

1976 edition

the plant

the flower



BETTER FARMING SERIES

The titles published in this series were designed as handbooks for an intermediate level agricultural education and training course. They may be purchased as a set or as individual documents. New titles will be added from time to time.

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
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9. Animal husbandry: animal diseases; how animals reproduce
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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
27. Freshwater fish farming: how to begin
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29. Freshwater fish farming: the pond
30. Better freshwater fish farming: the fish

The plant

The flower

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PREFACE

This manual is a translation and adaptation of "La plante — la fleur," published by the Agri-Service-Afrique of the Institut africain pour le développement économique et social (INADES), and forms part of a series. 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.

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PLAN OF WORK

FIRST WEEK

The flower.

Read pages 4 to 13.

- Take a good look at the flowers where you live.
- If the okra, hibiscus, cotton and groundnuts are not in flower, look carefully at the drawings.
Make sure you recognize the male and female organs in the flowers.
- In this course there are some new words. Learn them well. Then you will follow the rest of the course more easily.

SECOND WEEK

The reproductive organs. Fertilization.

Read pages 10 to 15.

- This means you will study once more pages 10 to 15 on the reproductive organs.
- Make an effort to understand these pages, to look carefully at the flowers and the drawings. It is very important to understand fertilization fully. If necessary, go over it again.

THIRD WEEK

The fruit. The seed. Germination.

Read pages 16 to 21.

- To help your memory,
read again pages 10 to 15.
They explain how fruits and seeds are formed.
- In learning how the germ grows,
you will understand why it is necessary
to sow seeds with great care.

FOURTH WEEK

Seeds and sowing: choosing, practical advice, storing.

Read pages 22 to 28.

What you learn this week
will be useful in all your work.

- Read again with care the whole course
(especially pages 10 to 15).
- Answer the question paper.
Try to answer the questions
without looking at the course.
Then look at the course
to see if you have given the right answers.

WHY WE STUDY THE FLOWER, FRUIT AND SEED

You want to understand what you are doing.

You don't want to work like a machine.

- You sow seed in order to get a good harvest,
but you want to understand
how the flower produces the fruit,
how the fruit produces the seed,
how the seed produces the plant.

You want to know
how the plant reproduces itself.

- You want to understand

why you must choose good varieties,
selected seed;
why you must disinfect seed;
how you can best store the harvest.

**We must study the flower, the fruit and the seed
in order to understand them better
and to get good harvests.**

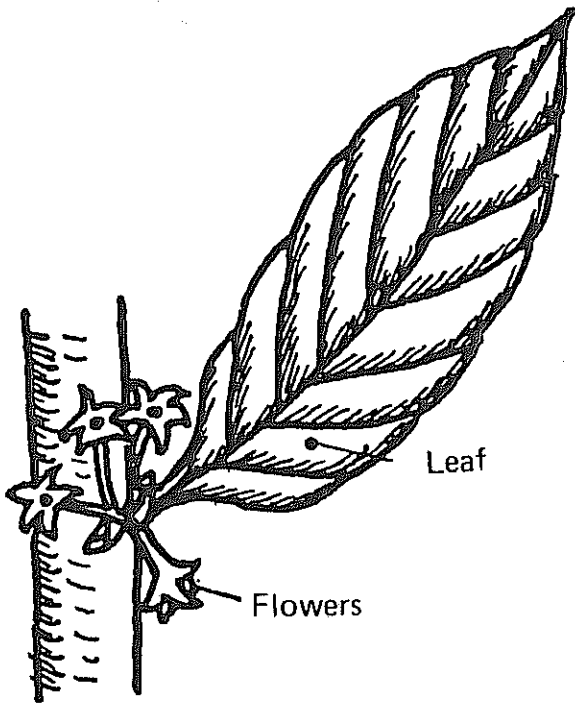
THE FLOWER

Where is the flower?

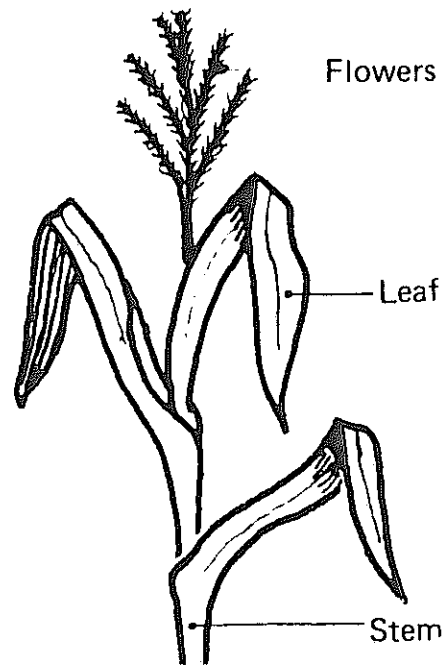
The stem bears buds (see Booklet No. 2, page 12).

The buds produce leaves or flowers.

Often the flowers are between the stem and the leaf.



Coffee flowers



Maize flowers

Flowers can also grow
at the tip of the stem.

How flowers are made

All the plants you grow have flowers.

- The cotton flower is like the hibiscus flower.

There are flowers which are alike; they belong to the same family.

- The cotton flower is not like the maize flower.

There are flowers which are different; they do not belong to the same family.

- The flowers of rice, maize, sorghum are pressed close together round an axis, a main stem. They make a **spike**.

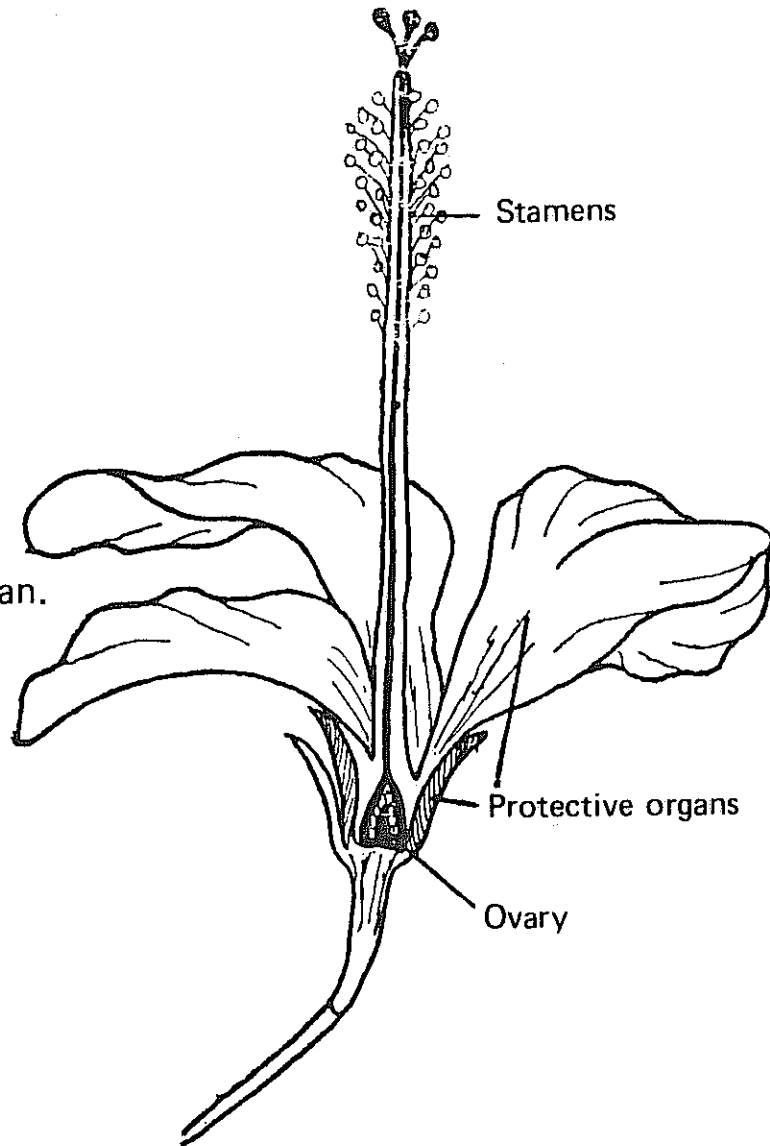
The flowers of coffee and hibiscus are not pressed close together.

- There are flowers of all colours: reds, yellows, violets, greens, greys. For instance, grass flowers are green.

Let us look at a hibiscus flower, or one of cotton,
which has been cut in half with a razor blade.

The **stamens**
are male organs.

The **ovary**
is the female organ.



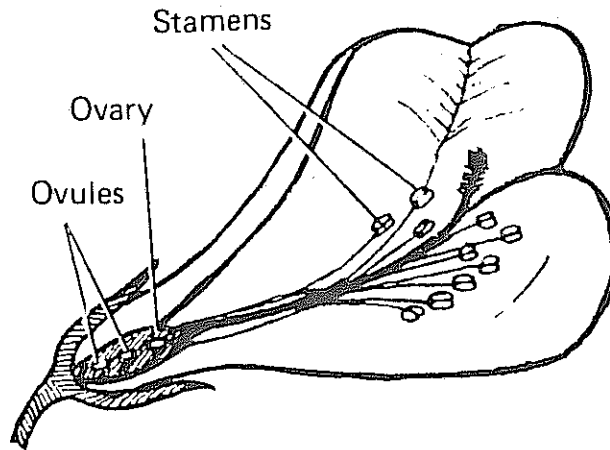
Hibiscus flower cut in half

Around the ovary and the stamens
there are **protective organs**.

Let us look at a groundnut flower.

The **stamens**
are male organs.

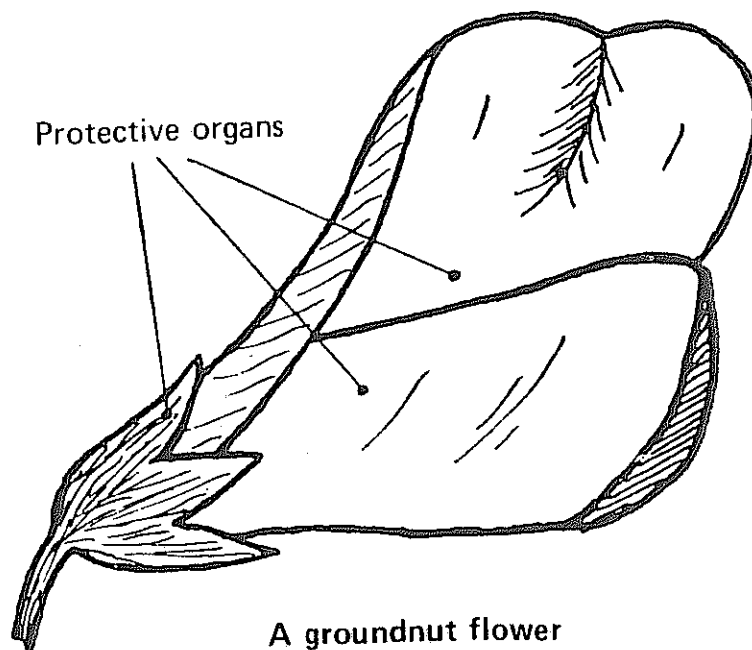
The **ovary**
is the female organ.



Groundnut flower cut in half

Around the ovary and stamens
there are **protective organs**.

They protect the stamens and the ovary.



A groundnut flower

Let us look at a maize plant.

- At the tip of the stem there are a lot of little flowers.

They have stamens but no ovary.

They are **male flowers**.

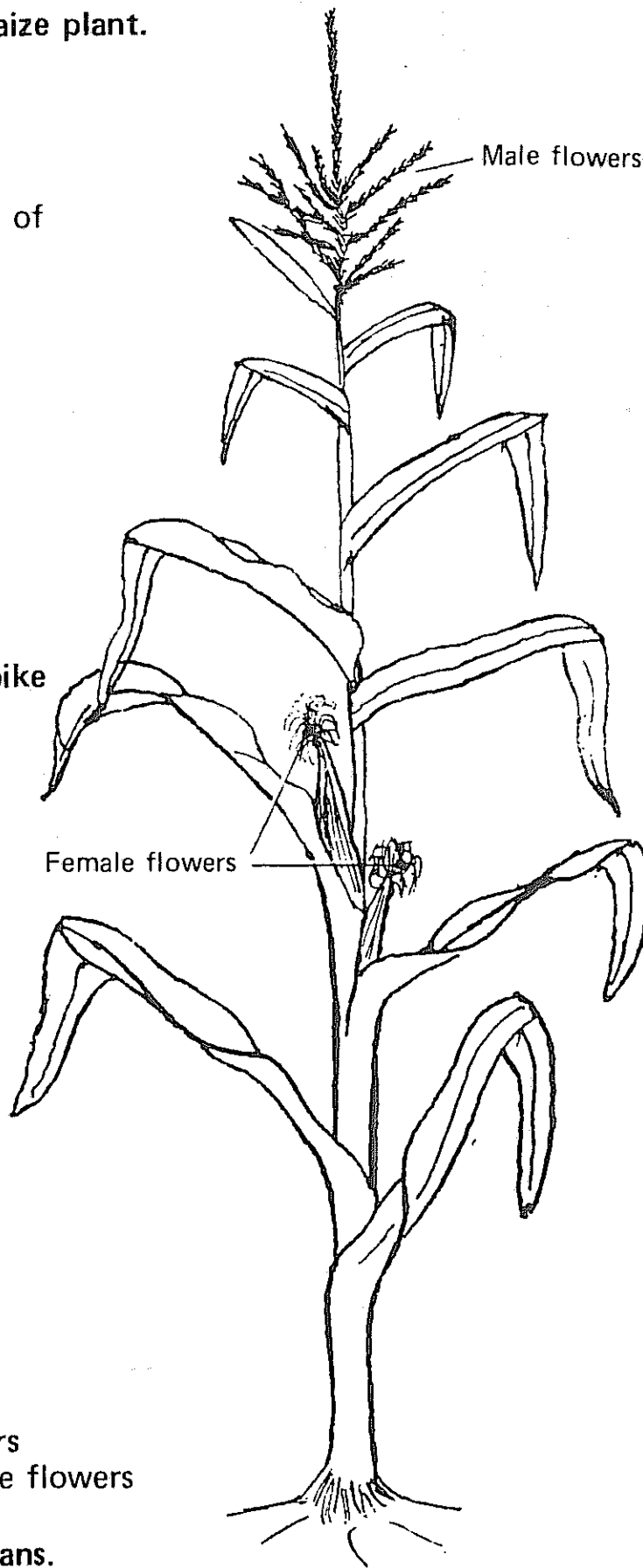
- In the middle of the stem there is the **spike** (see page 6).

It consists of many flowers. Each flower has an ovary but no stamen.

These are **female flowers**.

Each flower, each ovary, produces a fruit, a **seed**.

- The male flowers and the female flowers also have **protective organs**.



A maize plant

THE STAMENS AND OVARIES

These are the most important parts of a flower.

Let us now look in more detail
at each of these parts.

This will help you to understand
the rest of the course.

- **The male organs.**

Each stamen consists of a thread
with a little bag at the end.

In this little bag there is a yellow powder.

This is **pollen**.

If you touch the stamens of a flower,
pollen sticks to your fingers.

Pollen is produced by the stamens.

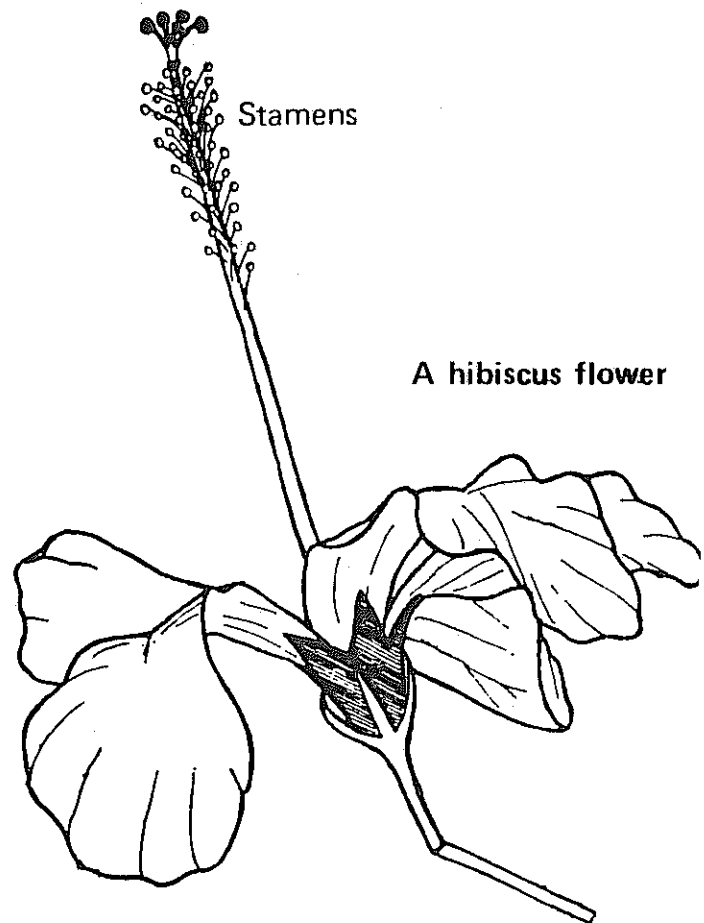
Not all flowers
have the same number
of stamens.

The hibiscus flower
has many stamens.

The groundnut flower
has ten stamens.

At the top
of the maize stem
there are
many flowers.

Each male flower
of maize
has three stamens.

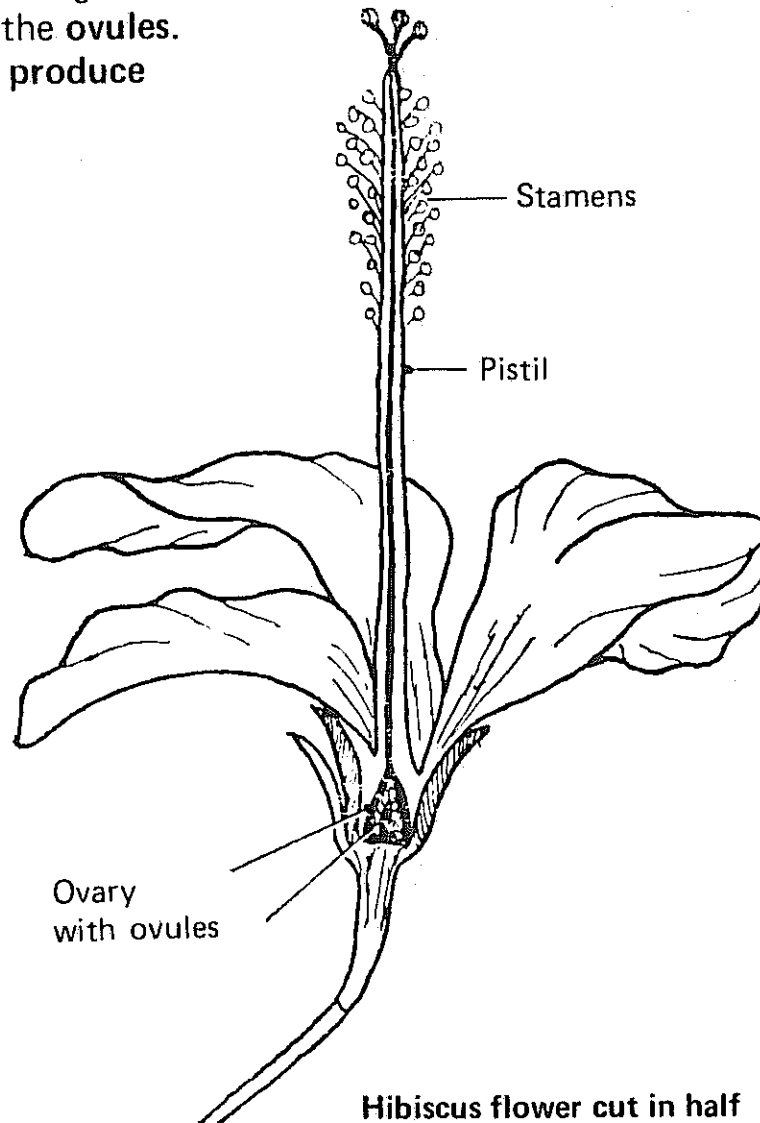


● **The female organs.**

With a razor blade we will cut in half
an okra flower,
or a cotton or hibiscus flower.

The ovary is full
of little white grains.
These are the **ovules**.

The **ovules** will produce
the seed.



From the ovary grows a long tube,
called the **pistil**.

The pistil of a hibiscus flower
carries five little red globes
covered with moist hairs.

The pistil of a coffee flower
has only one globe
(see page 14).

The pistil of the female flowers of maize (see page 9)
is highly developed.

On the female flowers of maize
you can see many pistils
(they look like hairs).

At the end of each pistil
there is an ovary
that produces a seed.

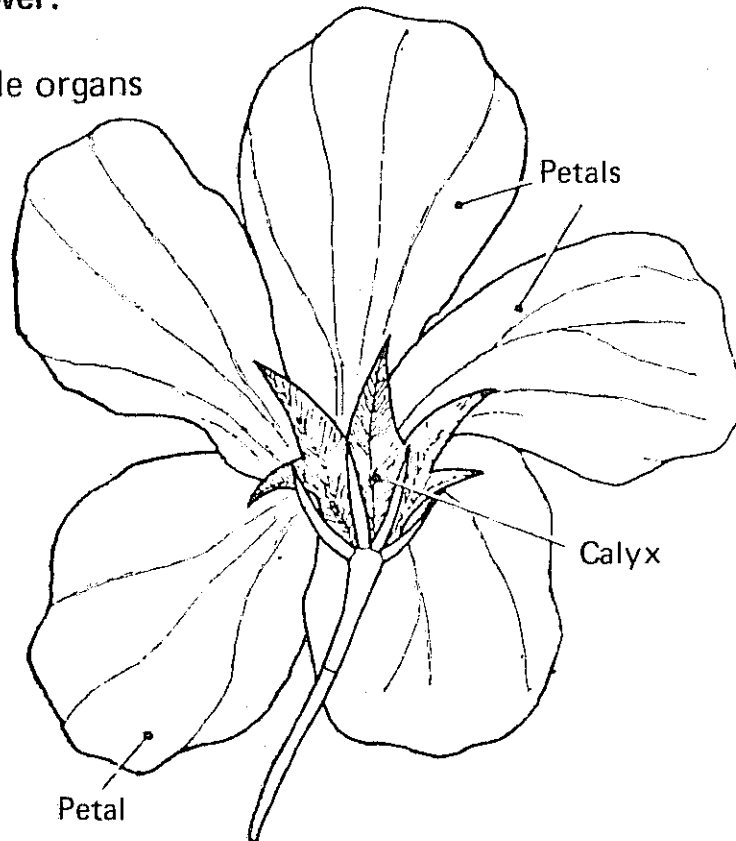
If you cut off the pistils,
there will be no seed.

THE PROTECTIVE ORGANS

Take a hibiscus flower.

The male and female organs
are protected by
five red **petals**.
These petals
go all round
the flower.

At the base
of the petals
is a little bowl
made of
five green leaves.
This is called
the **calyx**.



Hibiscus flower seen from below

When the flower opens,
the petals come out of the calyx.

The calyx and the petals protect the inside of the flower.

SUMMARY

A plant flower has always:

a male part – the **stamens**;

a female part – the **ovary**;

around these two parts – the **protective organs**.

Stamens and ovary can be

in the same flower,

for example, hibiscus, okra, cotton,
pimento, tomato, tobacco.

Stamens and ovary can be

in different flowers.

Then there are male flowers and female flowers,
for example, in maize and oil palm.

Stamens and ovary can be

in different flowers

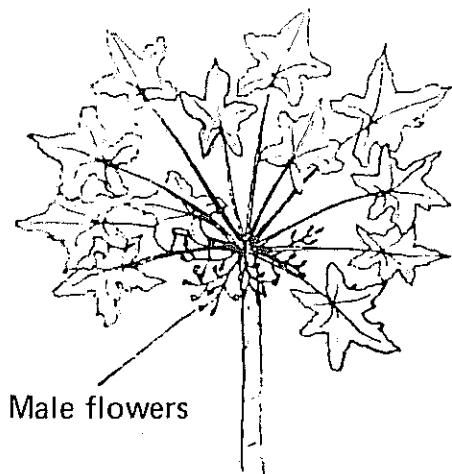
and on different plants.

In the papaya tree, the male flowers and the female flowers
are not on the same tree.

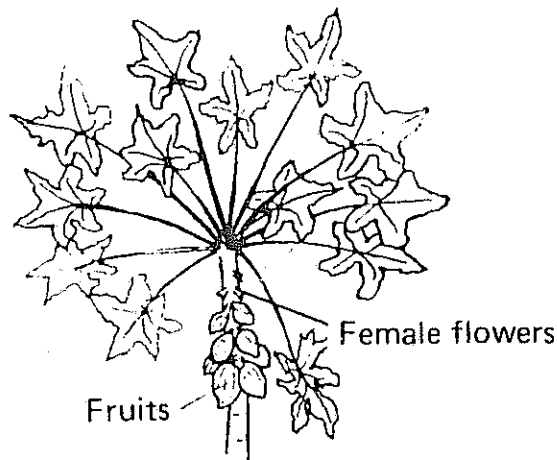
There are male papaya trees and female papaya trees.

Only the female papaya trees bear fruit.

The male papaya trees cannot produce fruit,
but sometimes papaya trees that have male flowers
do produce fruit.



A male papaya tree



A female papaya tree

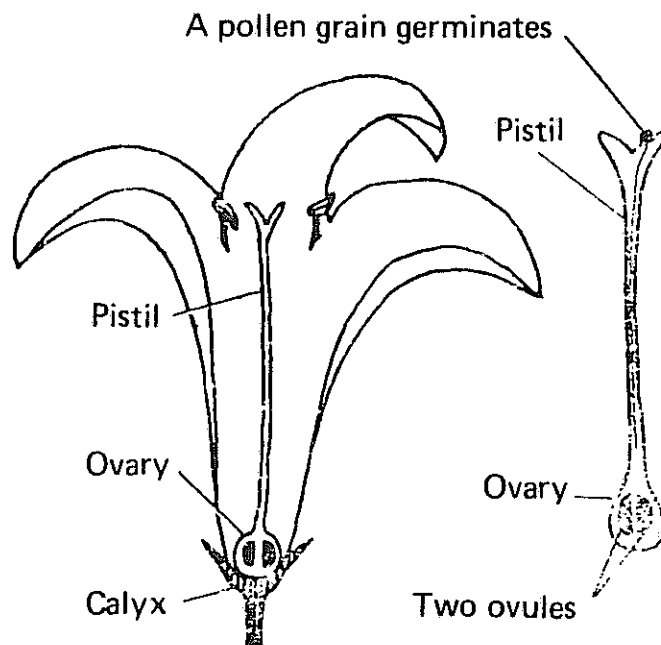
What the flower does

Flowers have male organs and female organs.
The union of pollen and ovule produces a seed.
The seed can produce a plant.

FERTILIZATION

● How does the union of pollen and ovule take place?

The stamens produce pollen.
The pollen is very light.
Wind or insects can carry it a long way.
The pistil hairs are moist.
Pollen sticks to them.
The pollen germinates in the pistil
as a seed germinates in moist earth.
The pollen penetrates inside the ovary
and into the ovule.
The ovule is fertilized.



Coffee flower cut in half

Fertilization is the union of pollen and ovule.

If the flower dries up before the pollen arrives,
there is no fertilization.

**When the pistil is dry,
the pollen cannot germinate.**

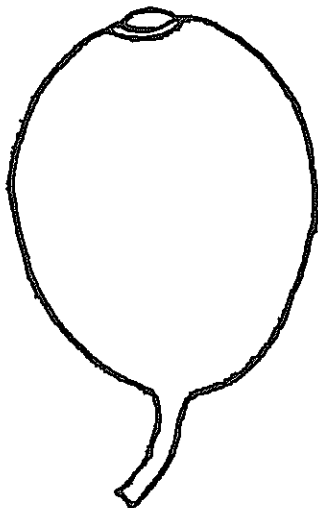
A very dry wind, for instance,
can prevent fertilization
and reduce the harvest.

After fertilization
the ovary and the ovules swell.
**The ovary becomes the fruit.
The ovules become seeds.**

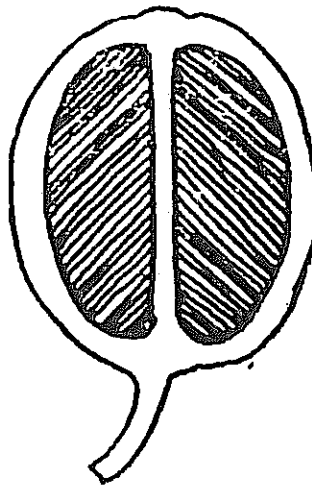
If the ovary has only one ovule,
the fruit will have only one seed,
for instance, mango, avocado.

If the ovary has several ovules,
the fruit will have several seeds,
for instance, orange, papaya, bean, coffee.

The two ovules have
produced two seeds



Coffee fruit



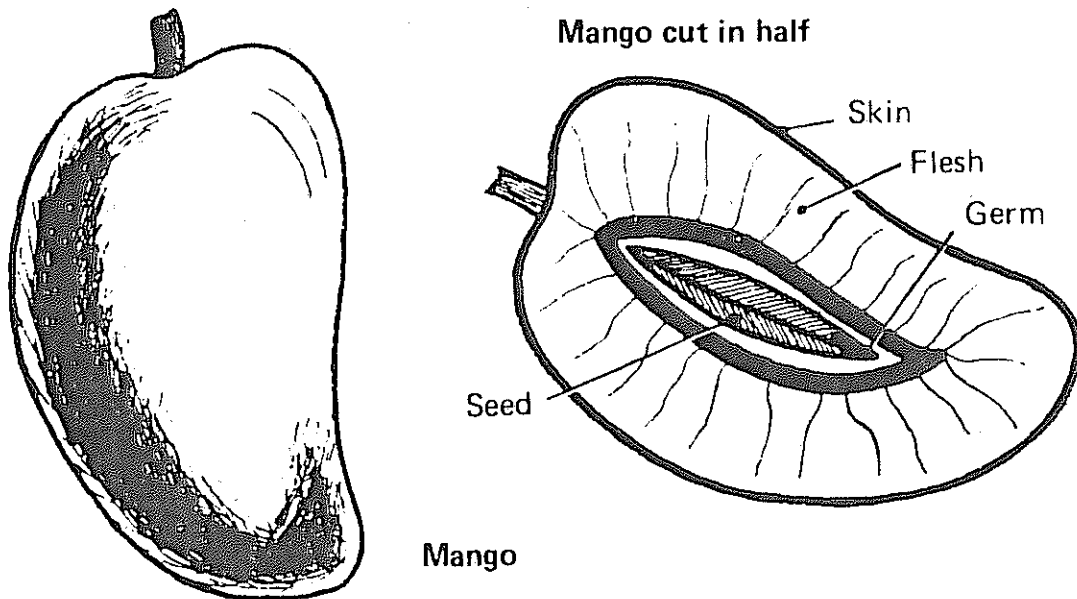
... cut in half

THE FRUIT AND THE SEED

Plants are not all alike,
Roots, stems, leaves, flowers are different.
The fruits too are different.

The mango, cocoa pod, grains of maize,
the avocado, papaya and cotton boll
are all fruits.
But they are not alike.

MANGO



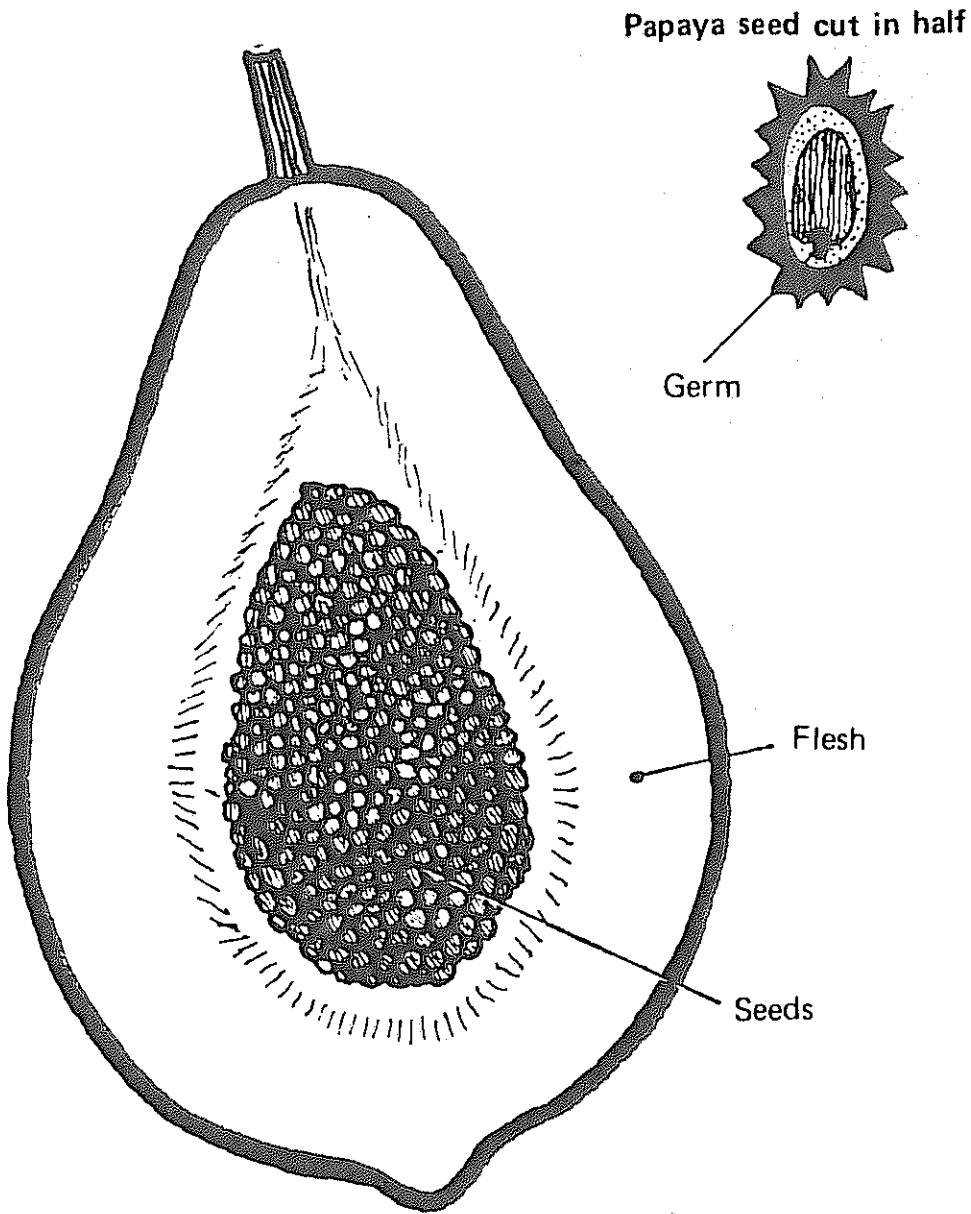
The fruit of the mango is covered with a hard **skin**.

The **flesh** is underneath this skin.
It comes from the ovary of the flower.
It is yellow, juicy, good to eat.
It covers the seed.

The **seed** is big and hard.
It comes from the ovule of the flower.
It contains a **germ**.

In the ground the germ can produce a mango tree.

PAPAYA



Papaya cut in half

The fruit of the papaya tree is covered with a very thin skin.

The **flesh** is underneath this skin.

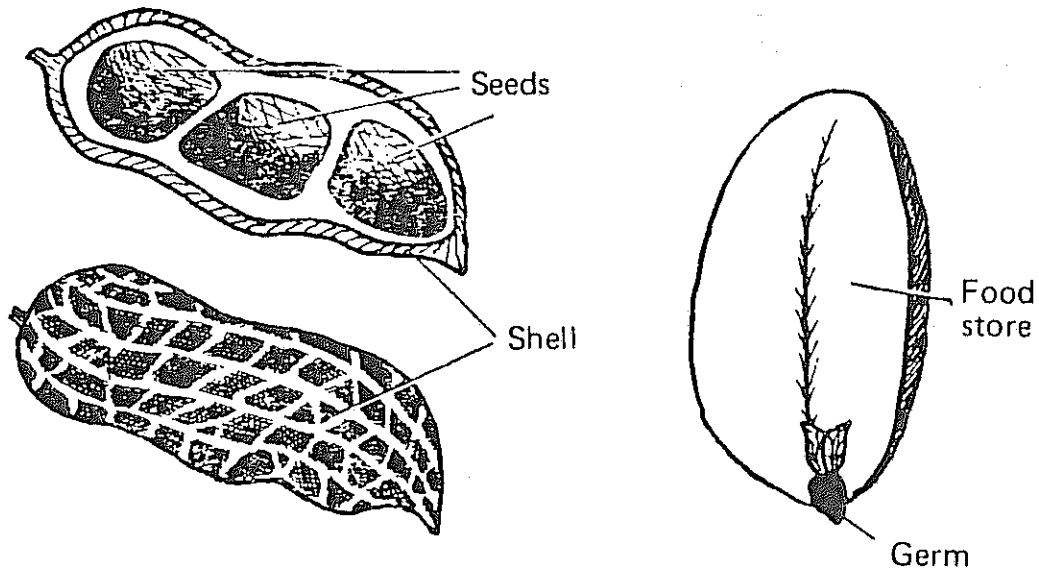
It is yellow, juicy, good to eat.

It covers very many seeds.

Each seed contains a **germ**.

In the ground the germ can produce a papaya tree.

GROUNDNUT



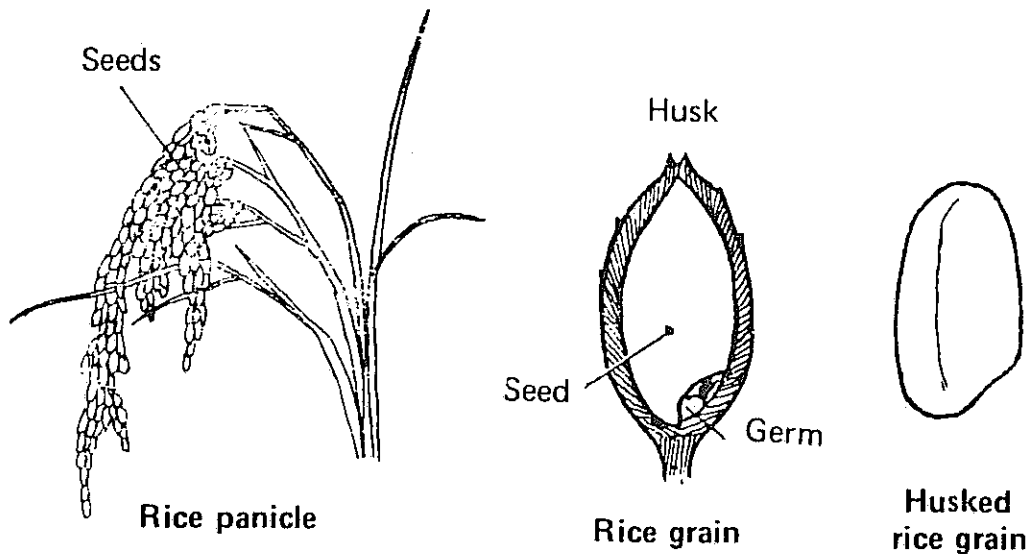
The fruit of the groundnut is covered with a **shell**.
This shell is yellow; it dries when taken out of the ground.

It covers one or more **seeds**.

Each seed contains a **germ**.

In the ground the germ can produce a groundnut plant.

Rice



Each grain of rice is a fruit.

The fruit of rice consists of two parts:

the seed and fine, dry husks.

Each grain contains a **germ**.

In the ground the germ can produce a rice plant.

SUMMARY

The flesh of the papaya and the mango,
the shell of the groundnut and the husk of rice
contain one or more seeds.

All fruits consist of a covering
containing one or more seeds.

We eat or sow
only the seeds and not the coverings
of millet, groundnuts, cotton or rice.

Removing the coverings of millet or sorghum
is called **threshing**.

Removing the covering of cotton
is called **ginning**.

Removing the covering of groundnuts
is called **shelling**.

Removing the covering of rice
is called **husking**.

Threshing, ginning, shelling or husking can be done
by hand in the traditional way
or by machine.

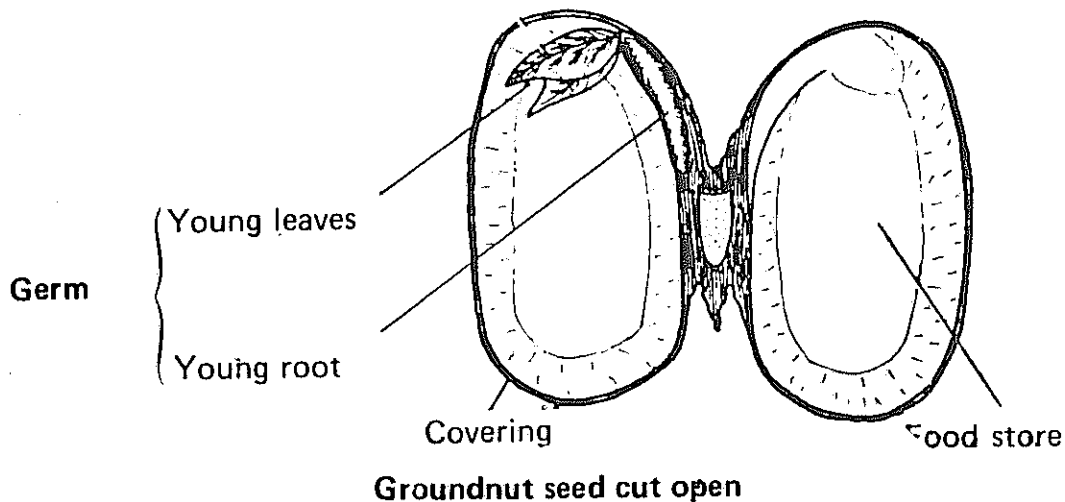
For instance, there are ginning mills for cotton.

We shall have more to say on this
in the courses on particular crops.

SEEDS AND SOWING

How the seed grows

- A seed consists of:
 - a protective covering which is more or less hard;
 - a store of food;
 - a germ.
- The germ is alive.
The germ takes its food
from the store of food built up in the seed.
The leaves and roots
cannot yet feed the plant;
they are still in the seed.



- The seed needs water.
The germ is a plant.
To grow it needs water.
The germ of a dry seed cannot grow.
When the soil is moist, water enters the seed.
Its skin becomes soft and splits. The germ grows.

Sowing must be done in moist soil.

But if there is too much water, seeds die.
They rot.

● The seed needs air.

The germ is a plant. It breathes (see Booklet No. 2, page 23).

The seed must find air in the soil.

Before sowing, the soil must be worked so that air can get into the soil.

The soil must not be packed too hard over the seeds.

If the soil is packed too hard, the germ will lack air and grow badly.

The seed must not be sown too deep.

If it is, it will lack air,

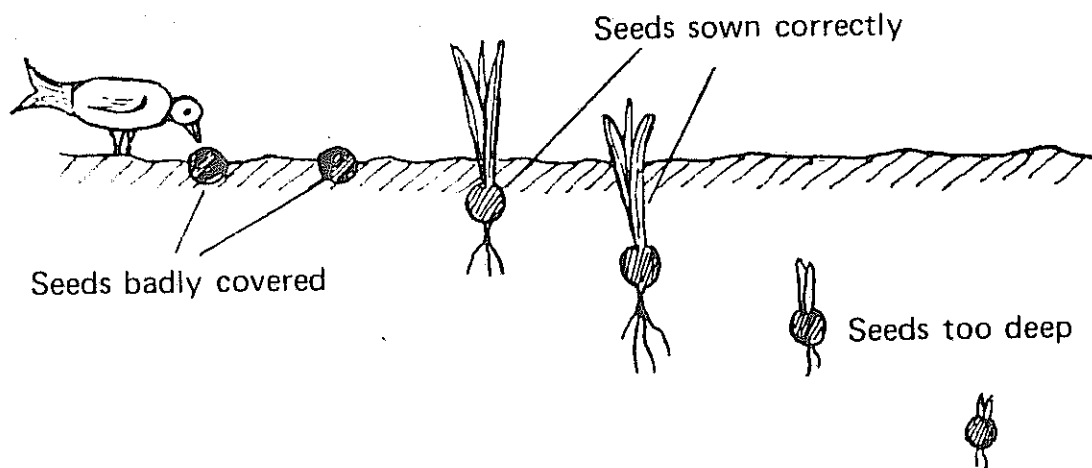
and its food reserves will soon be used up.

The plant will not be able to come out of the ground.

However, the seed must be sufficiently covered.

Seed that is not sufficiently covered germinates badly.

And the birds may eat it.



If seeds are sown at the same depth,

the plants come out of the ground at the same time.

They will all be the same size,

and you can more easily choose the moment

to put down fertilizers, apply pesticides,

and harvest.

Choice of seed

- To get fine healthy plants and good harvests,
you must sow good seed.

A child is like its parents.
An ailing, small plant
produces bad fruits and bad seed.

Bad seed produces bad harvests.

A modern farmer
chooses good seed
and gets good harvests.

Choosing good seed
does not take a lot of work,
does not take a lot of money.
It only needs care.

- How to choose good seed.

To get a better harvest,
you must choose better seed,
better varieties.

What is a variety?

For example:

All maize plants are not alike.
The height of the plants,
the size of the heads of grain,
are different.
The grains are not all the same colour,
or the same shape;
the harvest is not always at the same time.

There are many varieties of maize.

Some varieties give a bigger harvest.

For instance, local cotton yields 150 to 200 kilogrammes per hectare.

Allen cotton can yield 1 000 kilogrammes per hectare.

The wild oil palm

yields about 20 kilogrammes of fruit clusters per year.

Selected oil palm

can yield 100 kilogrammes of fruit clusters per year.

Some varieties can be harvested earlier.

In northern Cameroon,

gara sorghum grows in 110 to 130 days;

shoukouloum sorghum grows in 160 to 170 days.

Some varieties yield a better product.

Cotton fibres may be long or short.

Allen cotton has fibres

that are longer than Mono cotton.

Some varieties are more resistant to diseases.

Some varieties of groundnuts (varieties 48-37 and 1.041) do not get the disease called rosette.

These varieties are said to be rosette-resistant.

In your home district, what varieties

do the extension officers recommend for millet,
sorghum,
cotton,
groundnuts,
rice,
tomatoes?

Practical advice

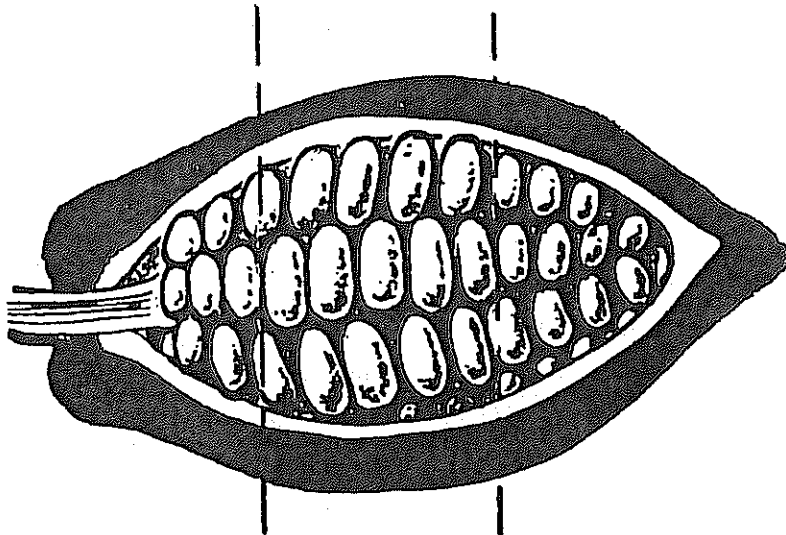
- Buy your seed from the agricultural service.

Grow the best varieties.
You will get good harvests.

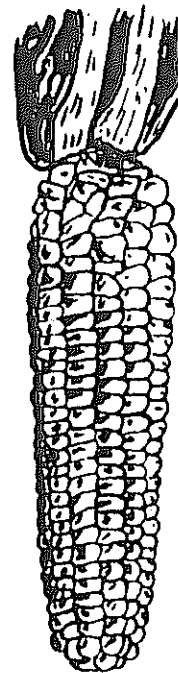
To buy seed you need money.
So as not to waste money,
you must prepare your field well,
sow at the right time,
do the harvesting well.

- You can produce your own seed.

Choose the finest fruits
from your finest cocoa trees,
from your best field of groundnuts.
Take the best grains of maize.
The plant's good qualities
will be passed on to the new plants.



Take the best beans from
the middle of the pod



Take the best grains from
the middle of the maize cob

- **Sort out your seed.**

Do not use seed that is too old.
The germ is dead,
the seed will not germinate.

Use whole, well shaped seeds.
Remove all bad seed,
all small, broken, diseased seed,
and seed eaten by insects.

Well sorted seeds will all germinate.
You will get a good density
(see Booklet No. 1, page 26).

- **Disinfect your seed.**

Seed can be attacked
by insects and diseases.

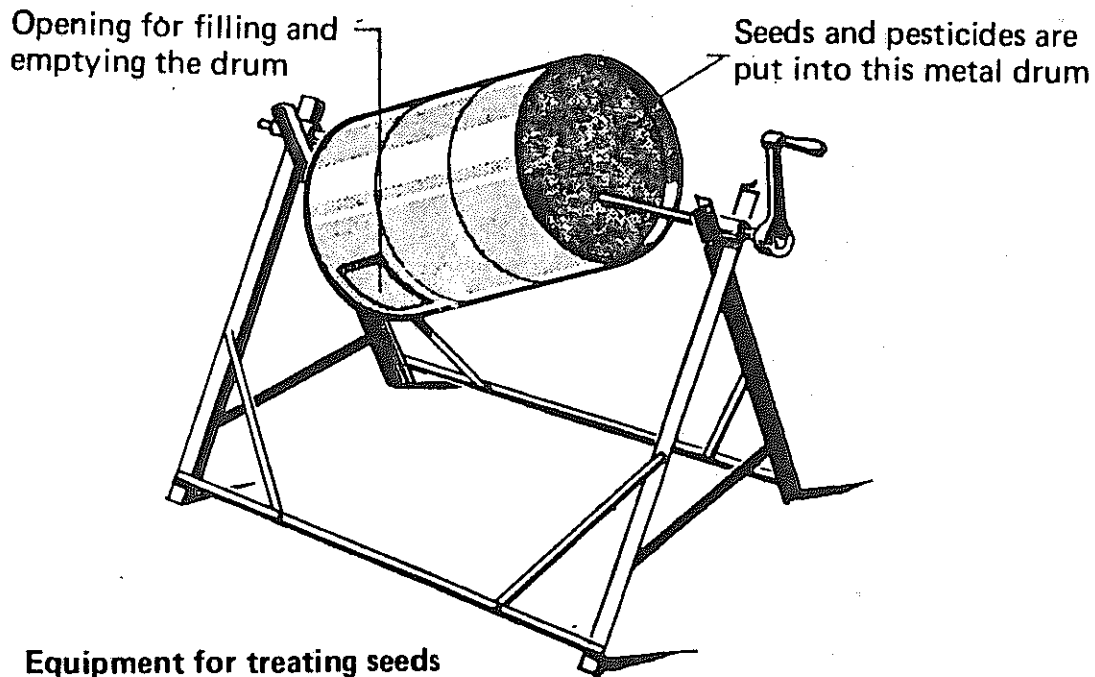
Protect seeds
against insects and diseases.

Mix a **pesticide** with the seed.

You can buy it from the agricultural service.
The agricultural adviser
will tell you how much to use.

You must follow his advice.

- Make sure that the seeds and the pesticide are well mixed, that all the seeds are covered by the pesticide.



Equipment for treating seeds

- You must take great care. The pesticide is a poison. Wash well after handling it. Do not leave the pesticide near children.

**Do not eat or give to animals
any seed treated with pesticide.**

Storing grain and seed

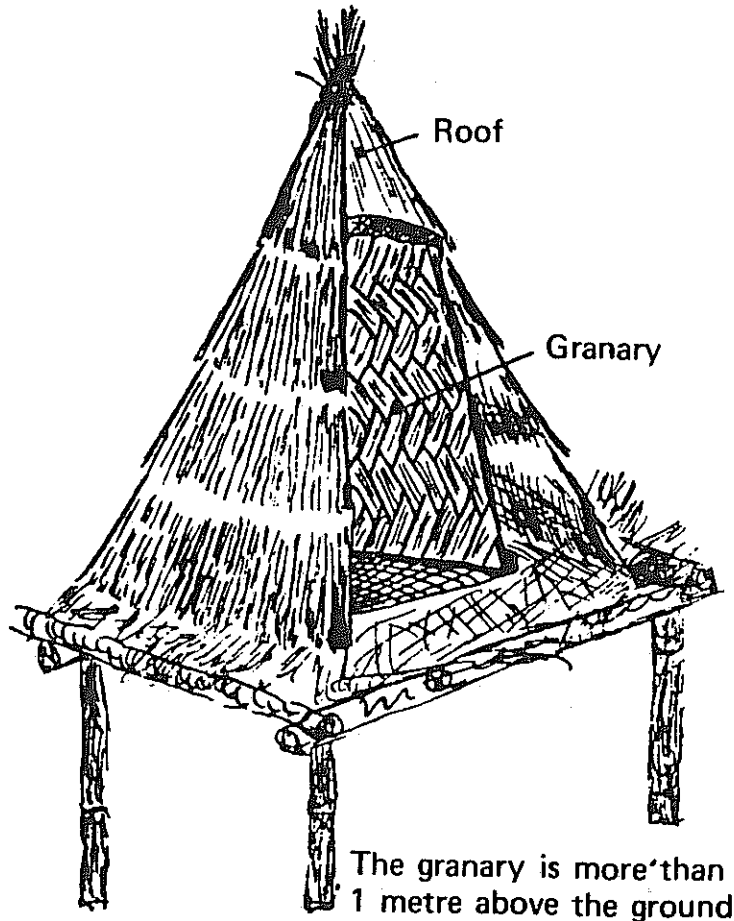
The farmer puts his harvest in granaries.
In this way he keeps his grain and seed
for the following year.

Not all granaries are alike.
They may be made of wood or clay or basketwork.

Granaries must not touch the ground.

Then the grain will keep dry.

Animals cannot knock over the granary
and eat the grain.



Basketwork granary

Before putting grain in granaries:

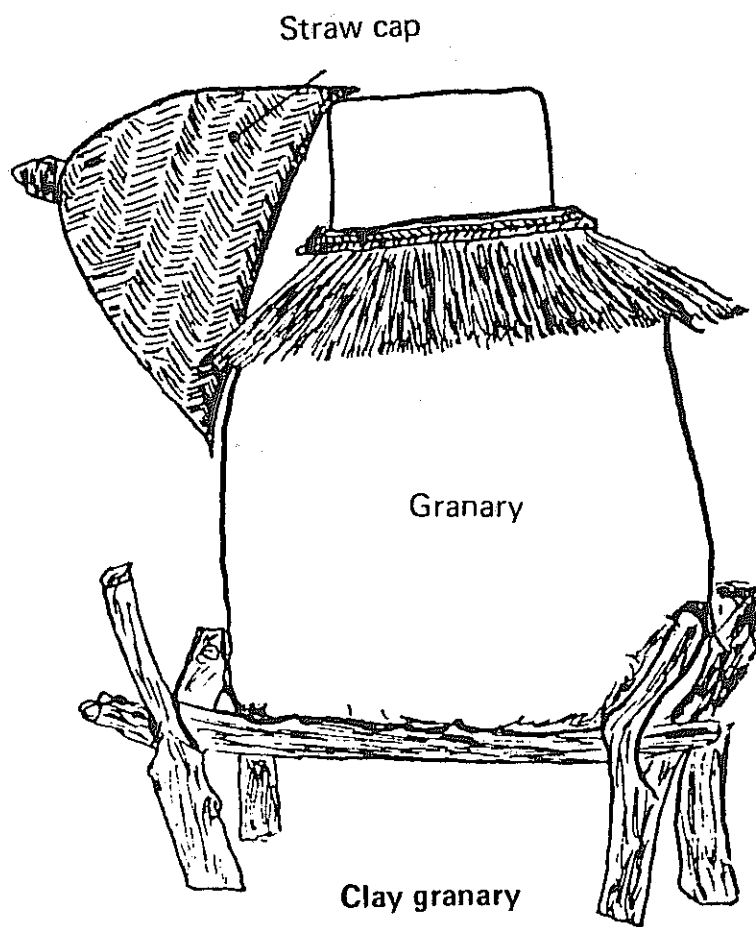
- **the grain must be well dried.**

Grain that is not dry enough may rot.
It will not be any good to eat or sow.
It is very important to dry grain well.

- **the granary must be well cleaned.**

Two weeks before harvest,
sweep and disinfect the granary.
Kill insects with a pesticide.

**Ask advice from the agricultural officer;
some pesticides are poisonous.**



SUGGESTED QUESTION PAPER

FILL IN THE MISSING WORDS

The are the reproductive organs of the plant.

The flowers have male organs called

and a female organ, called

These reproductive organs are protected by the

and the

The union of from the stamens and of an

contained in the ovary, produce a

A seed consists of a, some and a

Like all living things, a seed needs and

A farmer chooses the best seeds, the best

He removes the broken and eaten seeds, he the seed.

To protect them from insects and diseases, he the seed.

ANSWER THE FOLLOWING QUESTIONS

What is the ovule?

What is pollen?

How is a fruit formed?

Why must seeds be sown at the same depth?

What does the germ need to grow?

How should seed be stored?

Explain to a friend why you use the best seed, the best varieties.

Explain how to choose seed.

Did the courses on the plant (Nos. 1, 2 and 3) interest you? What part did you find most useful?

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