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Cocoa



BETTER FARMING SERIES

Twenty-six titles have been published in this series, designed as handbooks for a two-year intermediate level agricultural education and training course. They may be purchased as a set or as individual documents.

FIRST YEAR

1. The plant: the living plant; the root
2. The plant: the stem; the buds; the leaves
3. The plant: the flower
4. The soil: how the soil is made up
5. The soil: how to conserve the soil
6. The soil: how to improve the soil
7. Crop farming
8. Animal husbandry: feeding and care of animals
9. Animal husbandry: animal diseases; how animals reproduce

SECOND YEAR

10. The farm business survey
11. Cattle breeding
12. Sheep and goat breeding
13. Keeping chickens
14. Farming with animal power
15. Cereals
16. Roots and tubers
17. Groundnuts
18. Bananas
19. Market gardening
20. Upland rice
21. Wet paddy or swamp rice
22. Cocoa
23. Coffee
24. The oil palm
25. The rubber tree
26. The modern farm business

cocoa

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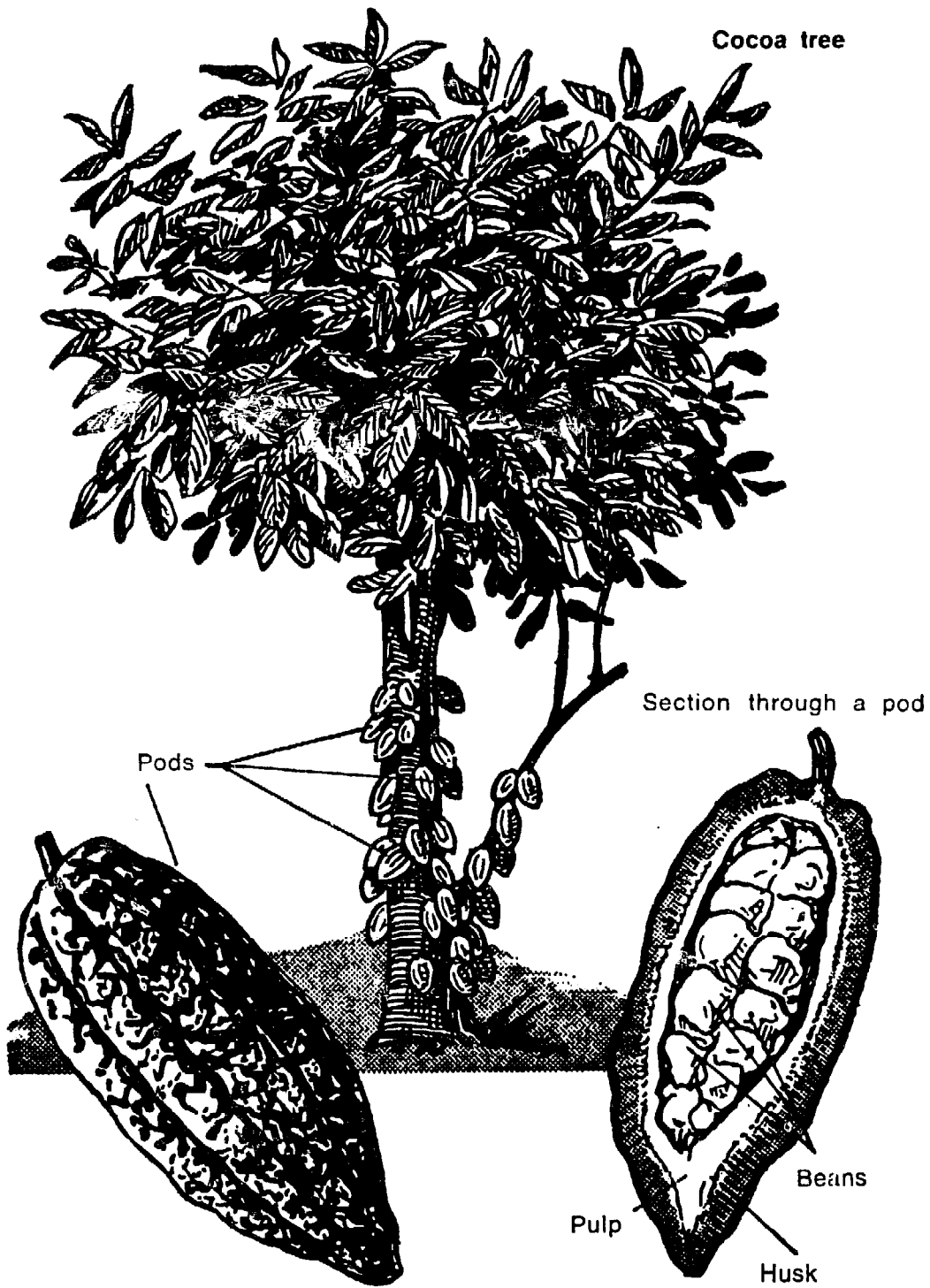
PREFACE

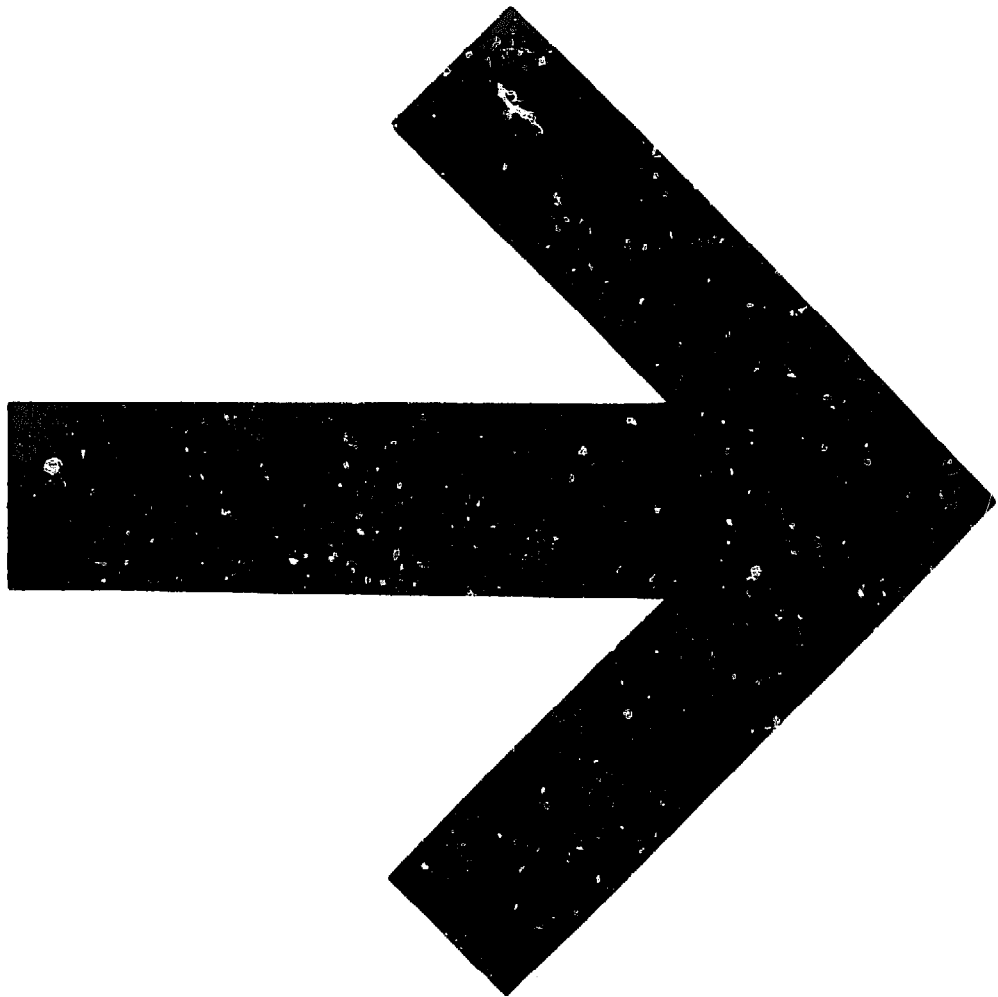
This manual is a translation and adaptation of "Le cacaoyer," published by the Agri-Service-Afrique of the Institut africain pour le développement économique et social (INADES), and forms part of a series of 26 booklets. Grateful acknowledgement is made to the publishers for making available this text, which it is hoped will find widespread use at the intermediate level of agricultural education and training in English-speaking countries.

It should be noted that the original texts were prepared for an African environment and this is naturally reflected in the English version. However, it is expected that many of the manuals of the series — a list of which will be found on the inside front cover — will also be of value for training in many other parts of the world. Adaptations can be made to the text where necessary owing to different climatic and ecological conditions.

Applications for permission to issue this manual in other languages are welcomed. Such applications should be addressed to: Director, Publications Division, Food and Agriculture Organization of the United Nations, Via Jelle Terme di Caracalla, 00100 Rome, Italy.

The author of this English version is Mr. A.J. Henderson, former Chief of the FAO Editorial Branch.





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GROWING COCOA

COCOA IS GROWN ON TREES

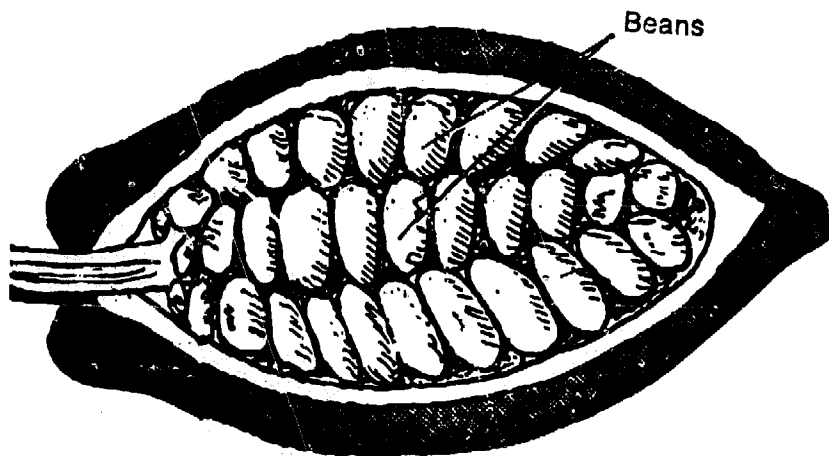
The cocoa tree bears fruit on its trunk and branches. They are called pods.

The pods contain seeds which are called cocoa beans. The beans are made up of a seed coat, a kernel and a germ.

1. Cocoa needs a high temperature, plenty of water, and air that is always moist. Therefore, cocoa is grown in the hot and humid regions of Africa (mainly in forest regions), Central and South America, Asia and Oceania.



Cocoa bean cut in two.



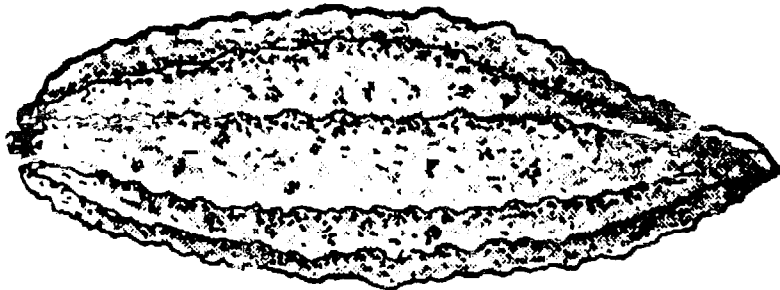
Cocoa pod

WHAT VARIETIES OF COCOA CAN BE GROWN IN AFRICA?

2. Three main varieties of cocoa are grown in Africa:

Criollo

When Criollo pods are ripe, they are long, yellow or red, with deep furrows and big warts. This variety does not produce as much as the others but the cocoa is of very good quality. It is grown mainly in America.



Forastero (Amelonado)

The pods are short, yellow, smooth without warts, with shallow furrows. This variety produces well, but the quality is not as good as Criollo. It is grown a lot in Africa.



Trinitario

This variety is a cross between Criollo and Forastero. The pods are long or short, red and yellow. It yields cocoa of fairly good quality.

WHY COCOA IS GROWN

3. People grow cocoa trees in order to sell the cocoa beans that are in the pods.
The kernel of the cocoa beans is used to make cocoa and chocolate.

In the countries of Europe and North America people eat a lot of cocoa and chocolate.
But the cocoa tree does not grow in their countries; they buy cocoa from Africa.

The countries of Africa earn a lot of money by selling their cocoa.

With this money, they can build schools and dispensaries, they can build roads and modernize the country. For Ghana, Nigeria, Ivory Coast and Cameroon, cocoa is an important export crop.

But to earn more money, these countries must sell good quality cocoa.

Sometimes they sell cocoa of poor marketing quality, badly harvested and badly fermented and dried.

Cocoa is better and fetches a higher price when it has been properly harvested, fermented and dried.
In order to sell a lot of cocoa beans of good quality, the grower must:

- **Choose the seeds and grow the seedlings carefully.**
- **Choose a good site for his plantation and prepare it well.**
- **Look after his plantation continuously.**
- **Harvest the pods and prepare the beans properly.**

CHOOSING SEEDS AND GROWING SEEDLINGS

4. The grower can buy at research centres

- **either selected seeds of good quality**

He sows the seeds in a nursery bed or in baskets. Later, he plants out the seedlings in the plantation.

- **or young seedlings of good quality**

He plants them straight away in the plantation.

5. But some growers have no research centre nearby.

They can nevertheless have good cocoa plantations by:

- choosing their own seeds,
- sowing their seeds in a nursery bed,
- planting out their seedlings in the plantation.

Nursery bed is the name for the place where the seeds are sown to make them germinate.

CHOOSING SEEDS

If you want to have fine cocoa trees which produce a lot of big pods, you must choose carefully the seeds you are going to sow.

6. If you choose your own seeds:

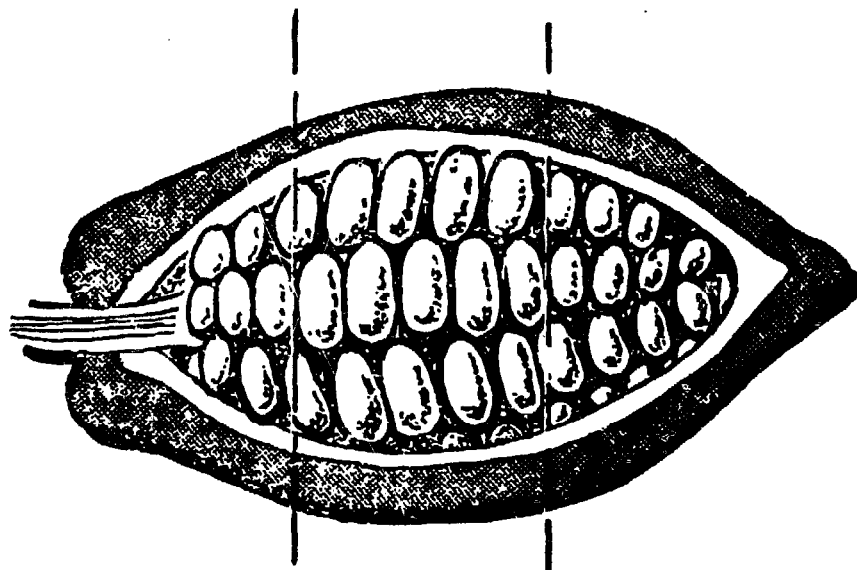
- choose the biggest pods from the trees which bear a lot of fruit.

The good quality of the tree and of the seed enters into the new plant, which will also yield many big pods.

The best seeds for sowing are those from the middle of the pod.

7. Sow the seeds as you remove them from the pod.
Never keep the pods more than one week, otherwise the germ may die.
If the germ is dead, the plant will not grow.

8. In some countries cocoa seeds are often sown directly in the plantation, that is, where the trees are to grow.
But this is a bad way of sowing, for many of the plants will not grow, and you cannot choose the best seedlings.



Take the best beans from the middle of the pod

SOWING SEEDS IN NURSERY BEDS OR IN BASKETS

9. A good grower should sow cocoa seeds in nursery beds:

Choose a small plot, quite flat, with light and rich soil.

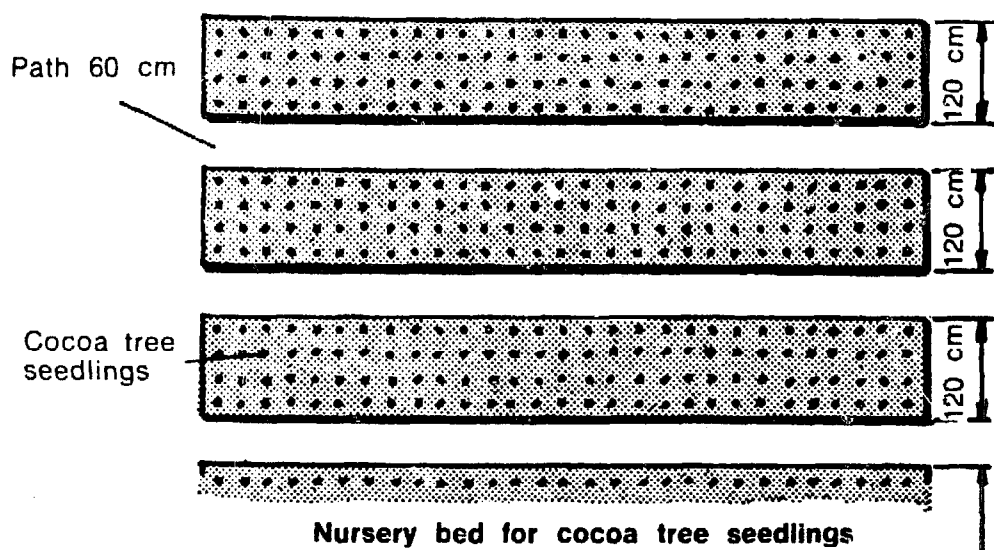
If the site is near a little stream, watering will be easier.

Till the soil fairly deeply, and break up all the lumps of earth so that you get a fine tilth.

Make beds of soil 120 centimetres wide:

- Leave a little path of 60 centimetres between one bed and the next, so that you can walk between the beds.
- Take a piece of string and mark out little furrows in each bed.
- Leave 25 centimetres between one furrow and the next.
- In each furrow, leave 25 centimetres between seeds.

Do not push the seed in too deeply, otherwise it will not have enough air and will not grow well.



Cocoa seeds can also be sown in baskets or bags.

10. When the seedlings are lifted from the nursery bed, the roots may break and little earth remains around the roots.

To avoid this, water the beds before lifting the seedlings.

Sometimes the young seedlings do not grow well and do not gain much height.

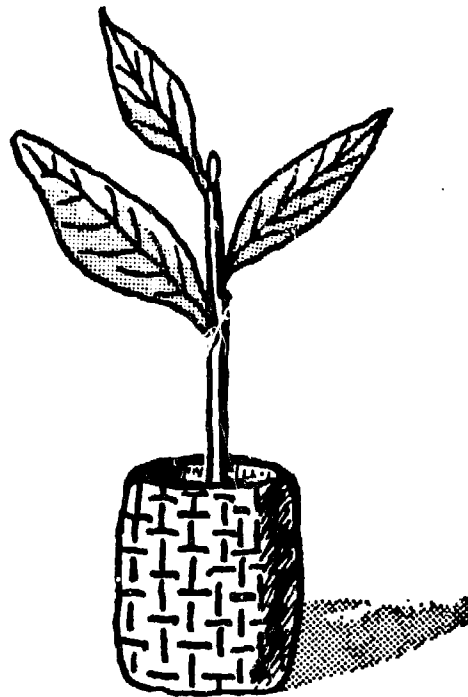
Some of them die.

11. To make the cocoa trees grow better, sow your seeds in small baskets or polyethylene bags.

These baskets or bags can be about 30 centimetres high and 20 centimetres wide.

Fill them with fine soil mixed with manure.

Put the baskets or bags in rows and leave a little path between the rows.



Young cocoa tree in a basket

You should take good care of the seedlings in seed beds or baskets.

- 12. Young cocoa tree seedlings are very delicate; you must protect them from the sun. Put them in the shade.**

In order to protect the seed beds or the baskets from the sun put up a screen 180 centimetres high above each bed.

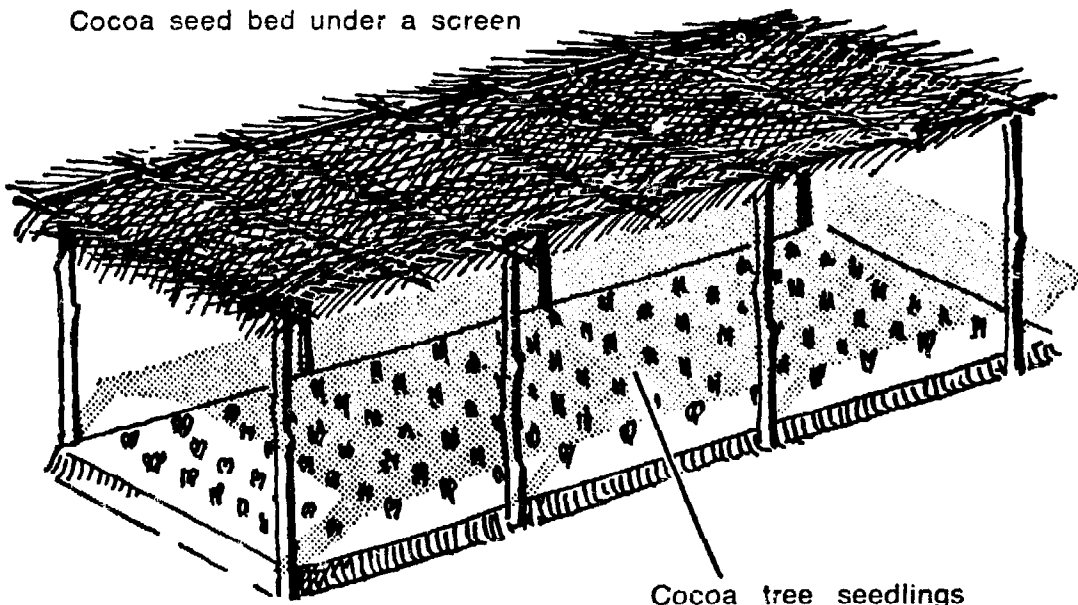
You can cover this screen with palm fronds.

Young seedlings need a lot of water. Water them every day.

Remove the weeds which take nourishment away from the seedlings.

Look for insects and kill them, pull out diseased plants and burn them.

Cocoa seed bed under a screen



Cocoa tree seedlings

LIFTING SEEDLINGS FROM NURSERY BEDS

- 13. Six months after sowing, when the seedlings have two leaves, take the young cocoa tree seedlings out of the nursery beds.**

If you wait too long, the seedlings will be too old and will not grow so easily.

Remove the seedlings from the nursery beds with a spade.

Be very careful not to break the roots.

Sort out the young cocoa seedlings.

Throw away diseased seedlings and badly grown seedlings.

Use only the healthiest seedlings.

- 14. If you have sown your seeds in baskets, place the baskets in holes dug in the plantation. There is no need to remove the basket, as it will rot in the earth.**

If you have sown your seeds in polyethylene bags, remove the bag.

Place the ball of earth with the seedling into the hole.

CHOOSING AND PREPARING THE PLANTATION SITE

CHOOSING THE SITE

15. If a cocoa tree is to grow well, it needs more than anything else a soil

- of good structure,
- permeable and deep.

The cocoa tree has tap-roots.

The tap-root descends straight into the soil.

The branch roots go down very deep.

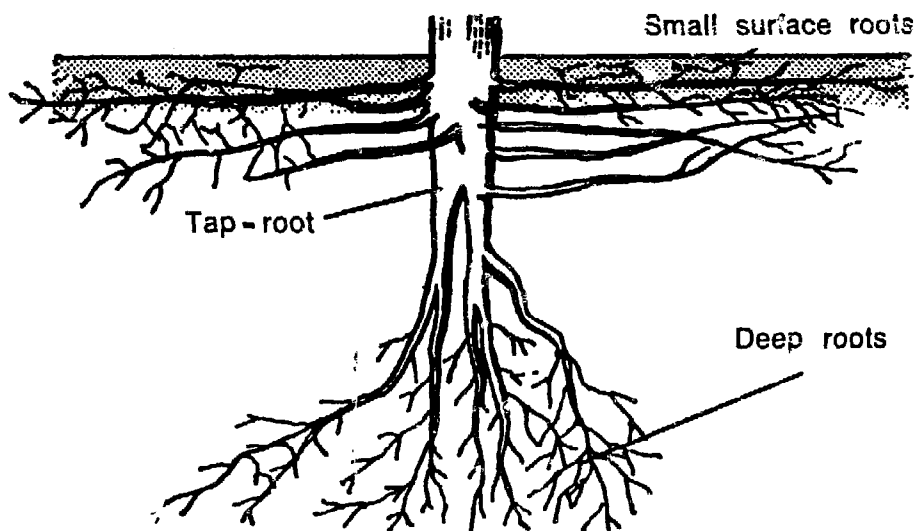
But many small branch roots also grow near the surface.

If the soil is of good structure and contains much humus, the roots penetrate well.

You can improve the soil structure by spreading manure and working it into the soil.

If the soil is deep, the roots can go down to a good depth.

Never plant cocoa trees in soil with a lot of stones, or in soil where there is some hard layer.



CLEARING THE SITE

16. In Africa, cocoa is grown in forest regions.
To make a plantation, you must clear the site.
But the cocoa tree needs shade, especially when it is young.

17. The traditional method is to cut down all the trees and to burn everything.

But this is a bad method because:

- You destroy all the organic matter in the weeds, the leaves and the branches.
- You leave the soil bare to the sun or rain.
- The soil becomes less fertile.
- The cocoa trees are not protected from the sun when it is too strong.

18. Sometimes growers put banana trees or taros into the cocoa plantation, to give shade for the young cocoa trees. If these are planted long enough before the cocoa trees, they give good protection.
But if they are planted at the same time as the cocoa trees, they do not protect the young cocoa trees well enough and they take nourishment out of the soil.

19. **To give shade it is better to keep a few of the forest trees.**

You should cut first all the tall weeds, the creepers and the small trees.
Make heaps of what you have cut down and arrange the heaps in rows.

It is better not to burn all the vegetation you cut.
Leave it on the ground.

It protects the soil against erosion and sun.
It rots and makes humus.

If you have to burn the vegetation you have cut, you must sow a cover crop.

20. Next, go through the plantation a second time:

Now cut down all the trees which might give some disease to the cocoa trees.

And cut down also all trees that give too much shade. **But leave those large trees which can give no disease to the cocoa trees, and which give a little shade.**

When the cocoa trees have grown taller, they need less shade.

You should gradually give them less and less shade. You should prune the big trees and cut off those branches that cast too much shade.

When the plantation is well cared for, you can cut down all the big trees.

When the cocoa trees have grown, it is better to get rid of the unwanted shade trees by using tree-killing chemical products. This way causes less damage than cutting them down.

21. In Cameroon, for example,

- **Farmers always remove the following trees:**

<u>Local name</u>	<u>Botanical name</u>
Atui	Piptadeniastrum africanum
Tôm	Erythrophloeum guineense
Ebaé	Pentaclethra macrophylla
Eyen	Distemonanthus benthamianus
Asam	Uapaca staudtii
Abem	Macrolobium or Berlinia
Esabem	Macrolobium limba
Engökôm	Myrianthus arboreus
Aseng	Musanga cecropioides

- **Leave in the plantation:**

Akom	Terminalia superba
Atol	Ficus vogeliana
Evouvous	Albizzia ferruginea
Esak	Albizzia fastigiata
Ekouk	Alstonia boonei
Eteng	Pycnanthus kombo

22. In Ivory Coast

- **Farmers always remove the following trees:**

Dabema	Piptadeniastrum africanum
Samba	Triplochiton scleroxylon
Bâla	Childovia sanguinea
Aiya, Kotibé	Nesogordonia papaverifera
Cola	Cola nitida
Ehéman	Corynanthe pachyceras
Cakoua	
Ntaba	
Akeato	Cola spp.
Aoussou	
Boto, Kotokié	Sterculia tragacantha
Fromager	Ceiba pentandra
Akogaouan, Oba	Bombax spp.
Grand Wounian	Myrianthus preussi
Bléblendou	Treculia africana
Inékichébi	Rauwolfia vomitoria
Glagla	Conopharyngia

- **Leave in the plantation:**

Adashia	Trema guineensis
Iroko	Chlorophora excelsa
Figuers	Ficus
Ouangrain	Allophylus africanus
Sipo, Tiama	Entandro phragma
Pri, Pouso oué	Funtumia
Abalo	Combretodendron africanum
Emien	Alstonia boonei
Minghi, Bahé	Fagara
Oualébé, Ndéa	Pycnanthus angolensis
Fraké, Framiré	Terminalia
Akoua	Antrocaryon micraster
Parasolier	Musanga cecropioides
Loloti	Lannea welwitschii
Tchikué, Tchikuébi	Brideia

PREPARING TO PLANT COCOA TREES

23. With traditional methods, planting is most often done in a haphazard way.

The cocoa trees are not planted in rows.

There is not the same distance between them.

When the trees are too far apart, they do not use all the soil; when they are too close, they grow badly.

Instead, you should always plant in rows.

First mark the rows for the cocoa trees, leaving about 2.5 to 3 metres between rows.

Along each row, mark out with pegs the spots where the cocoa trees are to go.

Leave about 2.5 to 3 metres between trees.

In this way you can plant about 1 000 to 1 600 seedlings per hectare.

24. Digging the holes

Before planting cocoa trees, the grower must dig holes in order **to stir the earth and loosen it.**

Dig the holes two months before planting the cocoa trees.

When you are digging the hole, **do not mix together the soil from above and the soil from below:**

Make two separate heaps.

PLANTING COCOA TREES IN A PLANTATION

Sometimes growers sow cocoa seeds straight away in the plantation.

This is a bad thing to do.

It is better to put into the plantation either young cocoa seedlings from your own nursery beds, or cocoa seedlings bought from a research centre.

- 25.** A few hours before lifting the seedlings from the nursery beds, **water the soil.**

Then take the seedlings out of the nursery beds with a spade or a hoe.

Be very careful not to break the roots.

Next sort out the cocoa seedlings.

Throw away diseased plants and plants that have a twisted tap-root.

You can dip the roots of the seedlings in liquid mud, so that the cocoa plants take root again easily.

- 26. When to plant cocoa trees**

Plant cocoa trees **at the beginning of the rainy season.**

Choose a day when the soil is moist and when the sky is cloudy.

Plant the young cocoa trees when they are about 6 months old.

27. How to plant cocoa trees

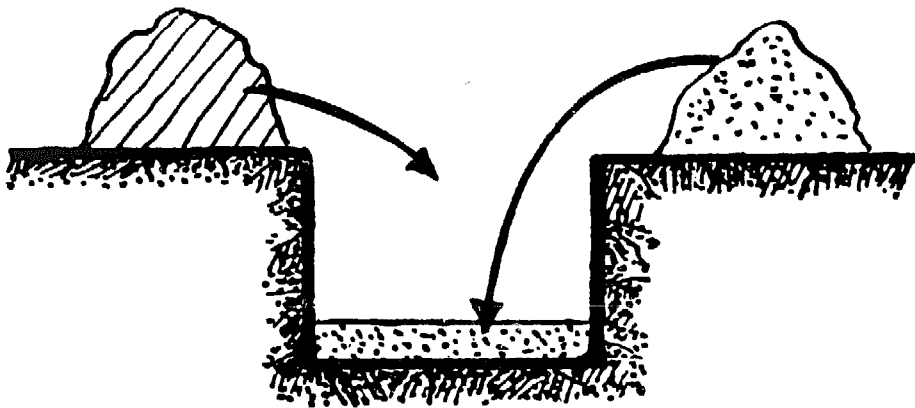
A few days before planting, fill in the holes you have dug.

At the bottom of the hole, put the soil you have dug out from the top, and on top put the soil you have dug out from below.

You may mix the soil with manure.

Bottom soil now to
be put on top

Top soil now to be put at
the bottom of the hole



When you are ready to plant, make a small hole. In this small hole place your young cocoa seedling. If you have sown your seeds in baskets or bags, make a hole big enough to hold the root ball with the cocoa seedling.

Be very careful not to twist the tap-root.

Do not cover the crown with earth. Pack the soil down well around the tap-root. For the first few days, protect the cocoa seedling from the sun. If there are palm trees in your village, use a palm frond.

TAKING CARE OF THE PLANTATION

- 28.** When the cocoa trees have been planted, the work is not finished. The grower still has a lot of work to do to look after his cocoa trees.

A grower who does not look after his plantation properly cannot harvest big pods and will not earn much money.

To look after your plantation properly you must:

- Replace seedlings that have not grown
- Remove weeds and keep the soil covered
- Prune the cocoa trees
- Apply fertilizer
- Protect the cocoa trees from insects and diseases.

REPLACING MISSING SEEDLINGS

- 29.** Sometimes certain cocoa seedlings do not grow well. They remain small or die.

During the months following the day when you planted your seedlings, you must always look to see whether the cocoa trees are growing well.

If you see diseased or dead cocoa trees, pull them out and burn them, and also those encircling them in case of swollen shoot disease (see paragraph 42). In their place, plant other young cocoa seedlings, from among those that you have kept in the nursery bed or in baskets.

WEEDING AND SOIL COVER

30. Many weeds grow among the cocoa tree rows.
You must not let weeds take nourishment away from the cocoa trees.

When the cocoa trees are young, you should weed 4 or 5 times every year.

When the cocoa trees are bigger, they cast a lot of shade and so few weeds will grow.

It will be enough to weed once a year.

When you are cultivating be very careful not to damage the trunk and roots of the cocoa trees.

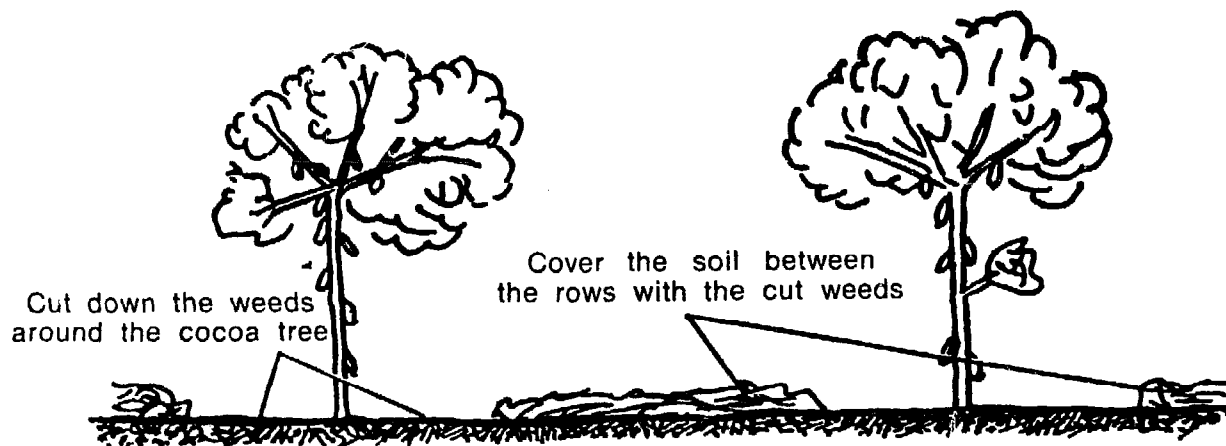
31. **Between the rows of cocoa trees, you should not leave the soil bare.**

You should cover the soil either with cut weeds or with palm fronds, if available.

In this way the soil is protected against sun and erosion; it stays moist and cool.

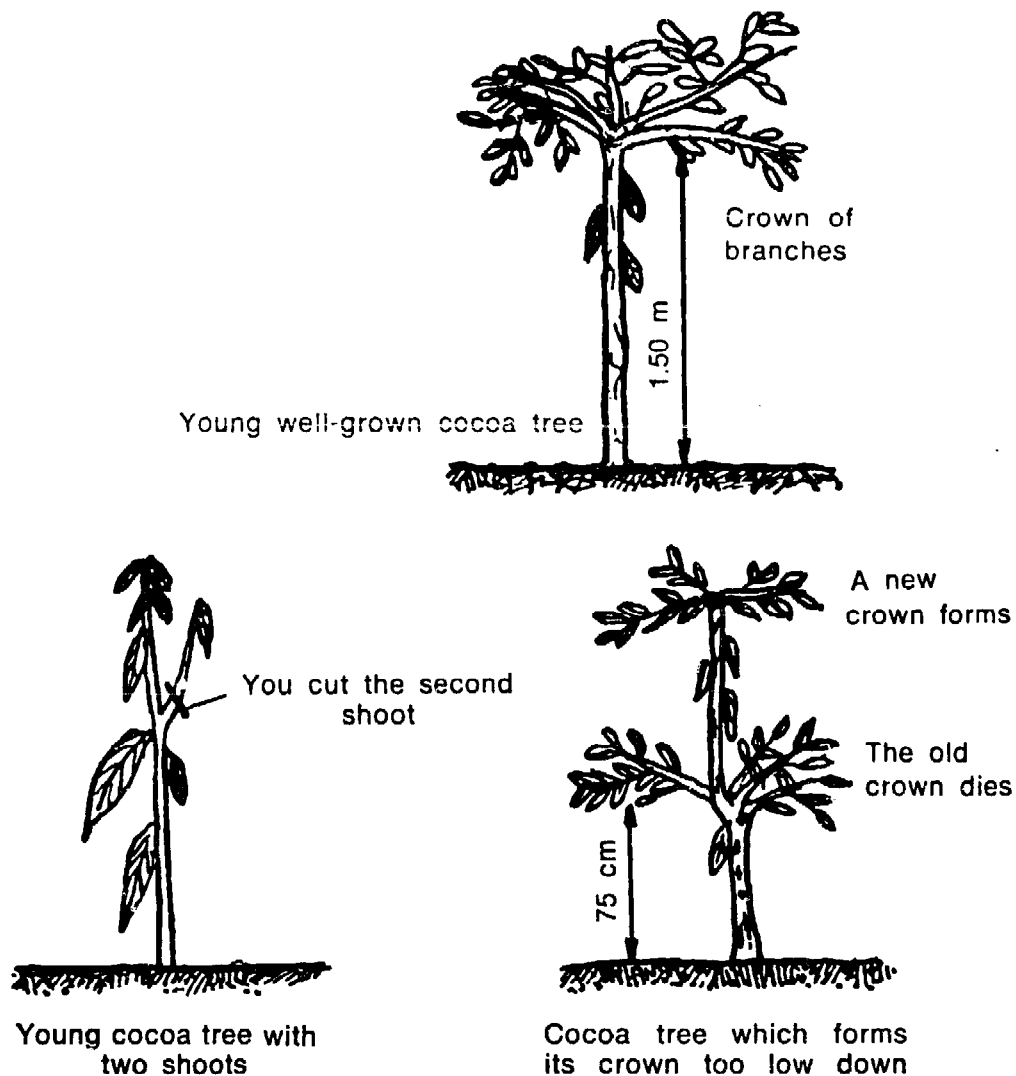
When the weeds rot, they give the soil organic matter.

You can also sow a cover crop, for instance legumes. This will give the soil good protection against sun and erosion.



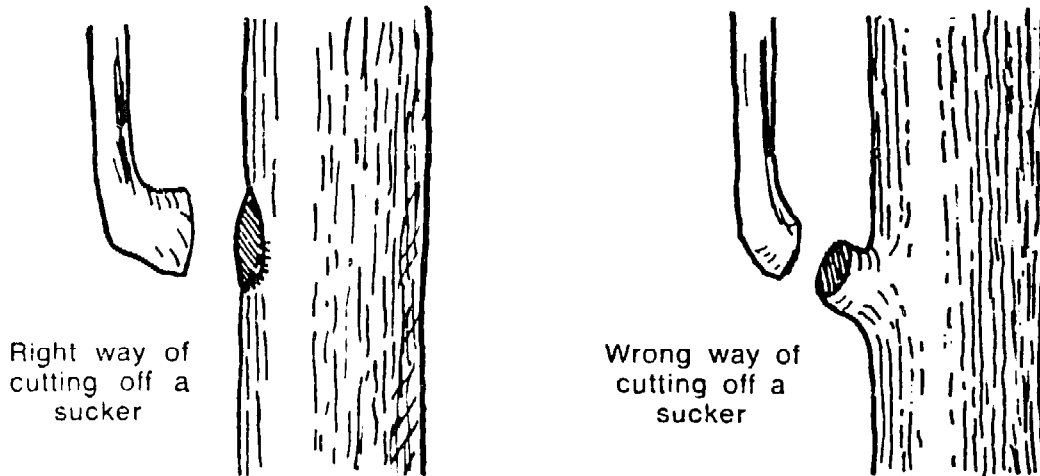
PRUNING COCOA TREES

- 32.** The cocoa tree is a tree that develops well. It has a single, straight trunk. A crown of 3 to 5 main branches forms about 1.5 metres above ground level.
- 33.** Sometimes, during the first year, several shoots form on the trunk.
Cut off these shoots and leave only the strongest. Sometimes the crown forms too low down, at less than 1 metre above ground level.
Choose a shoot which grows straight up and let it develop. A new crown will then form at a good height, and the first crown will stop growing.



34. Always cut out all dead branches, dry twigs and suckers.

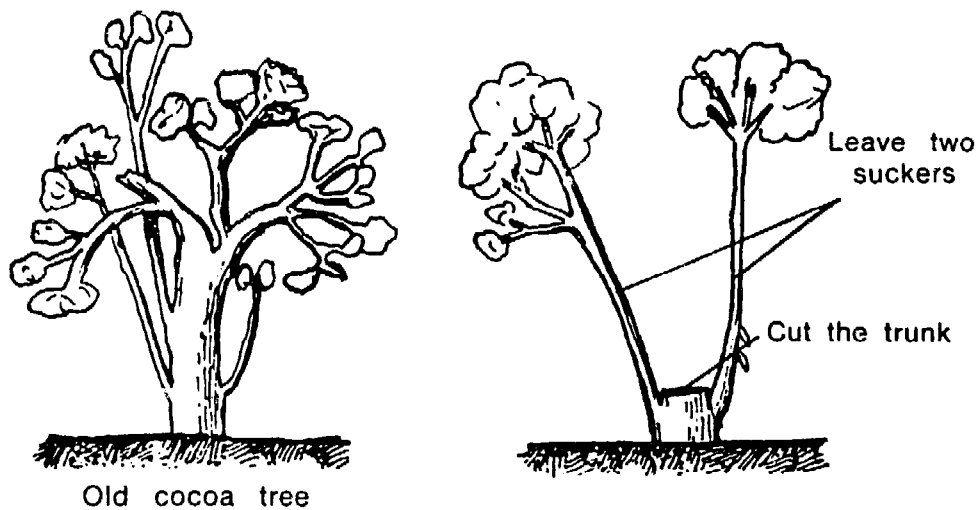
A **sucker** is a twig that grows upward out of the trunk. Cut off the suckers very close to the trunk.



35. When a cocoa tree gets old, it no longer yields many pods.

But you can make cocoa trees young again by letting one or two suckers grow low down on the trunk where they can develop their own roots.

Then cut down the old trunk, and you will again have a cocoa tree that yields many pods.



APPLYING FERTILIZERS

Fertilizers cost a lot of money.

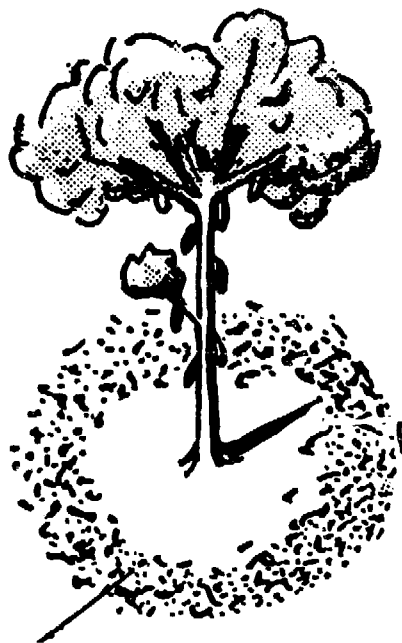
So the grower should use fertilizers only when this will make him earn more money.

- 36. When you have tended your cocoa trees, when you have hoed the weeds, then you should apply fertilizer.**

Spread fertilizer around each cocoa tree, but be careful not to put any on the trunk, the branches or the leaves of the cocoa tree: otherwise **the fertilizer will burn the tree.**

Spread the fertilizer in a ring around the trunk at a distance of about 1 metre from it, where most of its small roots are.

Apply fertilizer twice a year: in April and September.



Spread the fertilizer around the tree
at a distance of 1 metre

37. It is useless to apply fertilizers in a plantation that is not well cared for.

A grower who does not prune his cocoa trees and who does not hoe the weeds should not apply any fertilizer.

If the plantation is not cared for properly, fertilizers do nothing except feed the trunks of the cocoa trees, the suckers and the weeds.

The grower loses his money.

38. Different soils have different fertilizer needs.

Ask the extension service how much fertilizer to use.

For example, in Ivory Coast:

- on the more sandy soils, along the coast, use compound fertilizer, which contains nitrogen, phosphoric acid and potash: fertilizer formula 13-10-15;
- on the more granitic soils of the interior, use another compound fertilizer: formula 12-15-18.

The quantities for each tree are as follows:

- during the first two years:
 - in April: 125 grammes;
 - in September: 125 grammes.
- during the third year and from then on:
 - in April: 250 grammes;
 - in September: 250 grammes.

PROTECTION FROM INSECTS AND DISEASES

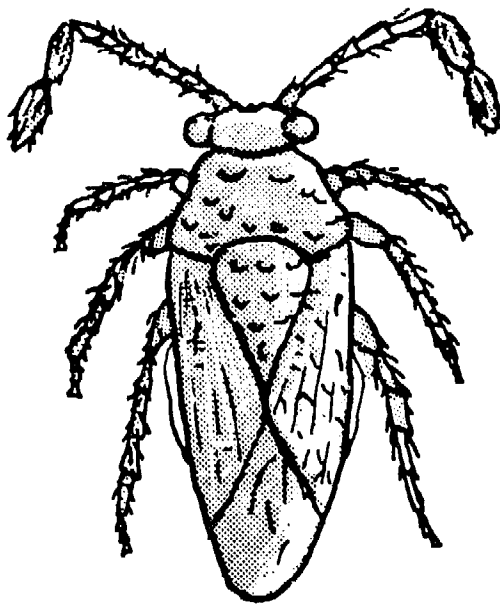
The most dangerous insects are the following:

39. Capsids

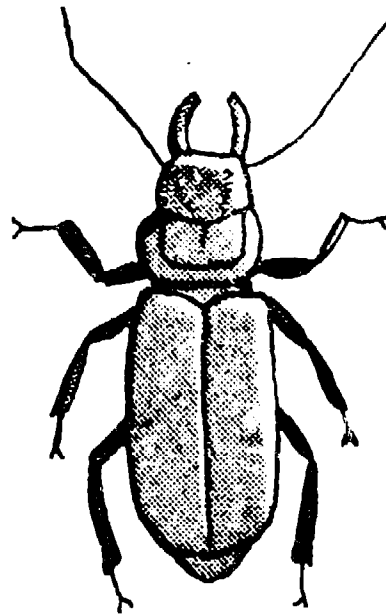
These insects prick the twigs and pods.
At the place where they make a hole, the tree dries out and the sap no longer circulates.
Young trees attacked by capsids often die.
To control capsids, use **Lindane** or **Aldrin**.

40. Borers

The larvae of these insects bore holes in the trunk or branches.
You can control borers with **DDT** or **Dieldrin**.



Capsid



Borer

The most dangerous diseases that attack cocoa trees are the following:

41. Black pod disease

This is caused by a fungus which chiefly attacks the pods.

If attacked, the pods rot and die.

Control this disease by picking off diseased pods and burning them.

You can prevent the disease from spreading by spraying the sound pods with copper preparations.

42. Swollen shoot disease

This is a very serious disease, which has caused much damage in Ghana.

You will see that the leaves are mottled. Sometimes some twigs become very thick and the tree soon dies. Mealy bugs carried about by ants can transmit the disease from one tree to another.

Control this disease by cutting down diseased trees and leaving them to wither.

Remember that, when a diseased tree has been discovered and cut down, all the trees circling it must be cut down also to avoid the spread of infection.

HARVESTING THE PODS

43. The tree makes its first flowers after two years. But in order not to tire the tree, you should cut off the first flowers. From these you will therefore get no fruit.

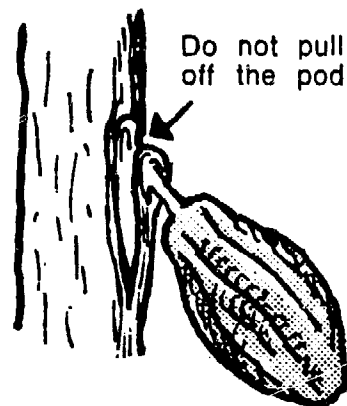
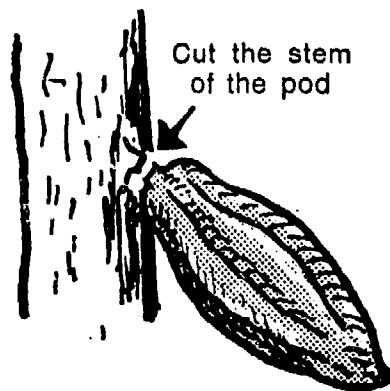
There are two harvests each year: a small harvest at the beginning of the rainy season, a big harvest at the end of the rainy season.

44. Do not pick all the pods at the same time. **Pick only pods that are ripe, whether yellow or red.** Leave on the tree any pods that are not ripe, that are still a little green.

Go through the plantation every fortnight to pick the ripe pods.

Never pick the pods by pulling them off: if you do, you will spoil your tree.

You should cut the stem of the pod with a machete.



PROCESSING COCOA BEANS

45. Opening the pods.

Do not wait more than 4 days to open the pods.
Open the pods by hitting them with a thick piece of wood.

Take the beans out of the pods and put them in baskets.

Then carry them to the place where they are to ferment.

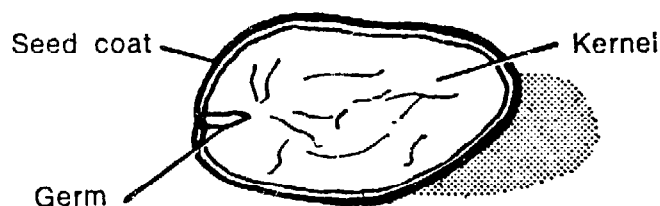
Do not leave the broken husks on the field.

They can be used to make compost.

46. Why cocoa beans are fermented.

We have seen that the cocoa bean consists of a seed coat, a kernel and a germ.

Cocoa beans are fermented so as to destroy the seed coat, kill the germ and give the cocoa a good taste.



Cocoa bean cut in two

47. How to ferment the beans.

Often cocoa growers ferment the beans in heaps. They chose a flat and dry spot, cover it with banana leaves, make a heap of cocoa beans and cover the heap with banana leaves.

The beans ferment well if the heap is stirred from time to time.

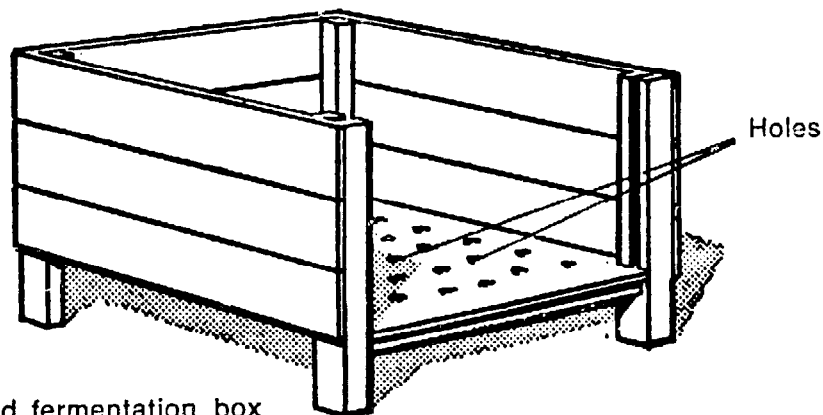
It is much better to ferment the beans in boxes.

Use boxes with holes in the bottom.
Place these boxes on supports, for instance stones.
The juice runs off at the bottom of the boxes through the holes.

After two days, take the beans out of the box, stir them around well and put them into another box.
To make this work easier, you can stack the boxes one on top of the other.

Never leave the beans in the same box for more than two days.

Fermentation takes 6 to 10 days.
The beans are purple at the beginning, and turn red-dish when they are fermented.



Good fermentation box

Drying cocoa beans

48. When the beans are well fermented, they must be dried.

Cocoa beans may be dried in the sun.
Spread the beans on boards raised 1 metre above ground level.

The layer of beans should not be very thick; not more than 4 centimetres.

Stir the beans often and protect them from rain.

To protect from rain, you can make a little shelter and slide the boards under the shelter every night and when it rains:

This is called a **sliding tray drier**.

Drying cocoa beans takes five to ten days.

49. In forest regions where the climate is very moist, cocoa beans do not dry at all well.

Badly dried beans are of poor quality.

You get less money for them.

In such regions several growers can get together and build a modern drier.

Spread the beans on a concrete slab set well above floor level.

Light a fire underneath, or allow hot air to pass through drums to heat the concrete slab.

Then the cocoa beans will dry better.

In this way one man alone can take care of drying the harvest of several growers.

He should not let the fire get too hot, to prevent the beans from becoming smoky.

He should stir them often so that they do not burn.

50. **When the cocoa is quite dry, the beans are sorted.**

Remove all the:

- flat beans
- germinated beans
- mouldy beans
- broken beans.

Keep only good beans.

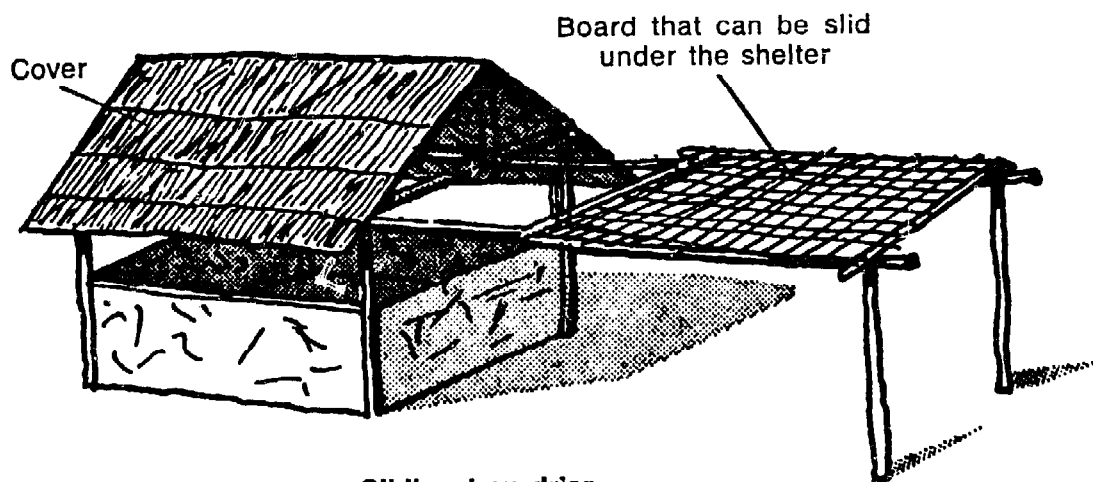
Put these good beans into sacks.

Keep the sacks in a dry place well protected against animals.

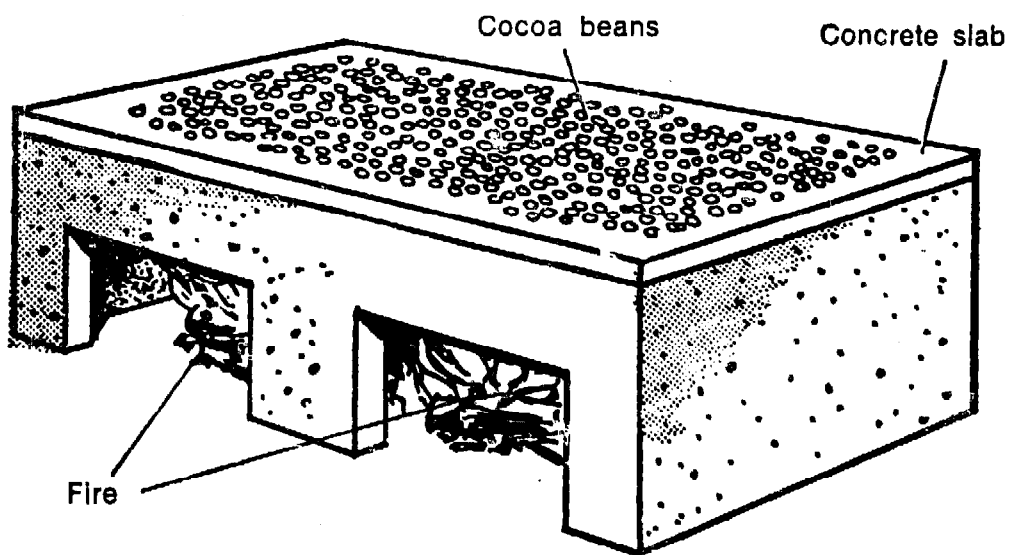
Finally sell your sacks of cocoa.

Good-quality cocoa is cocoa which has been:

- well harvested,
- well fermented,
- well dried.



Sliding tray drier



SUGGESTED QUESTION PAPER

FILL IN THE MISSING WORDS

The fruits of the cocoa tree are called

Cocoa and chocolate are made from the of the beans.

The young cocoa tree needs to be protected by

The soil must be with cut weeds or palm fronds.

The most dangerous insects for the cocoa tree are

Pods must be picked only when they are quite

A badly bean is of poor quality.

ANSWER THE FOLLOWING QUESTIONS

Of what parts does the cocoa bean consist?

Why should you make a nursery bed?

Why should you cover the soil in the plantation?

How should cocoa trees be pruned?

What do your people do at home to protect cocoa trees against insects and diseases?

How should you clear the land before making a cocoa plantation?

What must you do to get cocoa of very good quality?

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