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1977 edition

bananas

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better farming series 18

Bananas

Published by arrangement with the
Institut africain pour le développement économique et social
B.P. 8008, Abidjan, Côte d'Ivoire

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome 1977

First printing 1977

ISBN 92-5-100149-9

PREFACE

This manual is a translation and adaptation of "Le bananier," 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.

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 delle Terme di Caracalla, 00100 Rome, Italy.

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

OUTLINE OF COURSE

Why bananas are grown

The banana plant is grown for its **fruit.**

Bananas to be eaten raw
are grown in **commercial plantations,**
chiefly for export.

These bananas are soft, sweet, and not very mealy.
Two main kinds are planted:

- Varieties of the so-called Chinese banana,
  or Canary banana,
  such as Lacatan (chiefly in Jamaica),
  Poyo, Big Dwarf, Little Dwarf.
- Varieties of the fig banana,
  such as Gros Michel.

Around houses you often see another variety
which produces very small bananas
called "sweet figs."

The kind of banana called **plantain**
is grown as a **food crop** in forest regions.
Its fruits are very large,
not sweet and very mealy.
They are cooked for eating.

There are two main types of plantains:

- French plantains,
  with heavy bunches
  containing many fruits;
- horn plantains,
  with very big fruits,
  few in number, shaped like a horn.

Where bananas are grown

The banana needs
heat,
humid air,
plenty of water,
light.
It dislikes wind.
It likes soils rich in organic matter.
It likes soils that drain quickly.

Once picked, bananas
should not be left long in the plantation.
Banana plants are planted along roads, tracks,
railway lines or lagoons
so that the fruits can be quickly moved away.

In the world as a whole,
Central and South America produce most bananas –
nearly 20 million tons a year.
Asia produces 10.2 million tons
and Africa 4.2 million tons.

In Africa, the chief producers of bananas are:

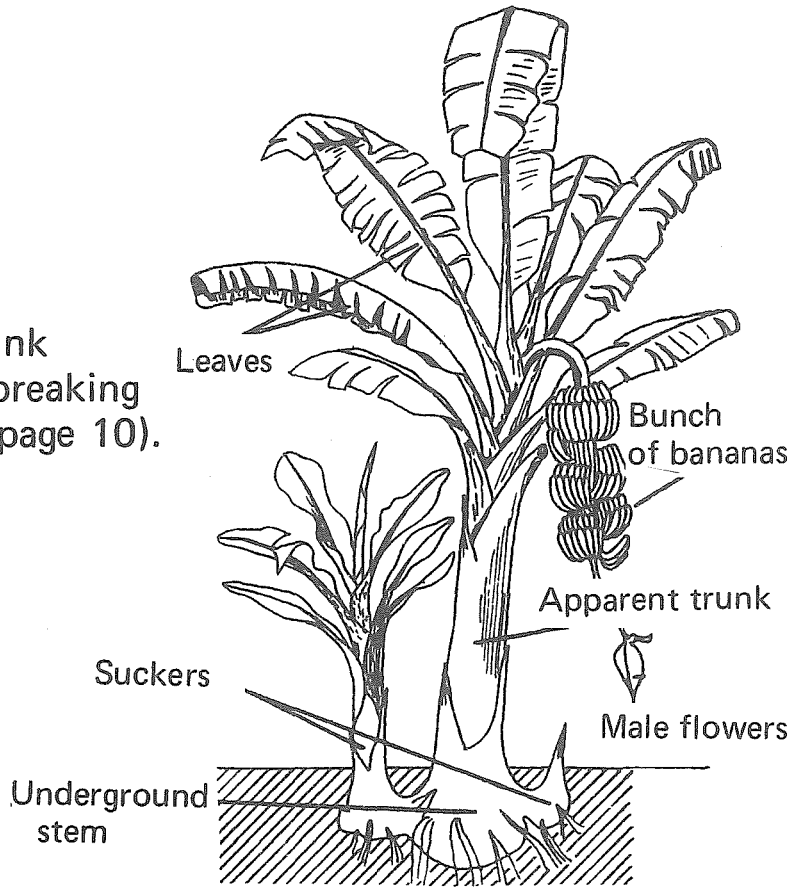
Angola	320 000 tons
Madagascar	280 000 tons
Ivory Coast	230 000 tons
Central African Empire	170 000 tons
Somalia	140 000 tons
Cameroon	90 000 tons
Guinea	90 000 tons

The above figures (for 1974) are from
the FAO **Production yearbook 1974.**
The production of plantains
is often not counted.

Description of the banana plant

The banana plant
is not a tree.

It is a giant
herbaceous plant
with an apparent trunk
that bends without breaking
(see Booklet No. 2, page 10).

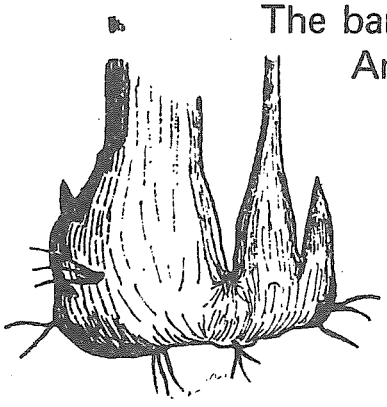


A banana plant

The banana has an underground stem
with adventitious roots
(see Booklet No. 1, page 25).
It is full of food for the plant.

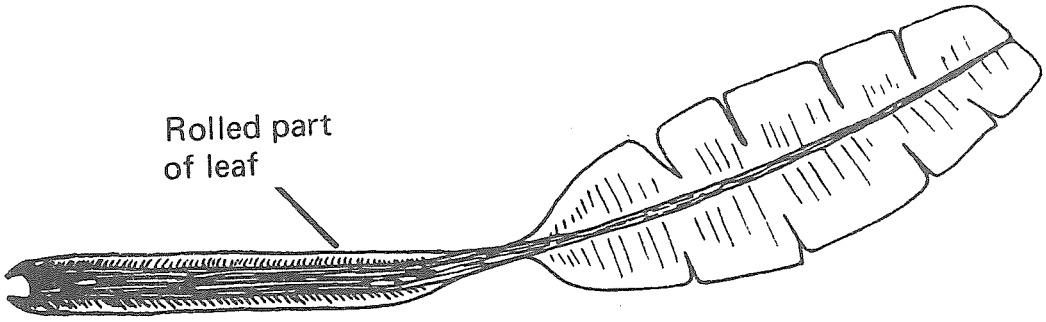
Alongside the main stem,
it has **other stems called suckers.**
These stems grow into banana plants.

The banana plant produces its fruit and dies.
Another sucker replaces it.

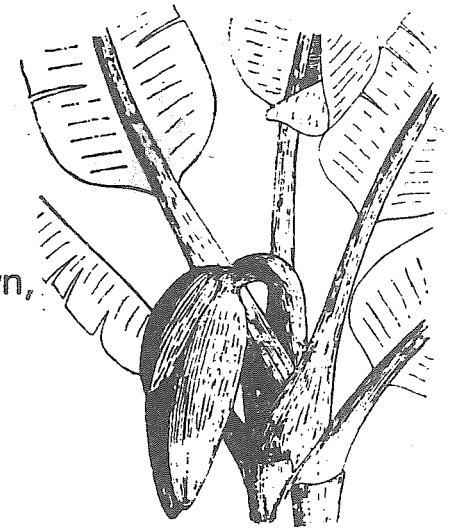


An underground stem with suckers

The banana plant has large leaves
closely rolled up one over the other.
Together they look like a trunk,
but they form only an apparent trunk.



Banana leaf



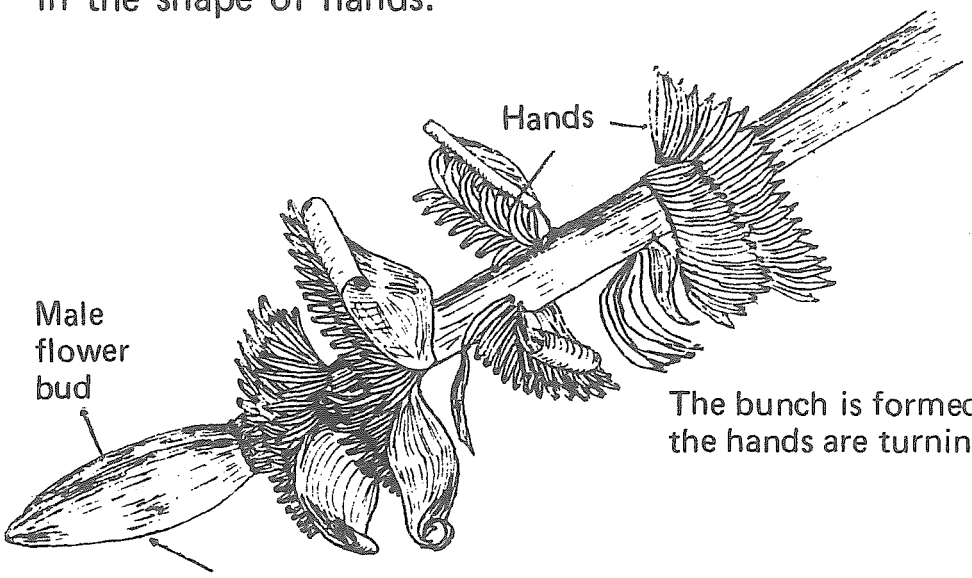
Inside it there is a bud
which produces leaves.
After 7 or 8 months,
when some 30 leaves have grown,
the bud produces flowers.

The flowers of the banana plant
form a large spike
(see Booklet No. 3, page 6).
It turns downward, to the soil and opens.
It bears male and female flowers.

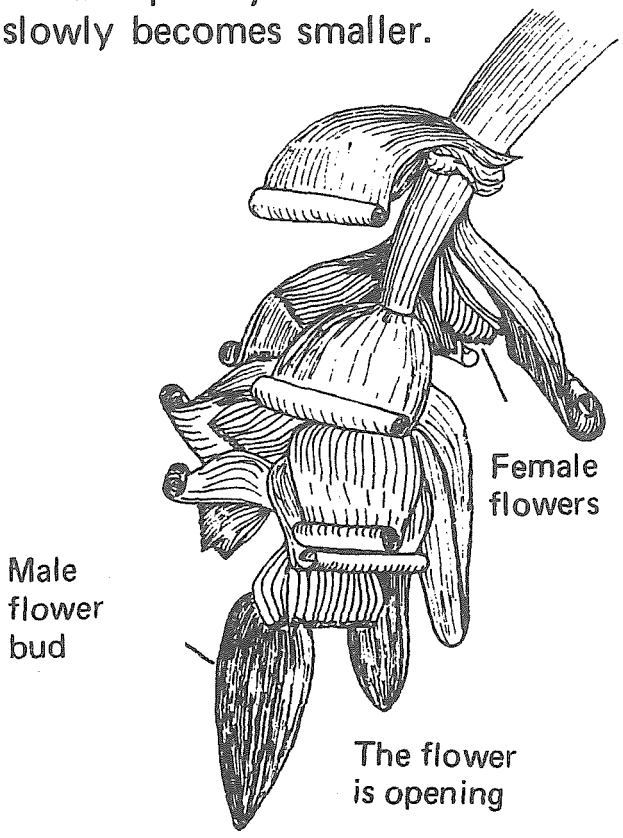
The spike comes out
of the apparent trunk
and turns to the ground.

You can see:

- **the female flowers**
  pressed closely together
  in the shape of hands.

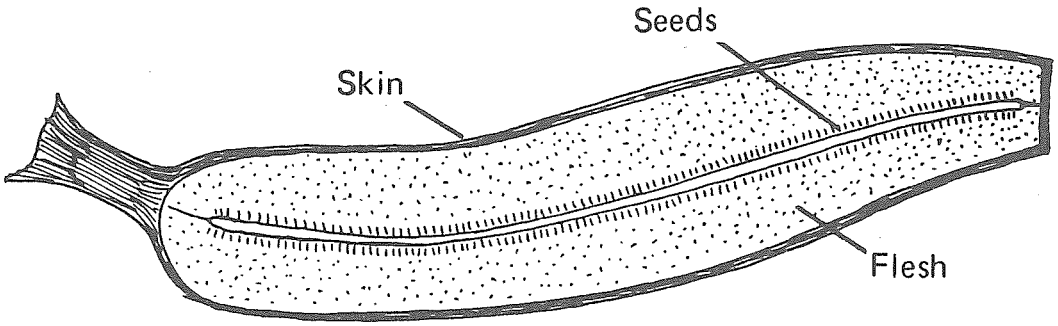


- **a red bud**
  at the end of the spike
  containing **the male flowers;**
  the male flowers die quickly
  and the bud slowly becomes smaller.



The banana plant yields fruits.
These fruits are long in shape,
with yellow or green skin.
The spike produces many bananas.
The bananas on one spike
are called a bunch.
On this bunch,
the bananas are clustered in several hands.

The flesh of a banana
is light in colour, sweet and soft.
In the middle of the fruit
you can see little black specks;
these are the seeds,
but they will not germinate
(see Booklet No. 1, page 8).



Section of a banana

HOW TO GROW BANANAS

A banana plantation may last a long time.
But if you want good harvests,
if you want to till the soil well,
you must dig up the plantation
after 7 to 10 years.

When you have dug up the banana plants,
let the ground lie fallow for 2 years.
Plant a legume
such as *Calopogonium, Pueraria* or *Stylosanthes.*
After 2 years,
dig in the legumes as green manure
(see Booklet No. 6, page 8).
You can then plant bananas again.

In Ivory Coast, in commercial plantations,
bananas are dug up
after cutting three bunches of fruit on each plant.
The replanting is done immediately.
Traditional plantations are short-lived,
for instance, 5 years in Cameroon,
2 to 4 years in equatorial Africa and Zaire.
In these plantations
other food crops are grown along with the bananas,
such as tania in southern Cameroon.

In Zaire attempts have been made
to grow banana plants and rubber trees together,
and bananas and oil palm.
Rubber trees and oil palms do not come into production quickly.
Between the rows of these trees,
bananas are planted;
they do produce a crop quickly
and the planter earns some money
while he is waiting to harvest latex and fruit clusters.

When you make a cocoa plantation,
plant a banana sucker
beside each cocoa tree.
The banana will provide shade
for the young cocoa tree.

Preparing the ground and making the plantation

For a good plantation, you must:

- prepare the soil well,
- make planting holes in rows,
- do the planting well.

PREPARING THE SOIL

Clear the ground, cut up the trees,
stack them and burn them.

Some ground is too wet;
the water prevents the roots from developing.
Soil like this must be drained
to get rid of the water
(see Booklet No. 6, page 20).
Make ditches every 15 metres
in the direction of the slope.
Dig a big central ditch
that will carry away all the water.
Make ditches on each side of the plantation.

Push pieces of wood into the ground, in rows,
to mark the spots
where a banana plant is to be grown.
The distance between the banana plants varies
with the variety
and the method of growing them.
Plantations that are replanted every 3 or 4 years
are planted closely.
Plantations that are replanted every 10 years
are planted at a lower density
(see Booklet No. 1, page 26).

For example:

In southern Ivory Coast,

Poyo bananas are planted 2 metres apart
in rows that are 2 metres apart.
This gives about 2 500 banana plants
to the hectare.

In Cameroon

Gros Michel bananas are planted 2.85 metres apart
in rows 2.85 metres apart.

In plantations

where bananas are grown with other crops,
bananas may be planted 5 metres apart
in rows 5 metres apart.

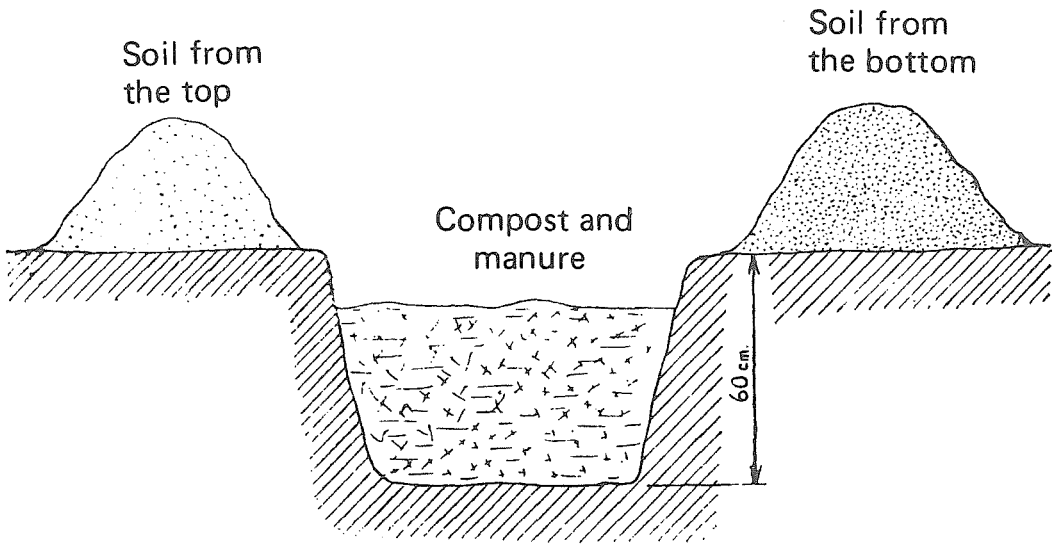
DIGGING THE PLANTING HOLES

One or two months before planting,
make a hole at the places
where the pieces of wood were stuck in the ground.

Make the holes 60 centimetres deep,
60 centimetres wide and 60 centimetres long.

Put the soil from the top on one side
and the soil from the bottom on the other side.

Fill the holes with compost and manure
(see Booklet No. 6, pages 5 - 7).



Bananas dislike wind.
To shelter them, plant bamboos
on the edges of the plantation.
These bamboos will also provide stakes
for the bananas (see page 15).

PLANTING THE SUCKERS

For planting, use suckers (see page 4).
Take them from banana plants
that are between 3 and 6 years old.
These suckers should be
between 50 centimetres and 1 metre high
and broad at the base.
Let them dry in the shade for 3 or 4 days
before planting them.

Just before planting them,
trim them at a point 50 centimetres
from the base of the plant
and dip them in water
in which potassium permanganate is mixed.

Plant at the end of the dry season,
so that roots grow
before the rainy season begins,
and the suckers do not rot.

Two months earlier,
you made the planting holes.
You separated the soil at the bottom
from the soil at the top.
You put compost in the holes.

At planting time,
take the compost out of the holes.
Put the soil from the top
into the bottom of the hole,
place the sucker in the earth.
The base of the sucker is now 10 centimetres
from the surface of the ground.
Put compost round the young plant.
Put the bottom soil on the ground surface.

LOOKING AFTER THE PLANTATION

For a fine plantation, you must:

- keep the soil clean;
- apply fertilizers;
- prune the plants;
- prevent the plants from falling;
- look after the fruit;
- protect the plants from diseases and insects.

Keeping the soil clean

The grass grows a lot
when the banana plant is small.
When the banana has grown up,
the grass dies, because it has no light.
There is no need to sow a cover plant.

If the grass does not die, apply Gramoxone.
Mix 0.4 litres of the product
with 400 litres of water to treat one hectare.
Add a spreader to the mixture
to make it stick to the grass better.

You can put down a mulch (see Booklet No.5, page 18)
of dry grass and leaves
at the end of the rainy season.
This vegetation will rot, and make humus;
it will help to keep the soil moist during the dry season.

In low-lying ground there is too much water.
It must be drained (see page 9).
In other places, the bananas do not get enough water.
So you must give the bananas water by **irrigating** them
(see Booklet No. 6, pages 18-19).
Look for a stream where there is water all the year.
Dig ditches between the rows of bananas.
Lead the water from the stream with dams and ditches,
so that the soil of the plantation is always moist.

Applying fertilizers

You added **organic matter** in the form of the compost
that you put into the planting holes.
The leaves and stalks cut from banana plants
rot on the soil and add more organic matter.
But the plantation still needs **mineral salts**
(see Booklet No. 1, page 19).
Bananas like **potassium**
(see Booklet No. 6, page 11).
You can give a banana plant each year the following:

- **Nitrogen** (see Booklet No. 6, page 10)
  750 grammes of ammonium sulphate
  or 300 grammes of urea.
- **Phosphorus** (see Booklet No. 6, page 10)
  300 grammes of dicalcium phosphate
  or 500 grammes of Thomas slag (Bessemer basic slag).
- **Potassium** (see Booklet No. 6, page 11)
  600 grammes of potassium chloride.

Give also 500 grammes of dolomitic limestone
per plant once a year, in one application.
The nitrogen and the potassium
are given in several applications (four or five times).
The phosphorus and the lime
are applied at the end of the dry season
or at the end of the rainy season.
The fertilizer will not be washed away by the rain.
If the banana plants are irrigated,
fertilizer may be given during the dry season.
Instead of applying several different fertilizers,
you can use one **compound fertilizer**
(see Booklet No. 6, page 11).
For young plants
you can give 1.5 kilogrammes of 10-10-20 fertilizer
per plant per year, in several applications.
For bananas in production,
you can give 1.5 kilogrammes of 5-12-24 fertilizer
per plant per year, in several applications.
In addition, give 500 grammes of dolomitic limestone
in one application per plant per year.

Pruning

Pruning banana plants is called **suckering.**
There are several ways of doing this.

We shall deal with only one way.

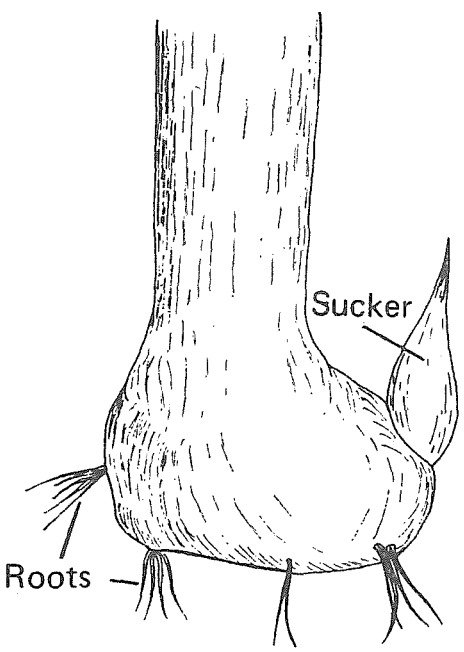
The **offshoot** that you planted is called the **parent plant.**
Four months after planting,
cut away all the suckers that have sprouted
except one.
Cut the suckers off at ground level
or below the surface of the ground.
Keep the best sucker,
the one that is best placed.
The plantation is laid out in rows,
so that if the suckers are in the same line,
the plantation rows are unchanged.

Four months after this first suckering,
the parent plant is 8 months old
and the one remaining sucker is 4 months old.
Once again, cut off all the other suckers
except one.

About 10 months after planting
(taking Poyo bananas
as an example),
the parent plant
produces fruits.

Harvest these fruits,
and cut down
the parent plant.
The first generation sucker
is now 6 months old
and the second generation
is 2 months old.

You can use a machete or axe
to cut out the suckers
you do not want to keep.

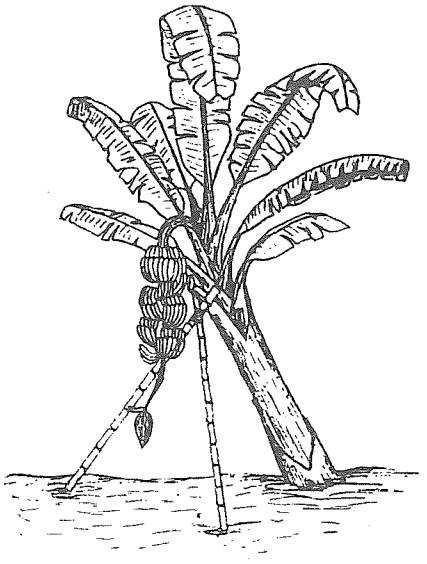


Underground stem of banana

Supporting the plant

The fruit of banana plants is very heavy.
The plant bends under the weight,
and the wind may blow it down.
You must prevent it from falling.

To do this, cut thick bamboos about 3 metres long.
Make a hole at one end of each bamboo.



Tie two bamboos together
with a piece of wire
40 centimetres long.

Put the bamboos in place,
as shown in the drawing,
when the flowers have appeared
and turned down to the earth.
The bamboos hold up
the banana plant.
It rests on the wire
between the two bamboos.

Looking after the fruit

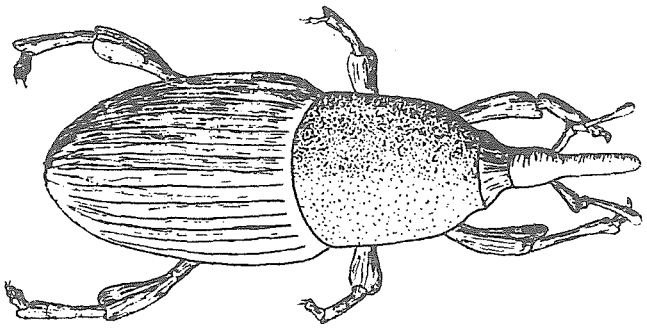
When the plant has flowered,
the male flower bud is a long way
from the lowest hand of female flowers.
Twist the bud to break it off,
and cut off the lowest hand of the bunch.

Cover the whole bunch with plastic
when the hands turn upward.
See that there are holes in the plastic
so that the bunch can breathe.
The plastic protects the bunch from sun and rain
and from sprays for leaf spot disease (see page 17).
If you do not cover the bunch with plastic,
the bananas will get black patches
and will not be fit to sell.

Protection against insects and diseases

The banana is attacked
by many insects and diseases.

- **Banana weevil**



Weevil

This insect
makes holes in the base of the banana plant
and lays its eggs in these holes.
The eggs turn into little weevils.
They eat out the heart of the banana plant.
You do not see the weevils,
but if the fruit bunch does not develop,
or if the bunch is small and badly shaped,
there may be weevils.

To find out if there are weevils in the plantation,
cut pieces of the plant's apparent trunk lengthwise.
Put two pieces on the ground near each plant.
Look every day at these pieces.
If there are weevils in the plantation,
they will hide under the pieces of "trunk."

To control the weevils, use BHC.
Put 25 to 30 grammes of BHC round each plant.

- **Banana eelworm or nematode**

These are tiny worms
that are found in the soil.
They eat the roots,
and once the banana has no roots,
it cannot feed,
and may be blown over by the wind.
Make sure the bananas have no eelworms
when they are planted.
Before planting,
dip the suckers in lukewarm water,
or in water mixed with Némagon.
If there are eelworms in the plantation,
put Némagon in the soil.

- **Other pests**

There are other pests that attack bananas
such as **thrips, aphids, scale insects,** etc.
They are controlled with BHC, Aldrin or Dieldrin.

- **Panama disease**

This disease is caused
by a tiny fungus in the soil.
It makes the leaves break.
If you cut the banana plant,
the apparent trunk is coloured brownish red.
To control the disease,
plant resistant dwarf varieties
such as Poyo or Lacatan.
These bananas are very resistant to Panama disease.
The Gros Michel variety is not resistant.

- **Leaf spot disease** (see page 15)

This disease is caused by a fungus.
The leaves show grey spots ringed with dark yellow.
The banana plant cannot breathe
and the yield falls greatly.
The disease appears
when the temperature is high
and the air is very humid.
It is treated by spraying with mineral oil,
using 12 to 20 litres per hectare.

- **Bunchy top**

  This disease is carried by an aphid.
  Dark green streaks appear on the leaves.
  The leaves do not grow long and are wavy at the edges.
  Dig up the diseased banana plants.
  The aphid can be controlled with Malathion or Dieldrin.

- **"Cigar-end" rot**

  The fruits go rotten.
  The disease begins at the tips of the bananas.
  To control this disease,
  cut off the last hand that does not grow
  and break off the male flower bud (see page 15).

- **Mosaic disease**

  Small yellow patches appear on the leaves
  toward the midrib (see Booklet No. 2, page 14).
  You can see them easily
  by holding the leaf up to the sun.
  You can also see little holes in the leaf-stalk.
  To control the disease,
  dig up the plants and wait a long time
  before planting again in the same place.

- **False mosaic disease**

  Light spots of varying colour can be seen on the leaves.
  This is not a serious disease.
  It may be caused by lack of copper in the soil.

- **Lack of zinc**

  The plant's leaves do not grow very long,
  and are pale, narrow and pointed.
  The disease is cured by sprinkling on the ground
  50 grammes of zinc sulphate per plant.

- **Lack of magnesium**

  The disease is cured by applying dolomitic limestone.

HARVESTING AND USE OF BANANAS

Harvesting

Bananas must not ripen on the plant.
The bunch of fruits finishes ripening
tied to a rope, in the shade.
If the bunch ripens on the plant,
the bananas split and become mealy.

Bunches can be kept longer if they are harvested unripe.

Output of a plantation

A well-cared-for plantation
has a big output.
The third harvest
on any one plantation
is the biggest of all.
From the fourth harvest,
the output begins to go down.

The yield of a plantation
may vary between 30 and 50 tons per hectare.

Use of bananas

Bananas are a strength-giving food.

The sweet banana, eaten raw when it is ripe,
is as rich as other raw fruits.
It contains a lot of vitamins.
It should be eaten very ripe.

Plantains, when prepared,
give more energy than prepared cassava.
They contain
more protein (see Booklet No. 8, page 14) than cassava,
but less mineral salts (see Booklet No. 1, page 19).
It is better to eat plantains than cassava.

Food crop bananas
such as plantains and certain fig bananas
are eaten cooked.
The greener they are when harvested,
the less sweet they are.

Large quantities of plantains are eaten
in all the forest regions of west Africa.
Ivory Coast produces about 1 100 000 tons of plantains,
Cameroon about 850 000 tons,
and Gabon about 80 000 tons.

- **Cooked bananas**

  To make *foutou*, peel plantains,
  cook them in water,
  then mash them and roll them into balls.

  Plantains are also eaten
  grilled over the fire,
  or fried in oil.

- **Dried bananas**

  - Bananas can be dried,
    if you cannot sell them all.
    Peel them,
    then slice them into rounds
    and dry them in the sun.
    When they are dry
    they can be made into powder or flour.

  - Banana flour is made with plantains
    or with green fig bananas.
    It is eaten in forest regions.

  - Banana powder is sweet.
    It is made from ripe bananas.
    Mash the bananas
    and dry the paste in the oven.
    Banana powder should be stored in metal boxes
    and kept in a dry place.

● Making banana beer

The bananas must be very ripe.

In the rainy season
let them finish ripening laid on a hurdle
over the fire where the cooking is done.
During the dry season
make a pit in the ground.
On one side of it, dig a little ditch.
Cover all the sides of the pit
with green banana leaves.
Pack the bunches of bananas in the pit.
Cover them with banana leaves and earth.
Light a fire in the ditch
and let the warmth and smoke into the pit.
Keep the fire going every day
until the bananas are quite ripe.
This takes about six days.

Then take away the leaves and earth.
Peel the bananas.
Half-fill a hollowed-out tree trunk with banana pulp.
Cover with fine grass.
Knead the pulp with a little water.
Press it and let the juice run out.

Then put the juice in a vat or earthenware jar
with germinated millet and a little beer.
Cover the vat or the jar
with grass to act as a filter.

The beer can be drunk the next day
through a straw or wooden tube.
This beer will not keep for very long.

Banana beer is made chiefly
in Rwanda and Burundi
with special varieties of bananas.

● Other uses of the banana plant

Bananas can be given to animals to eat,
especially to pigs.
The skins and the male flower buds
can also be used as fodder.

Oxen like
the chopped-up apparent trunk and leaves
mixed with oil cake.

If you leave the remains of the plants
(such as apparent trunk, leaves, flower buds)
on the ground of the plantation,
they will become organic matter in the soil.
If you take these remains
away from the plantation
to give to animals,
you will not add organic matter to the soil.
But a banana plantation
needs plenty of organic matter.
So if you remove the banana plant remains,
you must give the plantation
dried herbage, manure or compost.

Banana leaves contain fibre.
Sacks and ropes
are made with this fibre.
It is obtained chiefly
from a variety of banana called *abaca*.
The fibres of *abaca* leaves
are called "Manila hemp."

Running a commercial banana plantation

This example of a commercial banana plantation comes from near Akoupé in southern Ivory Coast:

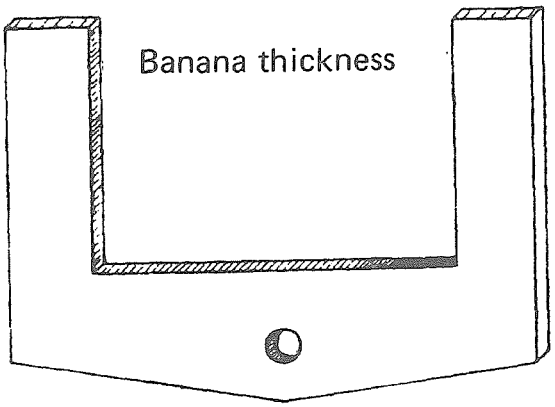
Every day, new flowers appear on the plants.
On the 5th and 20th of each month,
the new flowers are counted.
They are marked
with a little button tied on with wire.
Buttons of a different colour
are used each time the flowers are counted.
In this way, the number of new flowers is known.
In about 3 months
these new flowers will yield
a bunch of bananas for harvesting.

The planter knows the number of bunches
that will ripen
and can arrange for transport by banana boat.
A banana boat comes
about twice a week.
Each time a little of the harvest is sent.

It works like this:
Suppose the planter has ordered transport
for 40 tons of fruit during the month.
Then he sees that the fruit will ripen
before the 15th of the month.
He asks for transport for 25 tons
during the first 2 weeks of the month,
leaving 15 tons
for the rest of the month.

All the plantation owners belong to a cooperative,
COFRUCI (Compagnie fruitière de Côte d'Ivoire).
It organizes transport in banana boats.

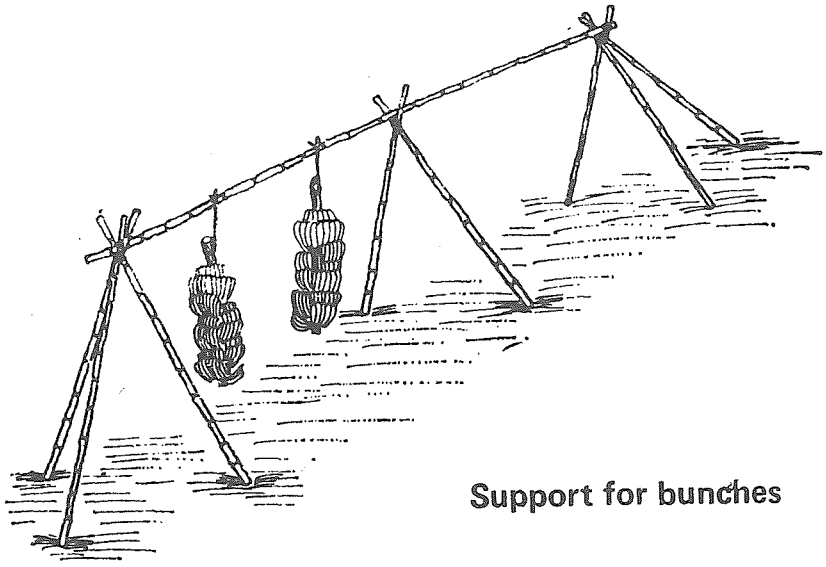
Bananas must be graded by size.
In the plantation
they use an instrument called a **gauge**
to measure the thickness of bananas.



A gauge

Bananas are graded from 40 to 45 millimetres thickness.
There are two grading systems,
one with the odd numbers (41, 43 or 45 millimetres)
and the other with the even numbers
(40, 42 or 44 millimetres)
When the planter gives his orders for the shipment,
he can state which system he wants.
For grading,
three bananas in one hand are chosen
and each is measured.
The thickness of the bananas on a bunch
is related to the number of hands on the bunch.
If the bunch has 5 to 7 hands,
the size of the three bananas measured
should be 40 or 41 millimetres,
depending on the chosen grading system.
If the bunch has 7 to 10 hands,
the size of each of the three bananas measured
should be 42 or 43 millimetres.
If a bunch has more than 10 hands,
the size of each of the three bananas
should be 44 or 45 millimetres.

The bunches ready for harvesting
are known by the colour of the buttons
with which the bunches were marked 3 months earlier.
The planter says what size fruit he wants picked.
A worker goes through the plantation
and counts the number of hands on each bunch
with a button of the right colour,
measures three bananas on each of the bunches,
makes sure that the bunch is ready for harvesting,
and marks the bunch for cutting.
The bunches are cut early in the morning.
This is done one day, at most,
before the boat leaves.
Men carry the bunches out of the plantation
on a pad on their backs.
The bunches are tied to long poles supported by trestles.
The string used for tying
is soaked in copper sulphate.



Support for bunches

The bunches are weighed.
The coloured buttons are taken off the bunches.
The buttons of one colour, let us say green,
are then counted.
Three months earlier, 1 600 green buttons
were fixed to the plants in the plantation.
Now, for example, 360 green buttons are counted.
So the planter knows that he still has
1 240 bunches marked green (1 600 less 360).
These bunches marked with the green buttons
will ripen in the course of the month.

Transporting and packing bananas

The goods lorry arrives.
Inside, it has pads along the sides
to protect the bunches.
On the floor of the lorry
there is a thick layer of dry leaves.
Each bunch is wrapped
and a cover is put over each row of bunches.

The lorry drives to the packing station.
There, the size of the bananas is measured again.

All the bunches
which do not measure up to the required size
are thrown out.
Stained or rotten bunches are also rejected.

The bunches are cut into hands of bananas
and these hands are cleaned and washed.

The hands of bananas
are packed in cartons.
Some countries still send out complete bunches,
but this wastes a lot of space and weight.

The cartons are then taken to the banana boat.

SUGGESTED QUESTION PAPER

ANSWER THE FOLLOWING QUESTIONS

Why are bananas grown?
The banana is not a tree, what is it?
How are the female flowers arranged?
What is the name for the fruit produced by one spike of flowers?
What is suckering?
Why do you put bamboos up against the banana plants?
Why do you wrap the bunch of bananas in plastic?
What does the banana weevil do to the banana plant?
What are the different parts of a banana plant?
How can you tell when a banana plant has mosaic disease?
When do you apply fertilizers to a banana plantation?

Read carefully what follows and reply in the words you use when speaking to a friend.

One of your friends has a banana plantation. He does not take much trouble over it. He always says that bananas look after themselves. He has heard that you have studied a course on how to grow bananas, and he comes to ask your advice, because his plantation does not produce much. What do you tell him? What do you advise him to do?

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ISBN 92-5-100149-9