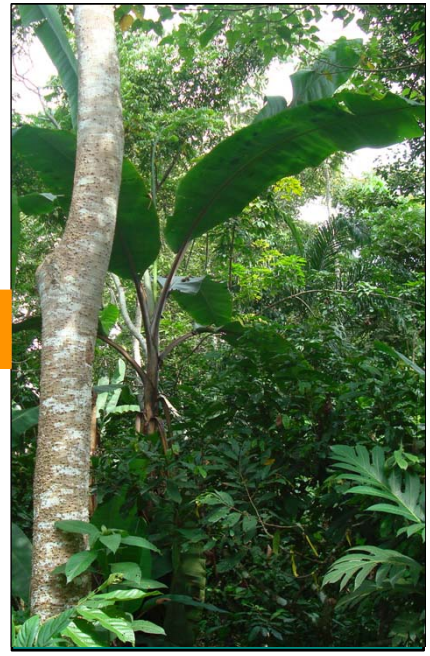


Fast growing tree species develop

Phase 3

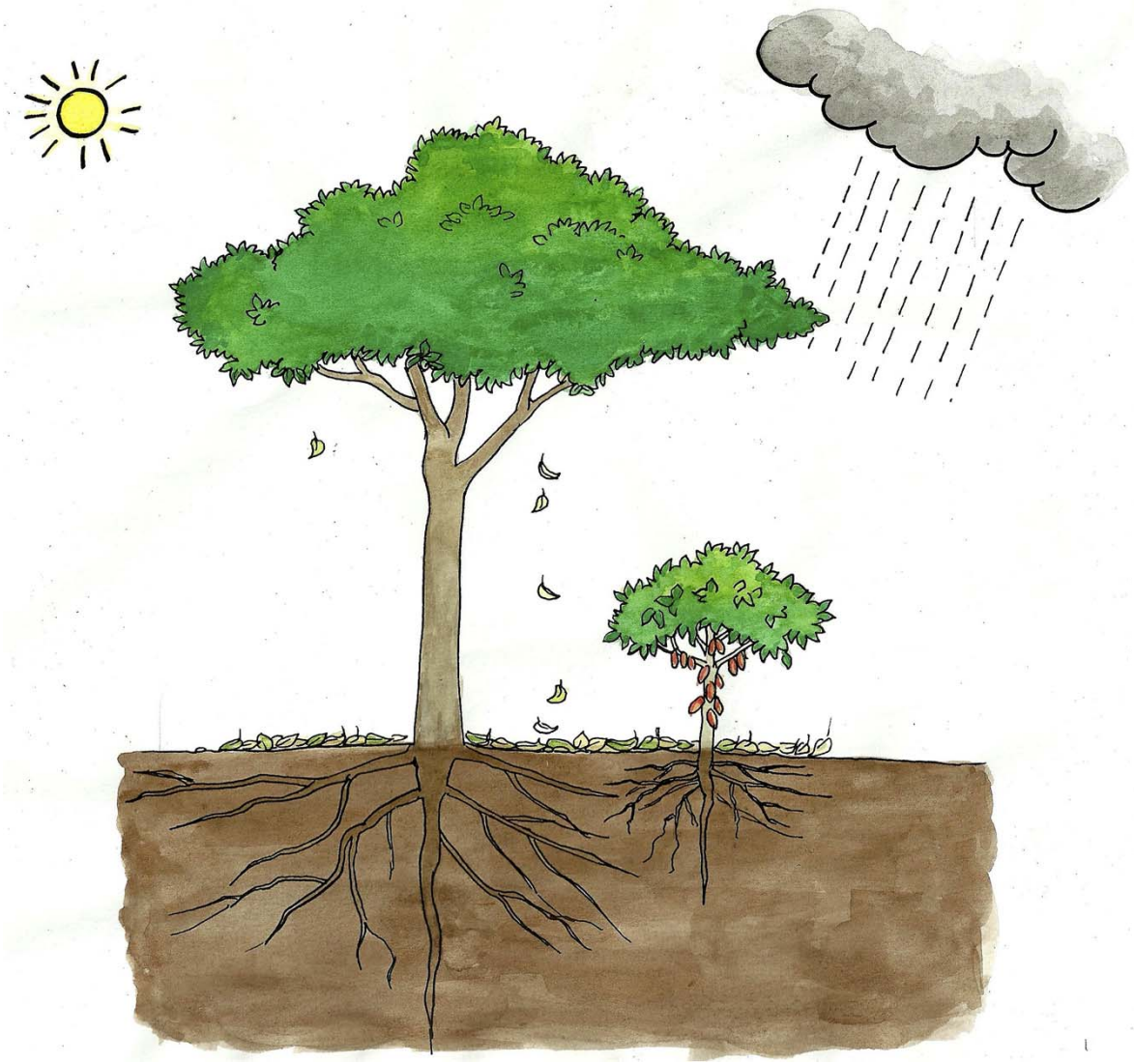
Forest tree species develop

Phase 4



Trees of the primary forest dominate

Suitable conditions for cocoa production



Altitudes up to 1400 m
Optimum temperature 25 to 28 C

Rainforest conditions
High and well distributed rainfall

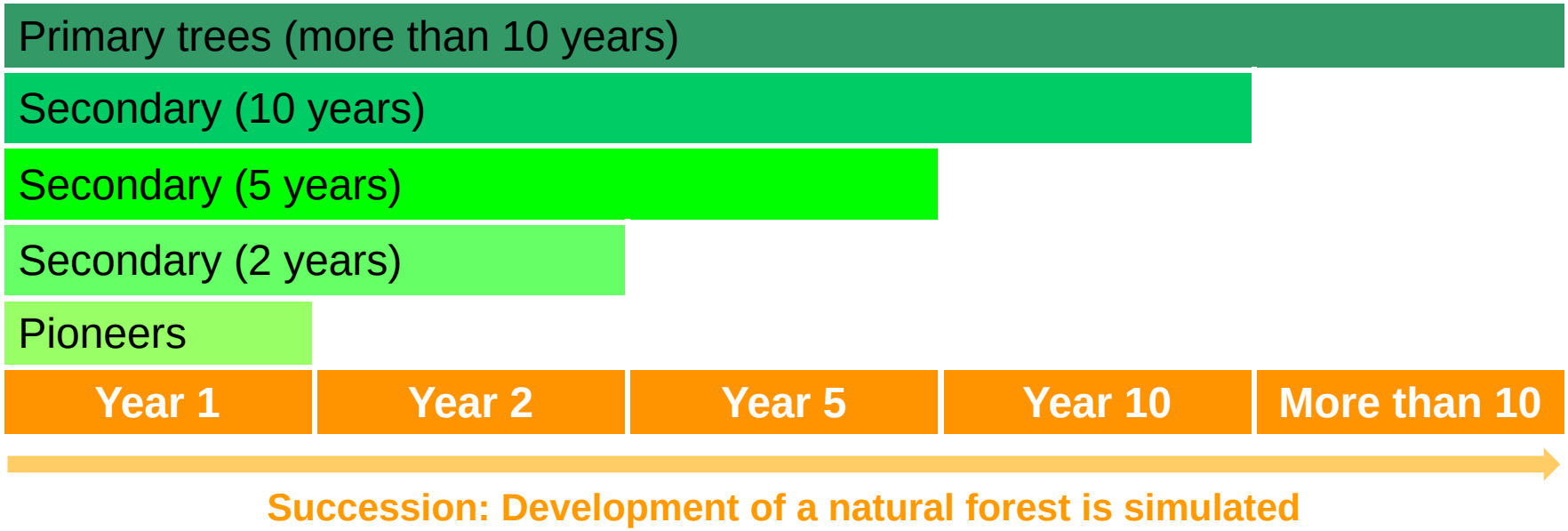
Short dry period
Important to restrict fungal diseases

Under agroforestry conditions a longer dry period is possible

No strong winds

Deep soil with good drainage
Sufficient organic matter

Lifecycles of different intercrops of cocoa



Pioneers: maize/sorghum, beans, rice, sweet potato or ginger

Secondary up to 2 years: pigeon pea, cassava

Secondary up to 5 years: pineapple, papaya

Secondary up to 10 years: bananas, oranges

Primary trees: timber trees, fruit trees, cocoa trees

Raising cocoa seedlings in a nursery

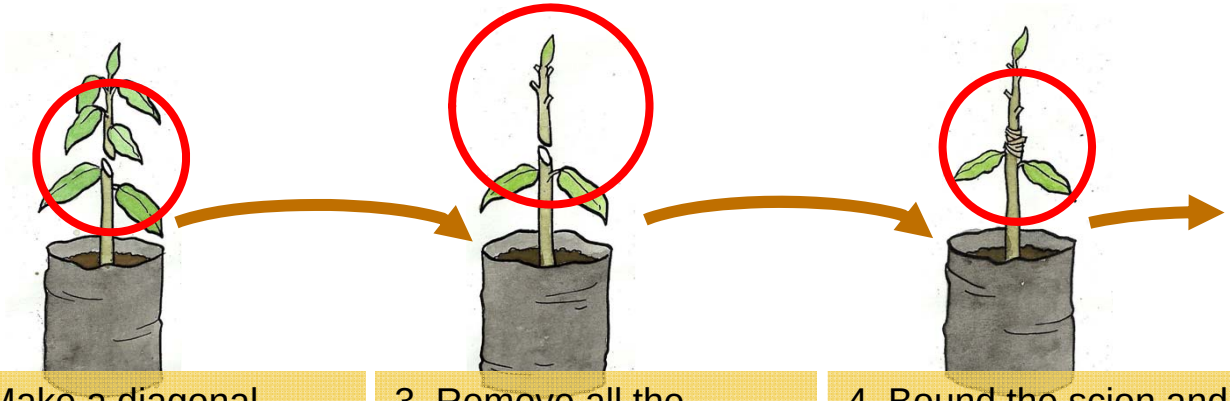
1. Harvest healthy and mature pods only. Good quality hybrid seeds obtained from local research stations can also be used for seedling production.

2. Plant the fresh beans of ripe pods directly into black polythene bags. Mix 40 % top soil, 30 % compost and 30 % sand for filling the bags

3. For the cocoa nursery make sure there is enough shade, ample water and protection from wind. Start with dense shade and decrease it, as the seedlings grow.

Grafting of seedlings

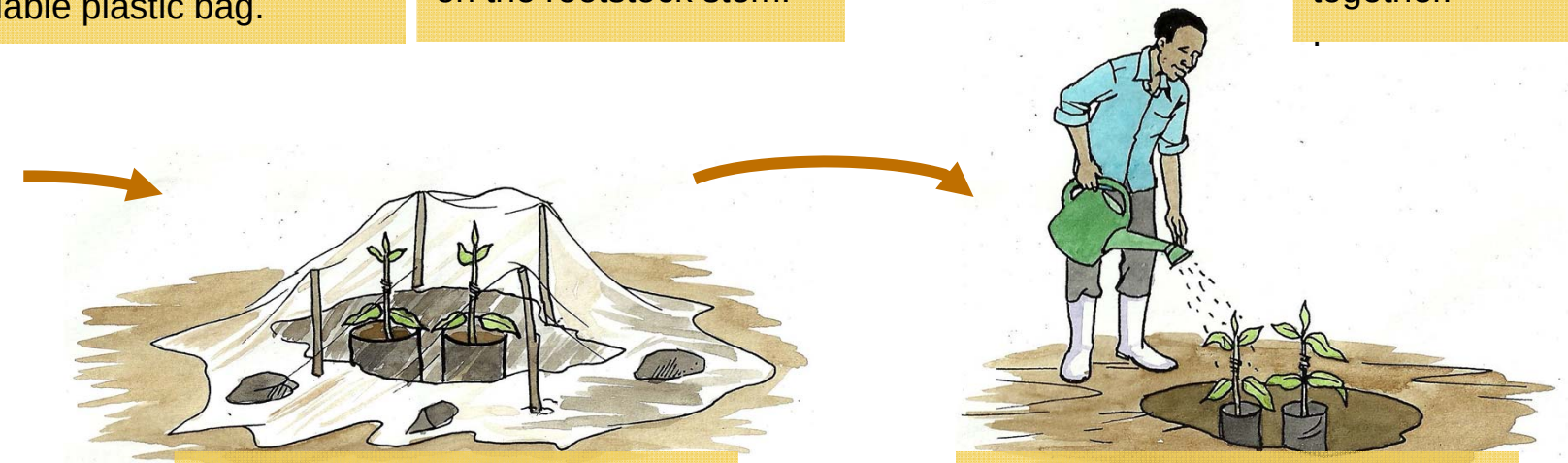
1. The seedlings are ready to be grafted at a size of 50 cm and 10 mm in diameter. Scions should be 10 cm long and have at least 3 buds. They should be collected into a resea-lable plastic bag.



2. Make a diagonal side-wedge, which fits on the rootstock stem.

3. Remove all the leaves of the scion.

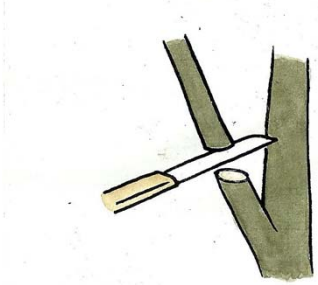
4. Bound the scion and the rootstock firmly together.



5. Cover the grafted seedlings with plastic sheet.

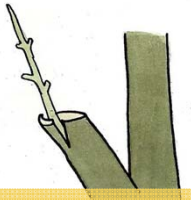
6. Remove the sheet, when buds sprout.

Grafting new suckers on old trunks

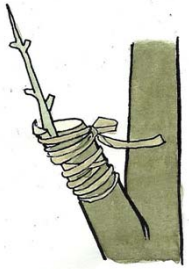


1. Identify a branch of a healthy but non-productive cocoa tree, with a light brown bark. Cut the branch horizontally.

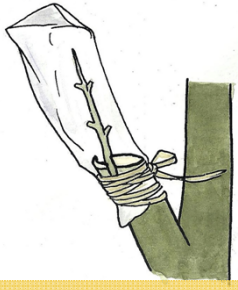
2. Collect scions with 3 to 4 eyes from new growth flushes in the top of improved trees. Eliminate all leaves an make a well tapered V-cut on the scion.



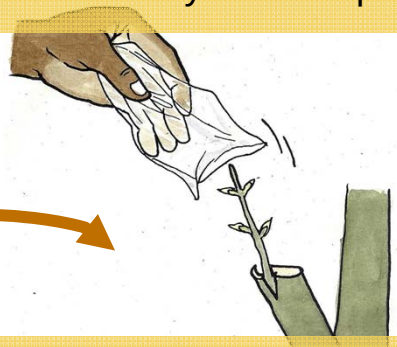
3. Slit the rootstock the same length as the V-cut on the scion. Remove all leaves from the rootstock. Insert the scion into the rootstock ensuring that all the bud eyes are exposed.



4. Wrap the branch of the rootstock from the base upwards making sure that there are no gaps between the scion and the rootstock.



5. Cover the scion completely with a plastic bag.



6. Once the scion has started to sprout, remove the plastic to avoid disease infection. Once the graft is well established, cut the parent tree down.

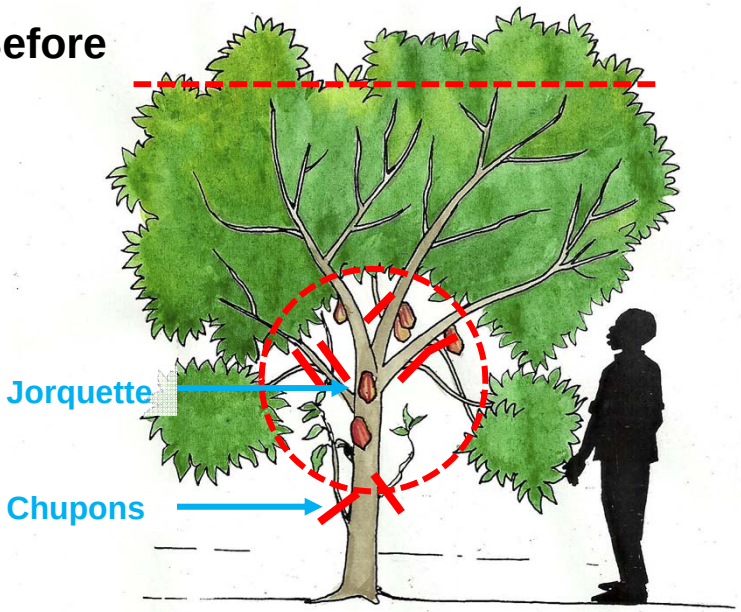
Most preferred shade trees in cocoa plantations

Tree species	
Acacia mangium	*Rauvolfia vomitoria*
Albizia spp.	*Terminalia ivorensis*
Alstonia boonei	*Tetrapleura* spp.
Ceiba pentandra	*Triplochiton scleroxylon*
Cola nitida	*Pycnanthus angolensis*
Entandrophragma angolense	*Gliricidia sepium*
Elaies guineensis	*Mangifera indica*
Funtumia elastica	*Persea americana*
Ficus spp.	*Cocos nucifera*
Khaya ivorensis	*Ricinodendron heudelotti*
Milicia excelsa	*Psidium guajava*

Poorly managed plantation

Pruning and height control of cocoa trees

Before



After

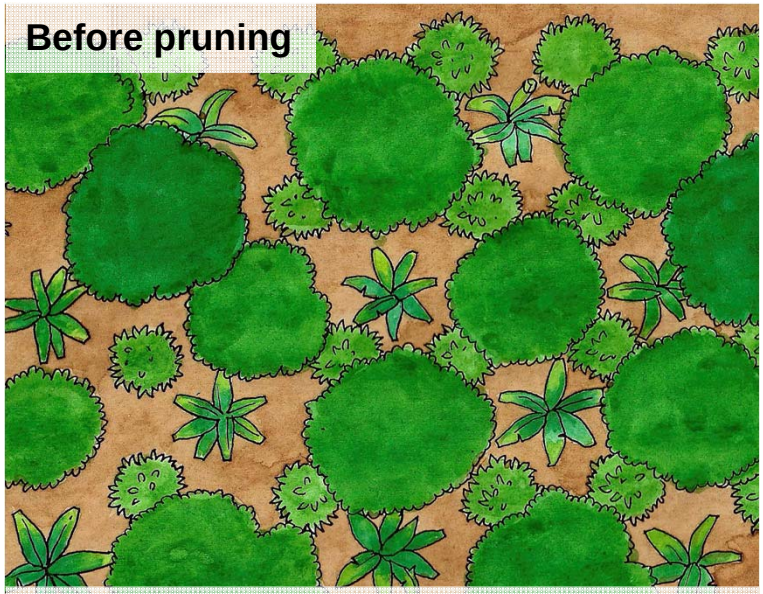
- Limit fan branches to 3 to 4.
- Remove all branches within 60 cm of the jorquette.
- Remove all old and diseased branches.
- Remove all branches growing into the centre of the tree canopy.
- Remove basal chupons at regular intervals.
- Trim-off branches that hang below the jorquette.
- Trim-off all top-branches that grow above 2.5 to 3 m.

Pruning:

- Allows sunlight to filter through to the main branches and the trunk to stimulate flowering and facilitate harvesting.
- Decreases the humidity within the canopy to reduce risk of diseases.

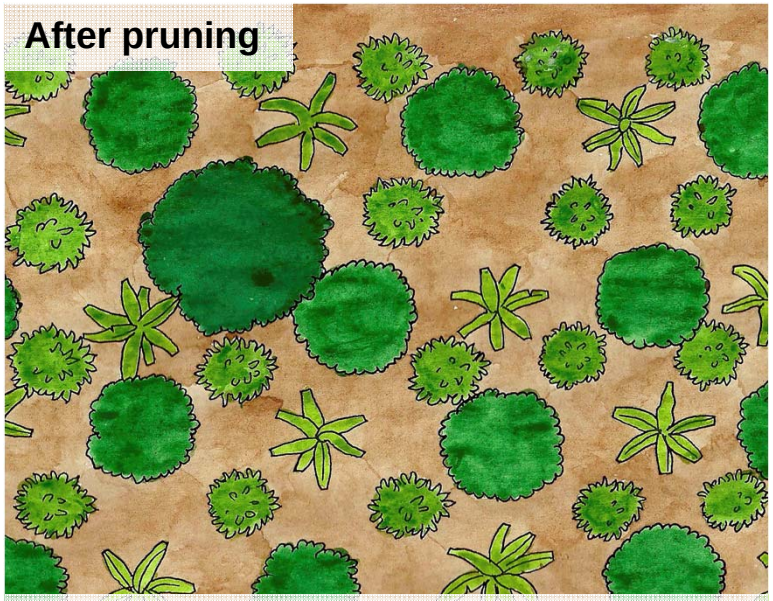
Shade management in cocoa plantation

Before pruning



- Prune back the shade trees that do not shed their leaves during the dry period.
- Regularly remove old leaves and de-suckering surplus shoots of banana. After harvest of the banana, split the pseudostems lengthwise and lay them on the ground as ground cover.
- Prune or remove any harvested tree intercrop.

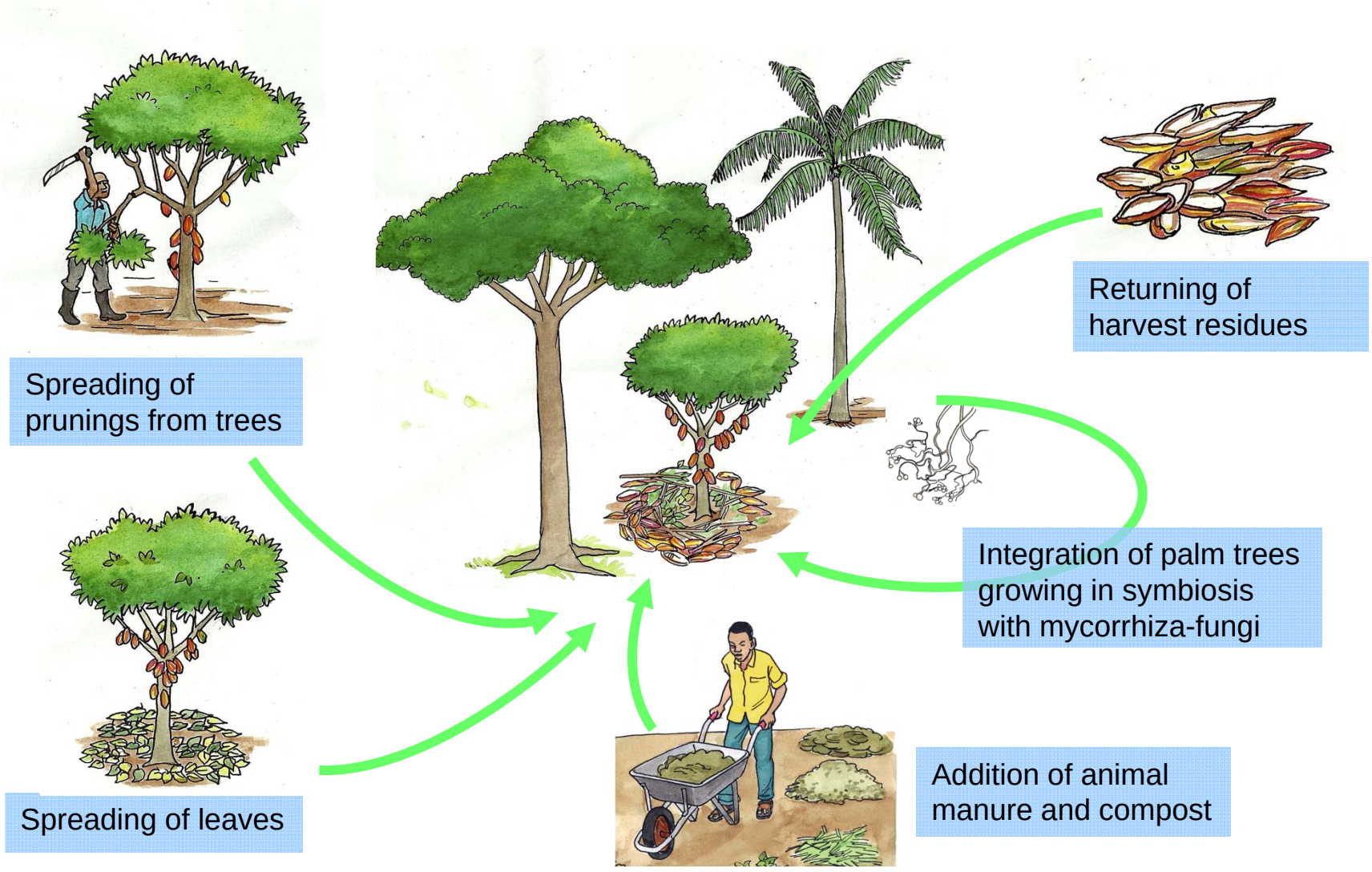
After pruning



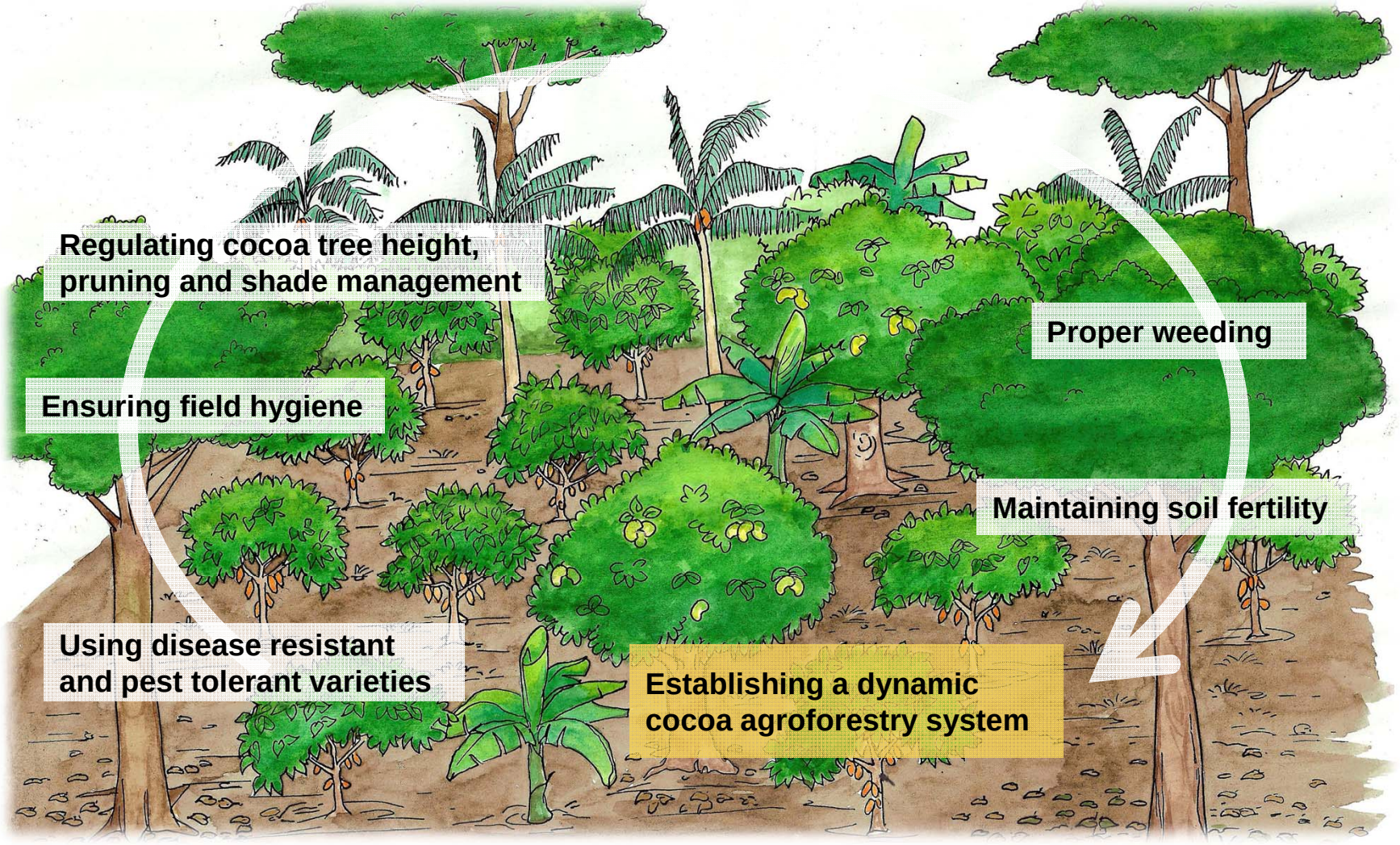
Pruning of shade trees …

- Increases light penetration to the understorey.
- Provides additional organic material for the maintenance of soil fertility.
- Prolongs the lifetime of the primary tree species.

Soil fertility improvement in cocoa plantation



Preventive pest and disease management



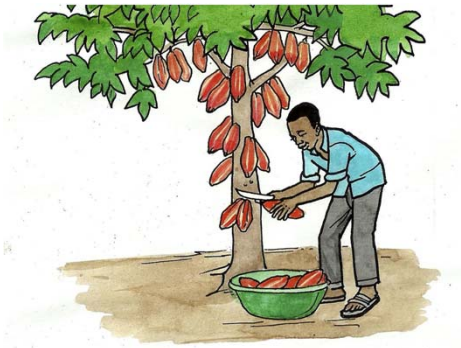
Common pest and diseases

Pest and diseases	Symptoms
Mirids (capsids)	› Sucking insects damaging young shoots and cocoa pods › Brown or black sap lesions, later infested by disease › Young cocoa trees are very vulnerable when grown without shade.
Mealybugs	› Vectors of CSSV
Cocoa swollen shoot virus disease (CSSV)	› Virus transmitted by mealybugs. › Swelling of roots and stems, red vein-banding interveinal chlorosis of leaves, trees becoming yellow, infected trees can die.
Black pod	› Caused by several species of the fungi Phytophthora › Pods can be infected at any stage of development. › Symptoms: Small translucent spot turning into a chocolate brown colour, then the whole pod turns black and mummifies. Infected pods have white sporulation on their surface.

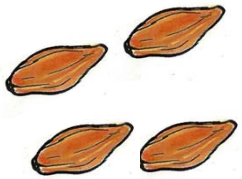
Common disease control measures

Measures	Effects
Use of disease resistant and pest tolerant varieties	› Varieties with tolerance to black pod disease and swollen shoot virus disease
Ensuring field hygiene	› Most important method for managing diseases: regular removal of diseased pods can suppress the black pod disease. › Use healthy planting material only.
Regulating cocoa tree height, pruning and shade	› Light and air circulation reduce Black pod disease.
Maintaining soil fertility	› Improves general health of the tree.
Proper weeding	› Air circulation and less humidity reduce diseases, particularly Black pod disease

Harvest and postharvest handling of cocoa



1. Harvest at regular intervals of 1.5 to 3 weeks without damaging the stem.



2. Keep the pods for a few days before opening them.

3. Open the pods without damaging the beans and separate the beans from the placenta.

4. Wrap the beans in banana leaves or make heaps of about 100 kg for fermentation.

5. Turn the leaf packages every second day.

6. Stop the fermentation when most of the beans have turned brown.

7. Dry the fermented beans by spreading them in the sun.

8. Store the beans in bags in a dry place with good ventilation.