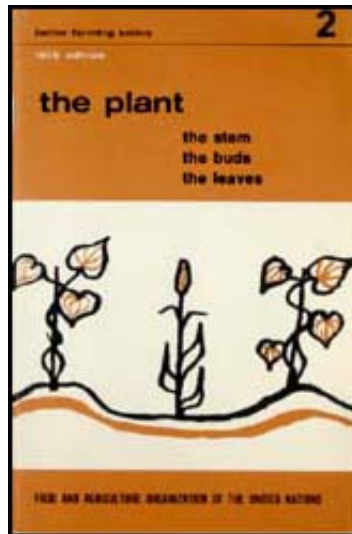








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- ➔  Better Farming Series 02 - The Plant: the Stem; the Buds; the Leaves (FAO - INADES, 1976, 30 p.)
-  *(introduction...)*
 -  Preface
 -  Plan of work
 -  The stem
 -  Where is the stem?


 How a stem is made
What the stem does

 The buds


 The leaves

 (*introduction...*)

 How a leaf is made

 (*introduction...*)


 The leaf-stalk

 The veins

 The shape of leaves







 What are leaves for?

 (*introduction...*)

 How the leaf changes raw sap
into elaborated sap


 Organic matter in the plant

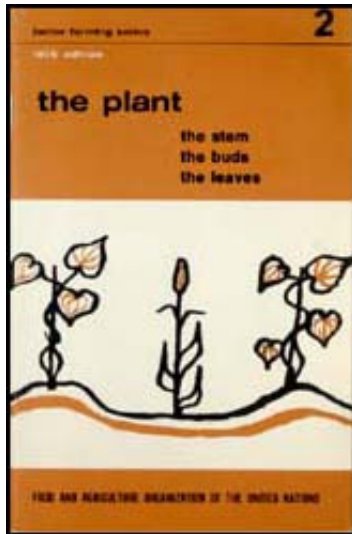
 The plant breathes.

-  The plant transpires.
- 
 -  Some practical applications
 -  The plant needs air and light
 -  The plant needs water
 -  The plant needs its leaves



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- ➔ (introduction...)
- 📄 Preface
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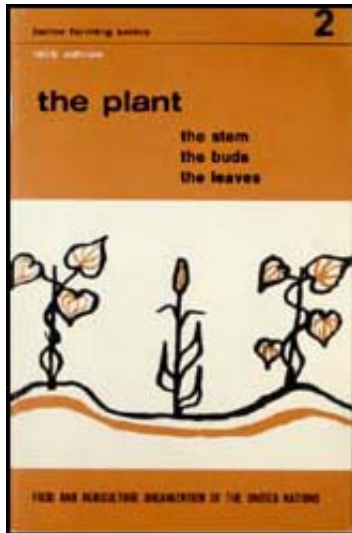
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 *(introduction...)*

➔  Preface

 Plan of work

The stem

 The buds

The leaves

Some practical applications

Preface

This manual is a translation and adaptation of "La plante la tige, les bourgeons, les feuilles," published by the Agri-Service- Afrique of the Institut africain pour le developpement conomique 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.

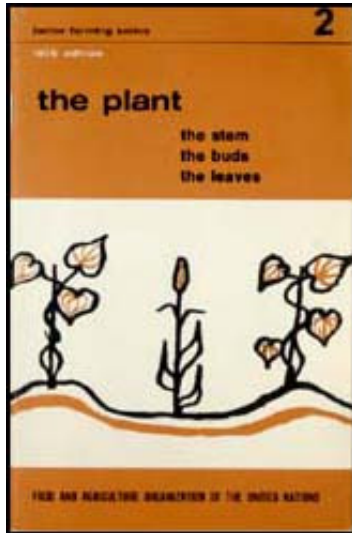
Applications for permission to issue this manual in other languages are welcomed. Such applications should be addressed to: Director, Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.


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



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 *(introduction...)*

 Preface

  Plan of work

The stem

 The buds

The leaves

Some practical applications

Plan of work

FIRST WEEK

The stem.

Read pages 4 to 11.

- You must look at each stem.

For example, on page 7 it says: "Let us look at a yam plant."

Go to the field, and look at the stem of a yam.

If there are no yams in your village, look carefully at the drawing.

- You must take good note of how one stem differs from another or is like another.

Make sure you understand what the stem does.

SECOND WEEK

The buds. How a leaf is made.

Read pages 12 to 18.

- To help your memory, read again pages 4 to 11.
- Look carefully at buds.
- Take a good look at the leaves you have picked. Look carefully, you will see the veins.
- Learn the new words, such as vein, midrib, leaf- stalk.

THIRD WEEK

What the leaves do.

Read pages 19 to 23.

- Read again pages 12 to 18.
- Leaves change raw sap into elaborated sap.
- Leaves breathe.
- Leaves transpire.

This week's work is more difficult.
You must take longer to study it.

Don't forget to look up the other pages mentioned.
For instance, where it says, "See Booklet No. 1, page 17."

FOURTH WEEK

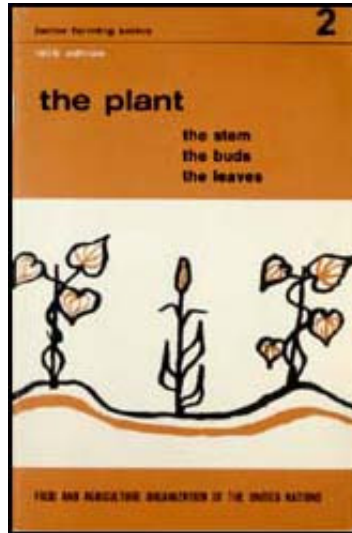
Some practical applications.


Read pages 24 to 29. This is easy work, and not long.

Read again the whole course, especially the work for the third week.






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➔  The stem

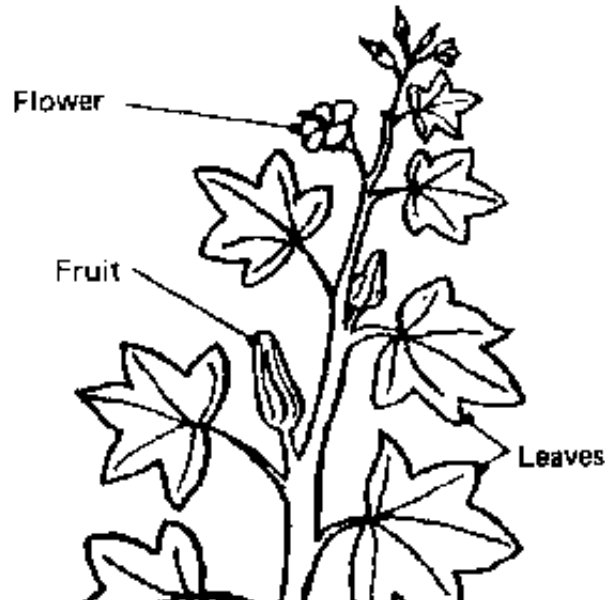
-  Where is the stem?
-  How a stem is made
-  What the stem does

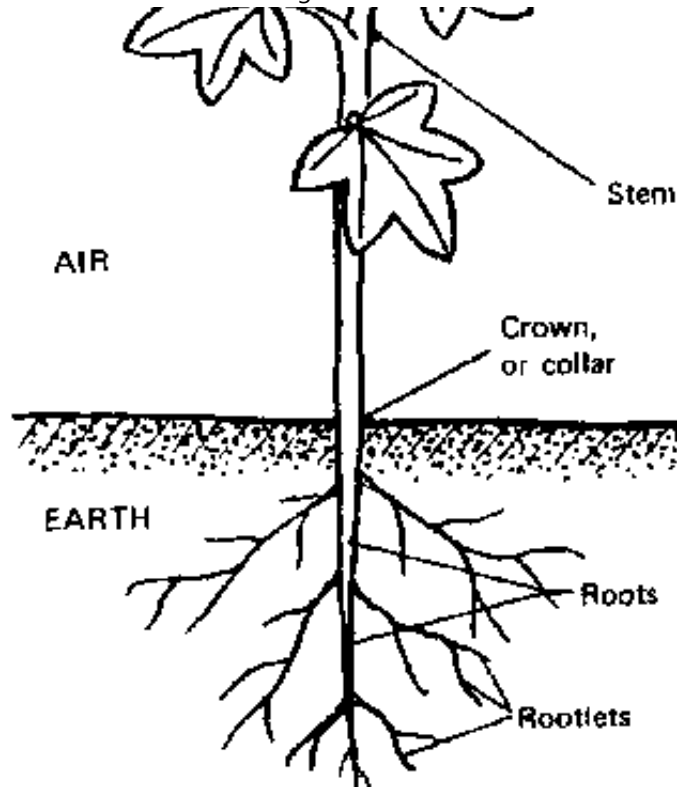
Better Farming Series 02 - The Plant: the Stem; the Buds; the Leaves (FAO - INADES, 1976, 30 p.)

The stem

Where is the stem?

- The root is the part of the plant that lives in the soil.
- The stem is the part of the plant that lives in the air, above the soil.
- The crown, or collar, joins the root and the stem.
- The stem bears leaves, flowers, fruits.
- Leaves, flowers, fruits, all grow on the stem.



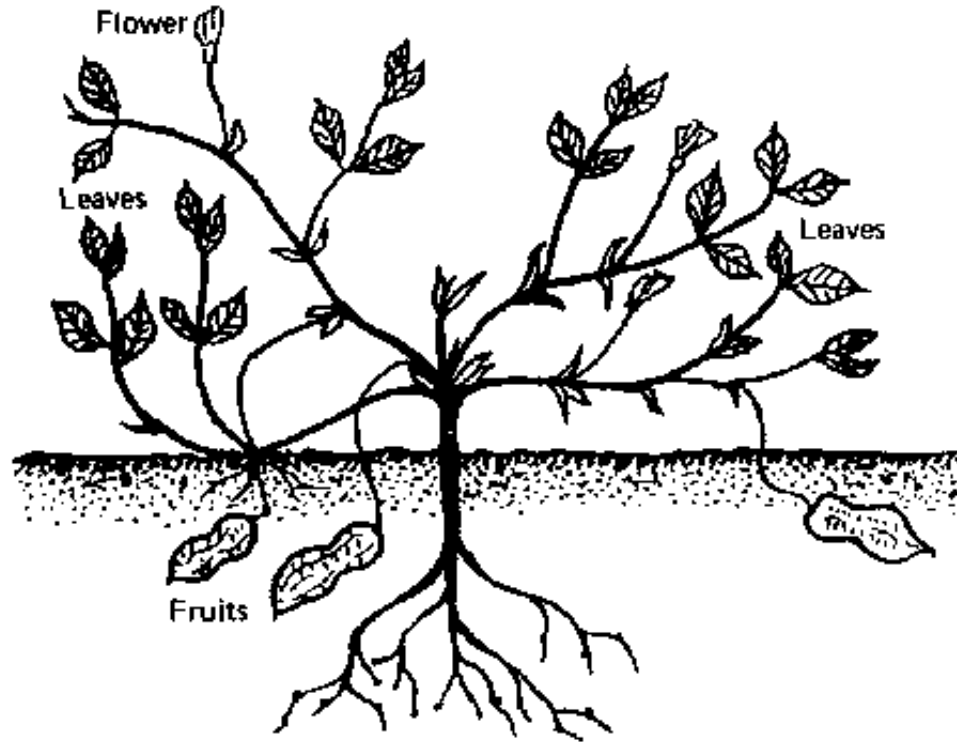


Plant and its roots

How a stem is made

- The stem can be trailing, for example, that of a groundnut plant, or of a marrow, cucumber or melon.

Let us look at a groundnut plant. What do we see?



A groundnut plant

A groundnut plant

A groundnut plant has several stems.

They are easy to cut or crush between the fingers.

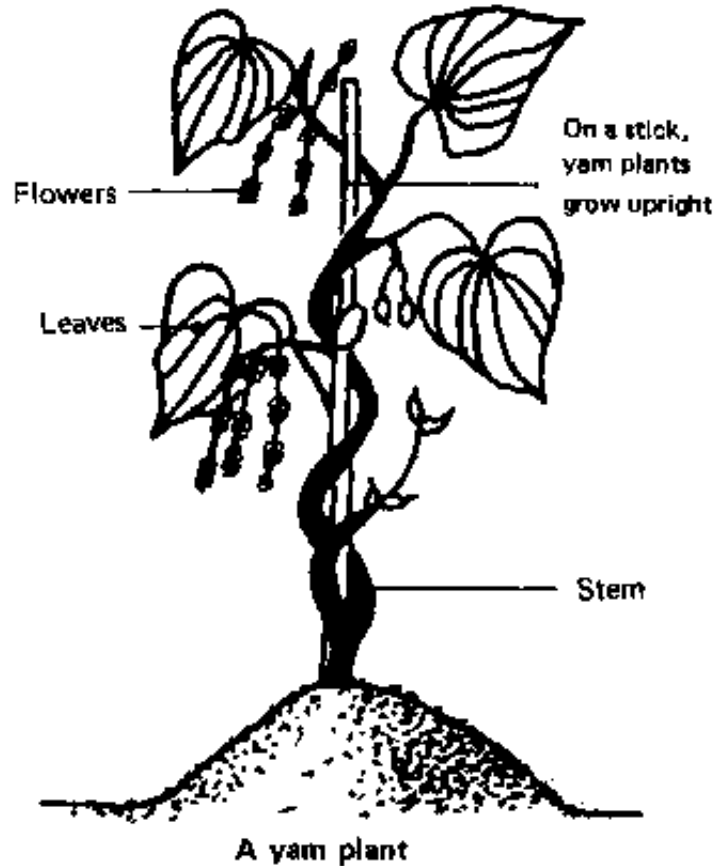
They are not hard.

The stems lie on the ground or are upright.

- The stem can be climbing, for example, that of the yam, bean, pea, and all the creepers.

Let us look at a yam plant.

What do we see?



What do we see?

- A yam plant may have several stems.

The stems lie on the soil.

If you push a stick into the ground beside a yam, the stems can be held upright, because they hold on to the stick. The stem winds round the stick and climbs.

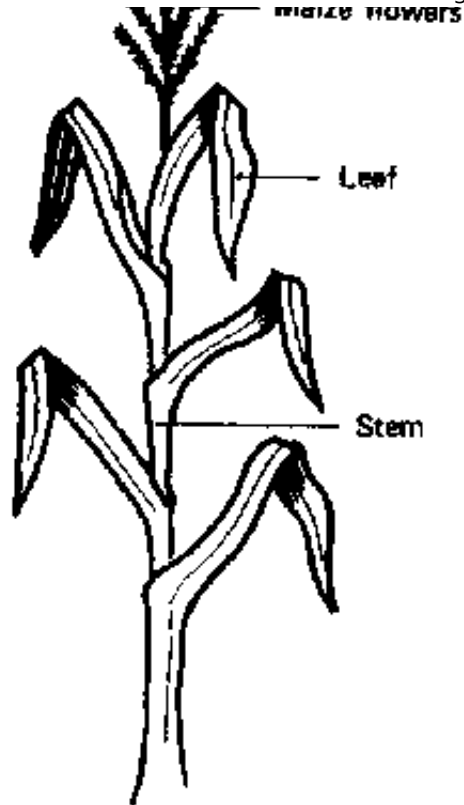
- The stems bear rather large green leaves and clusters of little flowers.
- The stem can be upright, for example, that of millet, maize, sorghum, cassava

**that of millet, maize,
sorghum, cassava**

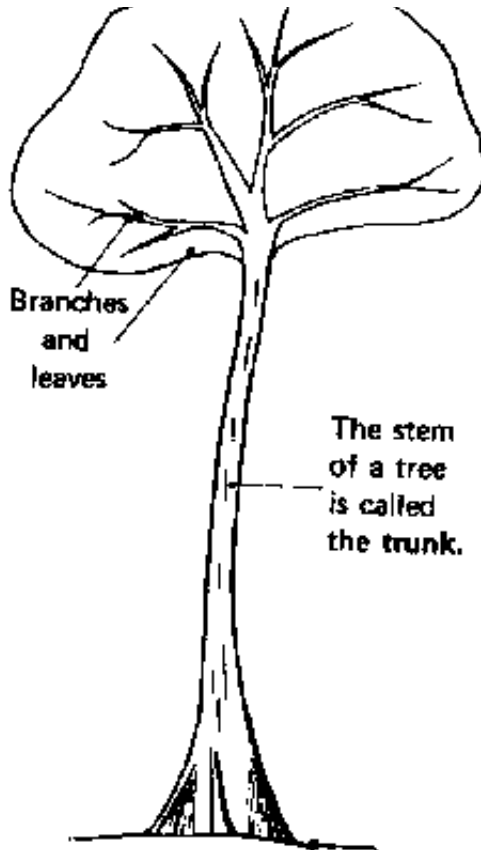


**cotton,
kapok tree or baobab.**





Maize plant



Kapak tree

Cotton, kapok tree or baobab.

Maize has only one seam.

The stem is upright.

It is harder than the stem of groundnuts or yams.

Trees: The stem is upright, very tall, very thick, hard.

It is called the trunk.

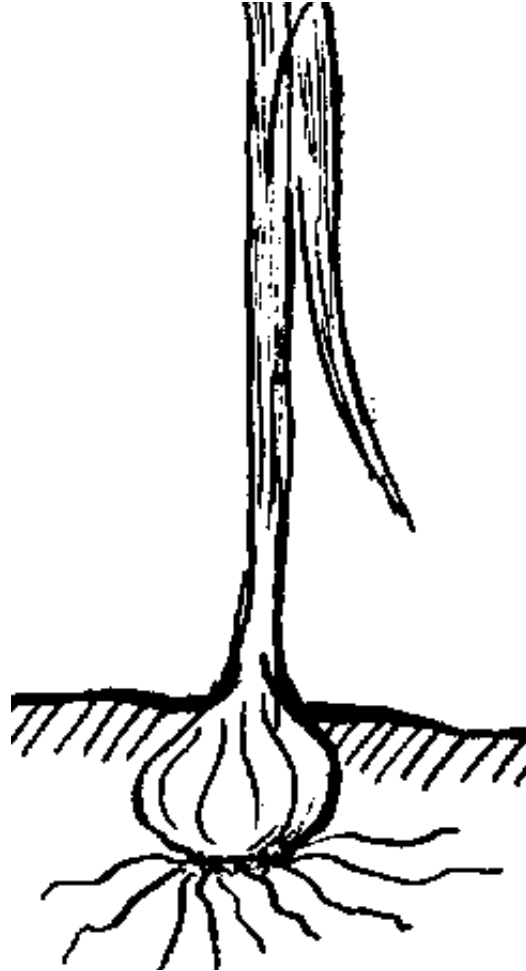
The trunk of a tree is its stem.

- The stem can be underground, for example that of garlic or onion.

Let us look at an onion.

What do we see?







An onion

An onion

- A very thick stem, in the ground; this is the onion.
- Long leaves come out of the stem.
- Roots grow in a ring at the base of the stem, at the base of the onion.
- These stems hold a lot of food.

HERBACEOUS STEMS AND WOODY STEMS

- The stems of groundnuts, yams, maize, millet, tomato and okra are green and pliable.

They can be bent without breaking.

They are like grasses.

They are called herbaceous stems.

- The stems of cotton, kapok trees, coffee, cocoa, of all trees, are hard.

They break if you try to bend them.

You have to strike hard to cut them with a machete.

They are called woody stems.

ANNUAL STEMS AND PERENNIAL STEMS

- The stems of groundnuts, maize, millet, tomato and okra last for only one year. They are called annual stems.
- The stems of the kapok tree, coffee, cocoa, the underground stem of yams, last for many years. They are called perennial stems.

What the stem does

- It supports leaves and flowers.

- It circulates sap.

THE CIRCULATION OF SAP

Cut through the stem of a coffee tree or of a lemon tree. What do we see?

- First of all, on the outside of the stem, there is the bark.

This is the skin of the tree.

Skin protects a man or an animal.

The bark protects a tree stem.

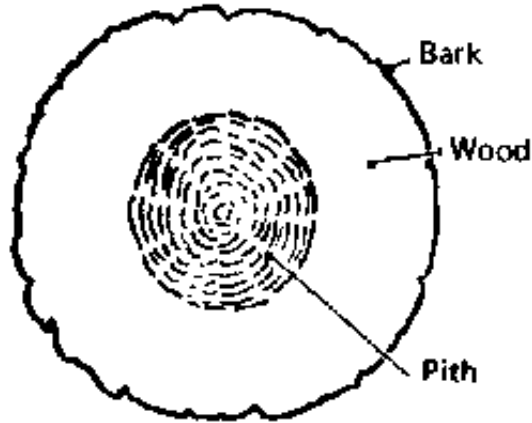
If a goat eats the bark, or you cut it with a hoe, the plant is no longer protected. It is injured.

Many diseases can get in through this injury.

You must not injure the bark.

- Under the bark is the wood.

When the tree is old, the wood is thick, the stem is hard.
Wood makes the stem hard.



Cut stem of a lemon tree

Cut stern of a lemon tree

In the wood you can see many little holes.
These are little tubes or vessels.
In a man's body the blood is carried by blood vessels.

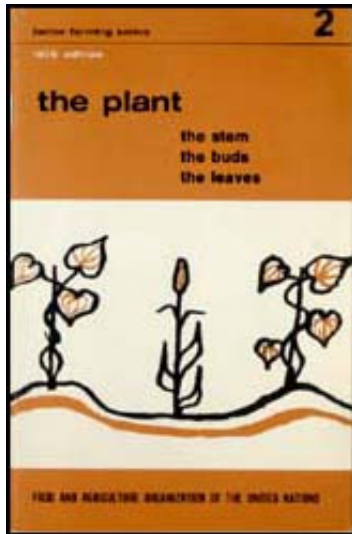
In a plant, vessels carry the sap.

- In the centre of the stem is the pith.

If you cut a cotton stem you can see the pith very easily.
It is less hard than the wood.
Often it is not the same colour.



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Better Farming Series 02 - The Plant:
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(introduction...)



Preface



Plan of work



The stem



The buds



The leaves



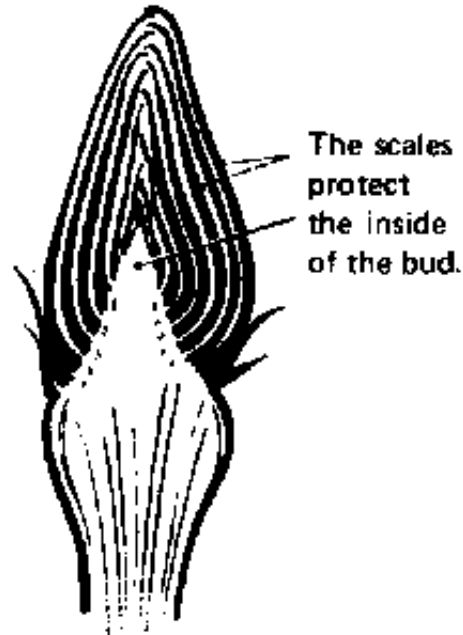
Some practical applications

The buds

How buds are made

A bud is made of little leaves; they are hard and very closely packed and called scales.

These scales are stuck together.
They protect the inside of the bud.



The scales protect the inside of the bud

What are buds for?

Flowers come out of certain buds. These are called flower buds.

Leaves or shoots come out of certain buds. These are called leaf buds.

Where are the buds?

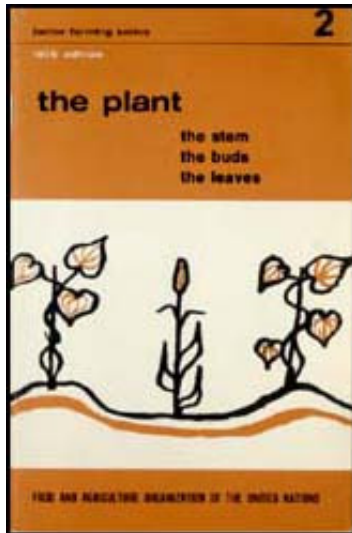
They are at the tip of the stem and on the stem.


- Those at the tip of the stem enable the stem and shoots to grow.
- Those at the base of the leaves produce shoots, leaves and flowers.








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- ➔ The leaves
 -  *(introduction...)*
 - How a leaf is made
 -  *(introduction...)*
 -  The leaf-stalk
 -  The veins
 -  The shape of leaves
 -

 What are leaves for?
(Introduction...)

 How the leaf changes raw sap into elaborated sap

 Organic matter in the plant

 The plant breathes.

 The plant transpires.

Better Farming Series 02 - The Plant: the Stem; the Buds; the Leaves (FAO - INADES, 1976, 30 p.)

The leaves

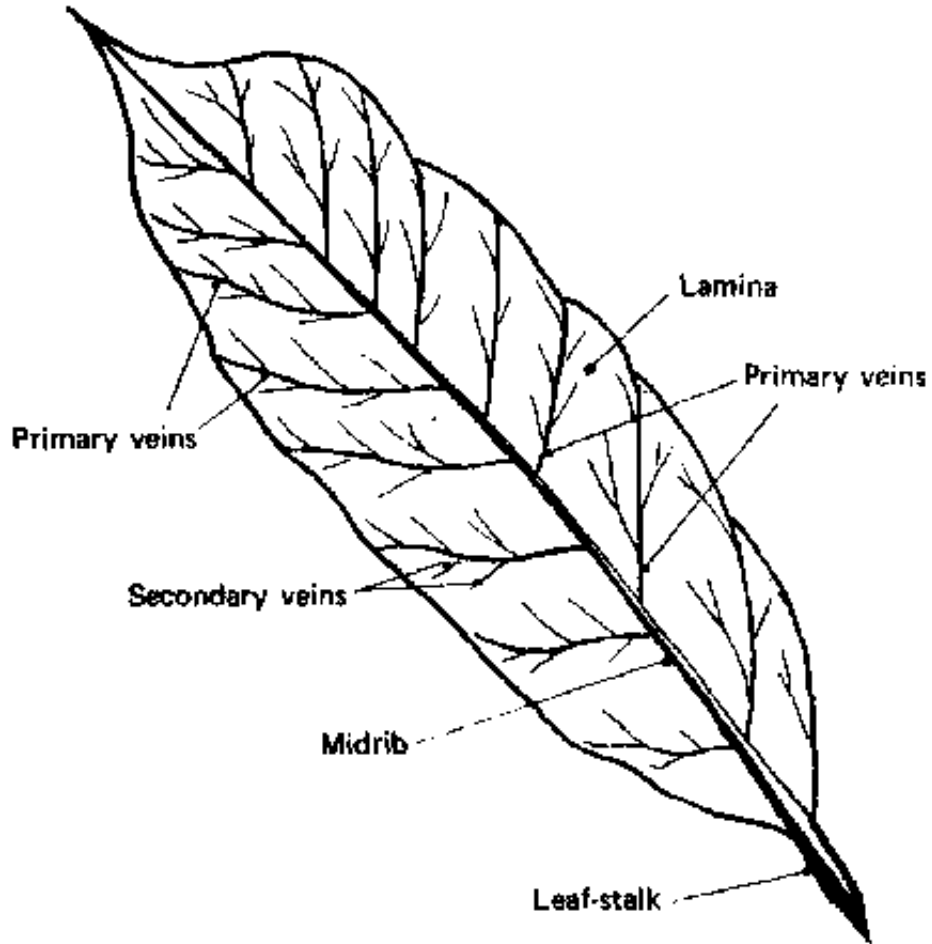
Where are the leaves found?

- Leaves grow from leaf buds.
- Leaves are found on stems and side shoots or branches.
- They are joined to the branches by the leaf- stalk.

How a leaf is made

Pick up some leaves of a mango tree or coffee tree. Let us look at them.

- Leaves are usually of a green colour, more or less dark.
- They are joined to the stem by a stalk called the leaf- stalk.
- The leaf-stalk is continued into the leaf by the midrib.
- Other smaller veins branch out from the midrib. These are the primary and secondary veins.
- The whole flat part of the leaf is called the leaf blade or lamina.



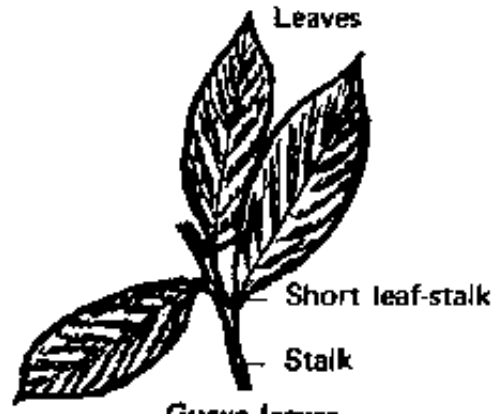
A leaf

The leaf-stalk

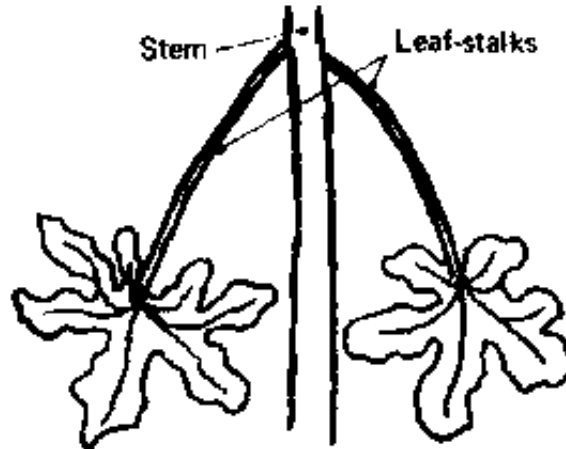
Some plants have a short leaf- stalk.
For example, coffee, orange, hibiscus, guava.

Some plants have a long leaf- stalk.
For example, papaw or papaya, sweet potato

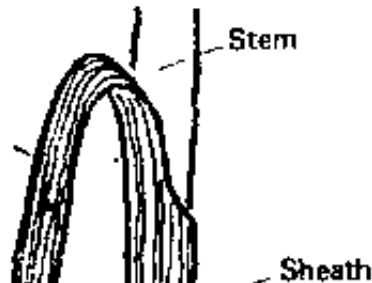
THE LEAF-STALK

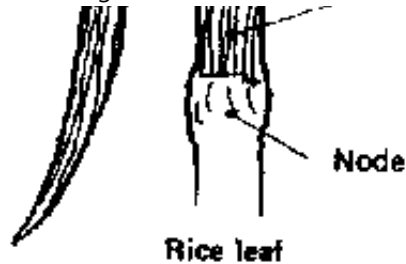


PAPAYA LEAVES



Papaya leaves





The leaf-stalk

Some plants do not have a leaf- stalk.

The leaves of maize, millet or rice surround the stem.
There is no leaf- stalk.

The veins

In the middle of the leaf there is the midrib.

On each side of the midrib other veins branch off.

These are the primary veins.

They are smaller. These primary veins divide into many still smaller veins.

Perhaps you have seen a leaf that has been eaten by insects. The leaf tissue has gone and only the veins are left. It is like a spider's web.

What are the veins for?

They carry the sap.

The sap passes along the stem vessels.

Then it enters the vein vessels.

Cut a palm frond and you will see the sap flow. The vessels of the palm frond carry the sap.

In a man's body, the vessels carry the blood.

In a plant, the vessels carry the sap.

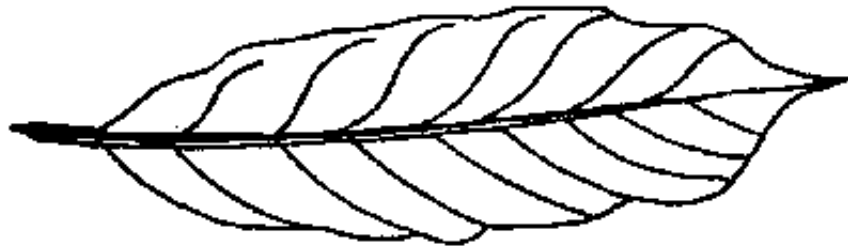
Sap is the blood of plants.

The shape of leaves

The leaves of yam are not like those of cassava.
You can recognize a plant by looking at the leaves.

Leaves are simple or compound.

- Simple leaf



Entire simple leaf

Examples: yam
millet
okra
hibiscus
maize
cocoa
teak





coffee

Lobed simple leaf

**Examples: cassava
cotton**

The simple leaf can be entire or lobed.

Entire simple leaf

Examples: yam , millet, okra., hibiscus, maize, cocoa, teak, coffee

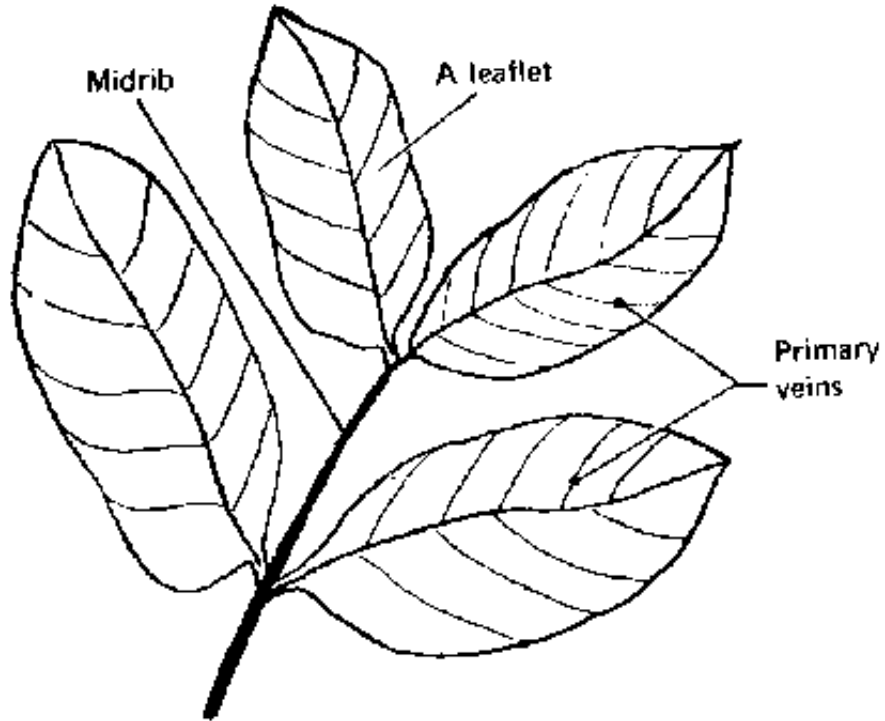
Lobed simple leaf

Examples: cassava, cotton

- Compound leaf

Look carefully at the drawing of a groundnut leaf. What it

shows is not four groundnut leaves. It is a single leaf.
But this leaf is made up of a midrib bearing four little leaves.
These little leaves are called leaflets.
The midrib of a compound leaf is not a stem.
So there is never a bud between the midrib and the leaflets.



A groundnut leaf

A groundnut leaf

What are leaves for?

To live, a man feeds and breathes.

To live, a plant also feeds and breathes.

THE PLANT FEEDS

- The plant takes up food from the soil through its roots. It takes water and mineral salts from the soil (see Booklet No. 1, page 17). But it has to change the water and mineral salts. A baby drinks only milk. Its hair grows and so do its arms and legs.

It becomes strong and heavy.

The baby has changed the milk in its stomach into hair, fat, muscles, etc.

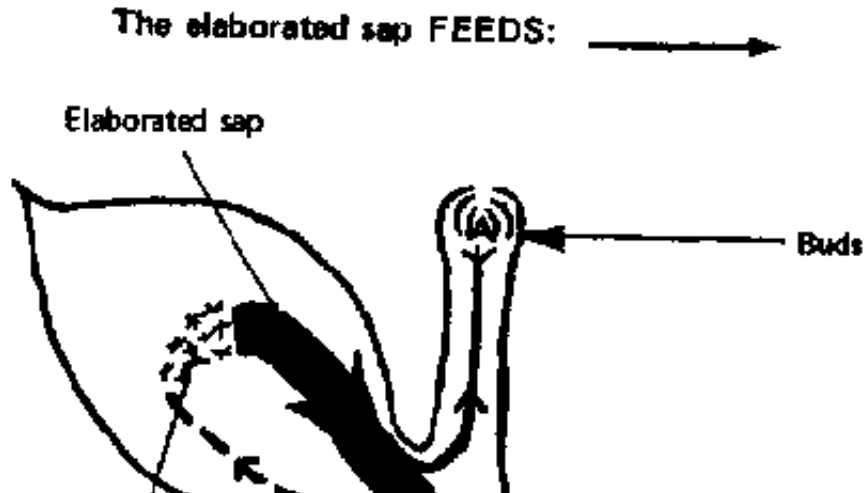
- The leaf changes the water and mineral salts taken from the soil by the roots. Water and mineral salts make up the raw sap (see Booklet No. 1, page 19, and Booklet No. 2, page 21). The leaf changes the raw sap into elaborated sap.

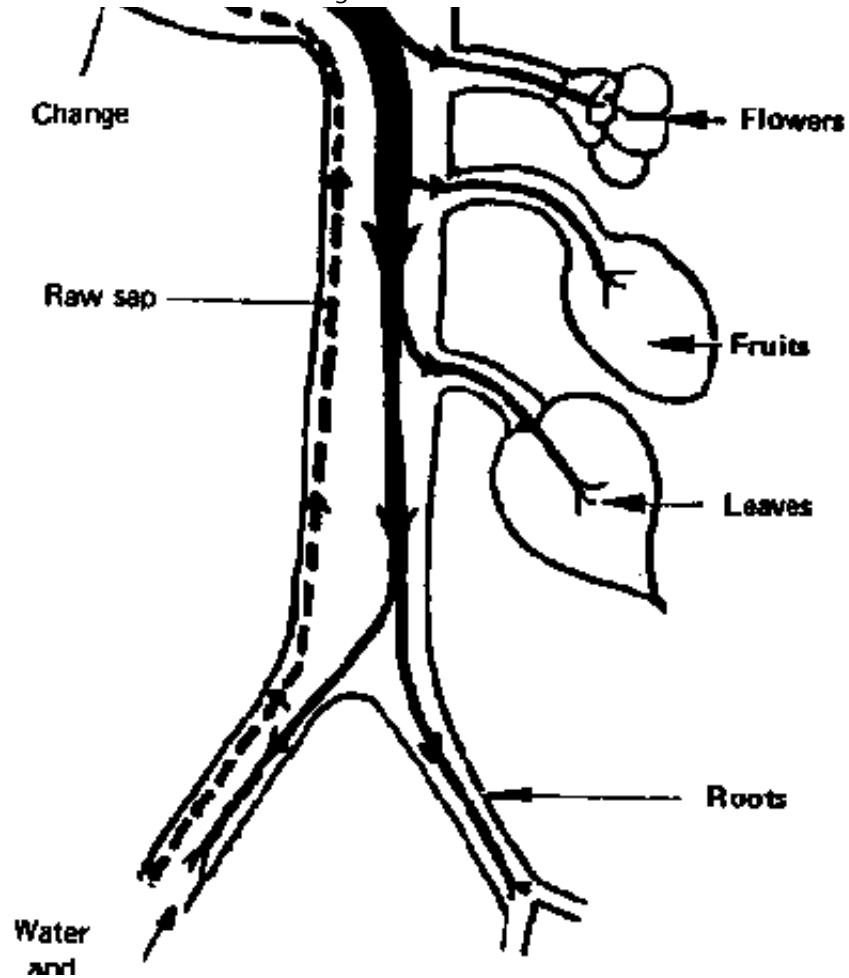
The leaf sends the elaborated sap into the buds, flowers, fruits, stem and roots.

The elaborated sap feeds the whole plant.

- The leaf changes the raw sap into elaborated sap.

The elaborated sap FEEDS:





www
mineral salts

The elaborated sap feeds

How the leaf changes raw sap into elaborated sap

- The leaf feeds the plant.

It receives the raw sap; it changes the raw sap into elaborated sap.

This change is called plant material synthesis.

What is plant material synthesis?

- Heaps of sand, wood and bricks are not a house.

To build a house you have to put them together.

You join them with cement.

The cement changes the wood, sand and bricks into a house.

- Water and mineral salts cannot feed the plant.

They have to be put together, they have to be joined.
How are water and mineral salts joined together?

- The leaves live in the air.

The air contains carbon dioxide gas.

The carbon dioxide gas is made of oxygen and carbon.

The leaf keeps the carbon and gives off oxygen.

- The carbon joins the mineral salt and the water.

The mineral salts and water are changed into elaborated sap.

The elaborated sap can then feed the plant.

The carbon changes the raw sap into elaborated sap.

This is plant material synthesis.

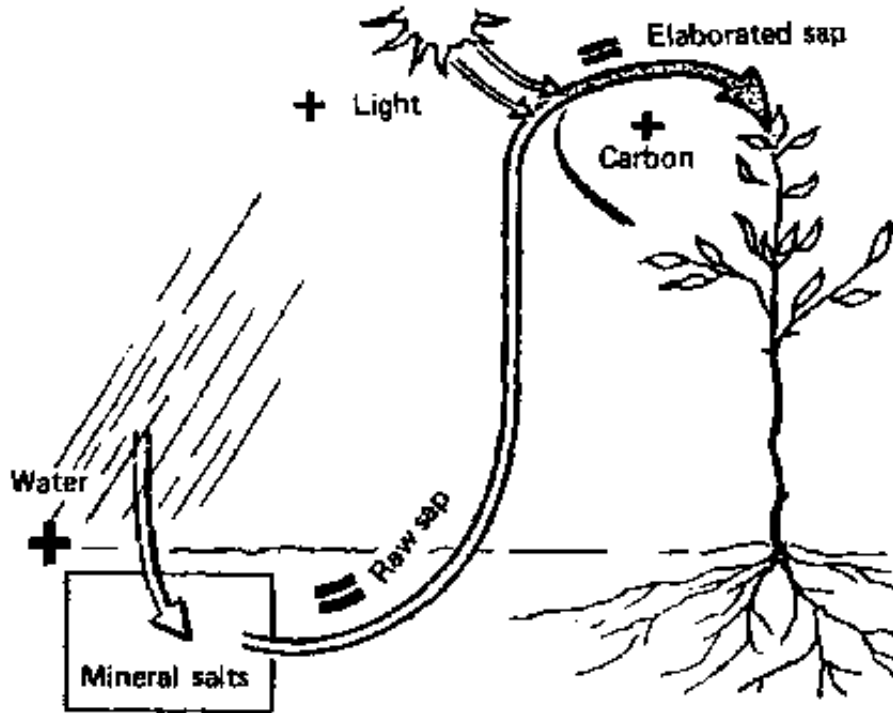
To join sand, wood and bricks with cement requires work.

You can't have a house without men's work, men's energy.

To join water and mineral salts with carbon also requires work and energy.

- Light gives the leaf this energy.

Light enables the leaf to change raw sap into elaborated sap.
At night there is no light, and the raw sap is not changed.



Light enables the leaf to change raw sap into elaborated sap

Organic matter in the plant

The plant gets water and mineral salts from the soil.

This is inorganic matter.

This inorganic matter is changed by light and carbon and becomes elaborated sap.

The elaborated sap feeds the plant.

Just as blood enables a man to make his muscles, hair, bones, so elaborated sap enables a plant to make leaves, wood, fruits. The leaves, the wood, the fruits are organic matter.

Inorganic matter has become organic matter.

The plant breathes.

To live, a man feeds and breathes.

To live, a plant also feeds and breathes.

A plant breathes through its leaves.

The plant transpires.

When it is hot, a man sweats, he transpires.

A plant also transpires.

The water in the sap evaporates, the leaf gets dry.

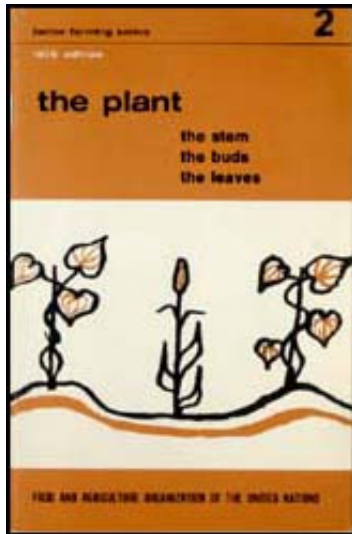
The plant is thirsty.



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- ➔ ☐ Some practical applications
 - 📄 The plant needs air and light
 - 📄 The plant needs water
 - 📄 The plant needs its leaves

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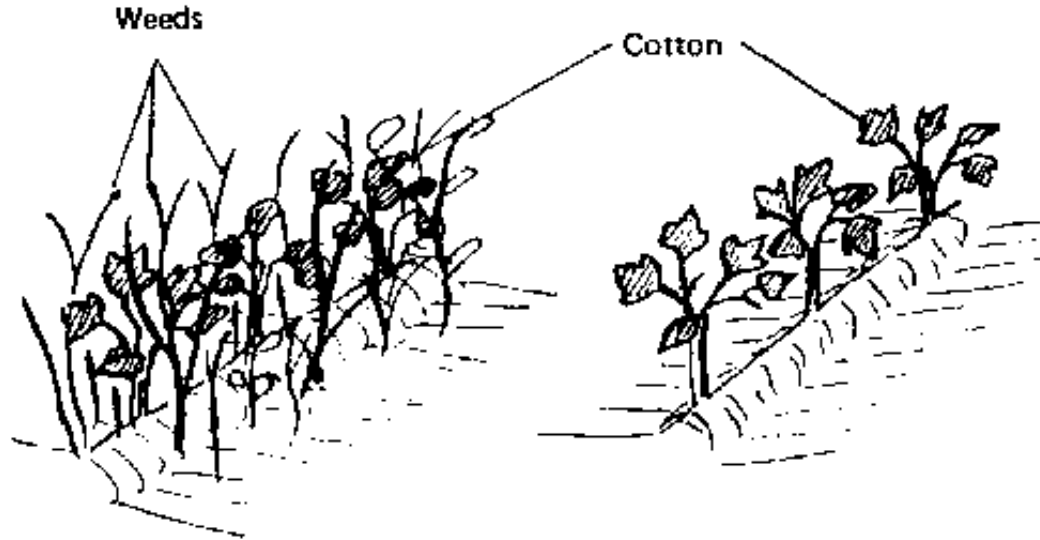
Some practical applications

The plant needs air and light

If a plant is not in the light, it does not grow well.
Light does not come through the leaves of a dense mango tree, and almost nothing grows under it.
Grass needs light to grow.

Plants get most good from air and light:

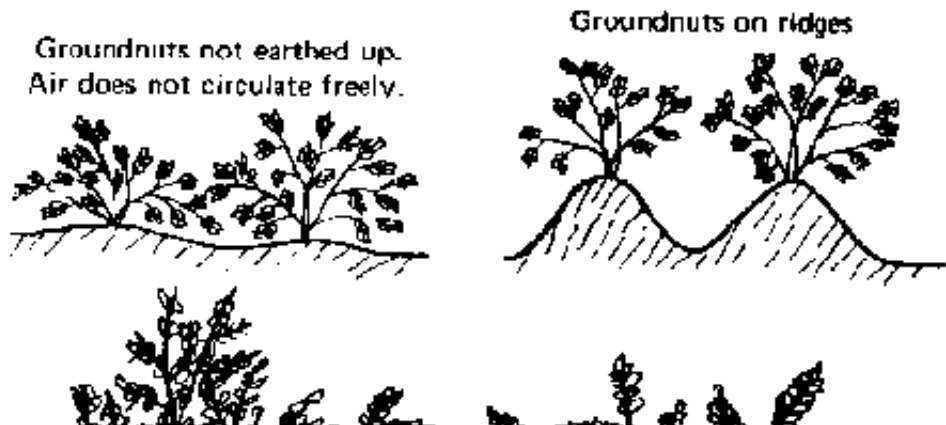
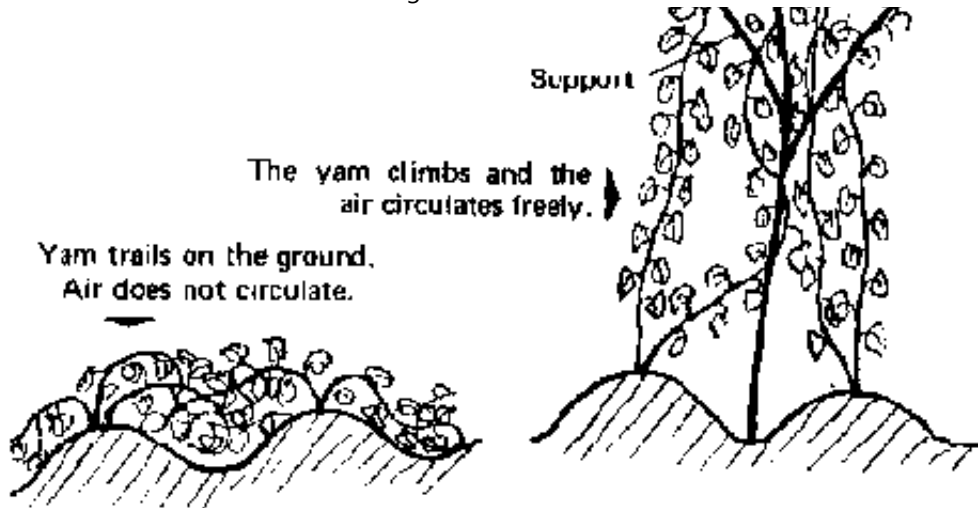
- if you pull out weeds;
- if you prune trees such as coffee, cocoa.
- if you grow crops on fairly high ridges, as with groundnuts, cotton, salad plants.
- if you make stems climb on sticks or branches, for instance, cowpeas, tomatoes, yams.

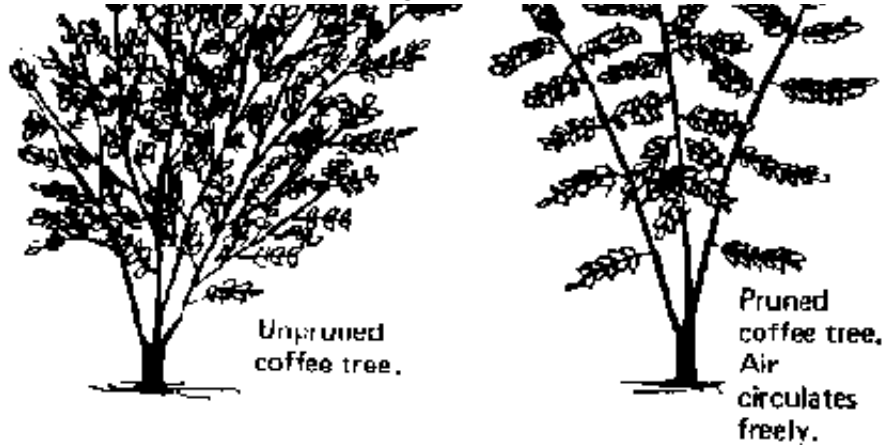


Weeds and cotton

With good air circulation, there is less disease.
Well ventilated plants resist disease better.







Figure

The plant needs water

When there is not enough rain, the roots cannot find water, the leaves wilt, the plant grows badly.

If there is a great lack of water, the harvest is very poor.

The plant feeds badly.

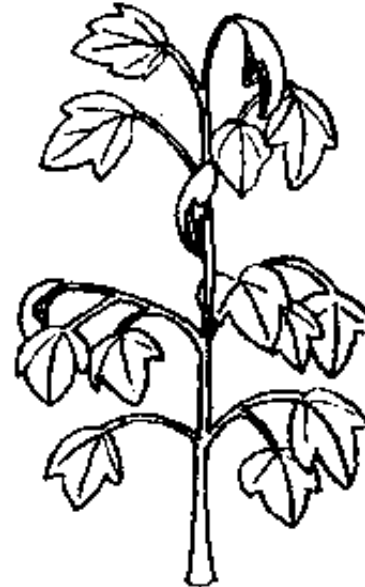
It does not produce many fruits or seeds.

It may die.

You understand now why you have to give the plant water. When there is enough water, the plant grows well; it produces plenty of seeds or fruits.



The plant has plenty of water.
It grows well.



The plant lacks water.
The leaves wilt.
The plant grows badly.

The plant which has water and the plant which does not have enough water

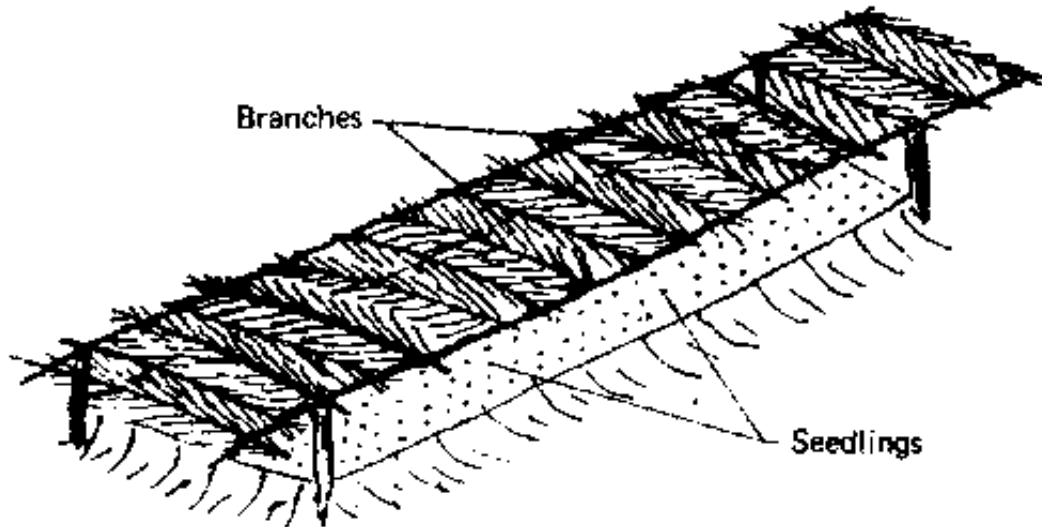
Young plants do not have many roots.

They cannot seek out water that lies very deep.

They wilt quickly if they are left in the sun.

Seedlings must be protected by covering them, for instance, with branches.

Seedlings must be well watered.



Branche and seedlings

The plant needs its leaves

If a plant has many big leaves, the harvest will be good.

If a plant has few, small leaves, the harvest will be less good.

Plants sown at the best density (see Booklet No. 1, page 26) will have the best leaves.

The roots will find enough food, and the leaves will change this food into organic matter, and the harvest will be good.

When plants of cotton or maize are too close together, the surplus plants are removed.

- Some insects eat leaves and buds.

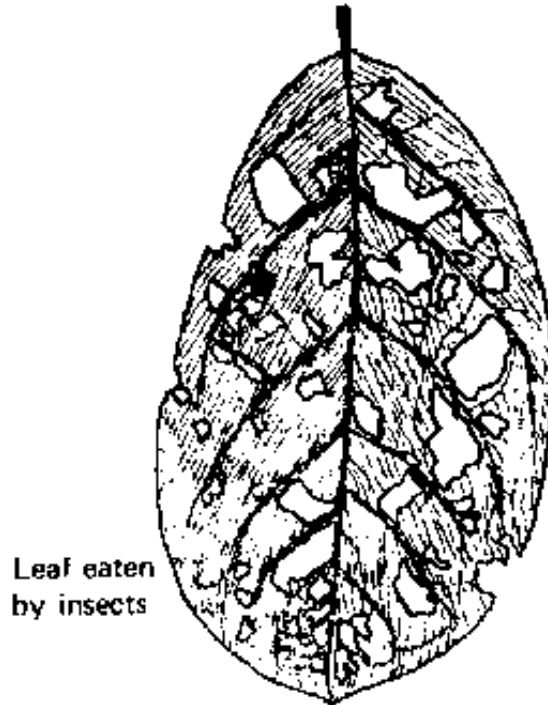
Young leaves are eaten first, because they are not hard.

When the insects are born, the plants should already be strong.

The leaves, being harder, will be less attacked.

Plants sown at the right time will be strong when the insects

appear.



Leaf eaten by insects

- Insects and diseases can be destroyed.

You should pull out diseased plants.

Let them dry.

Burn them.

Insects and diseases are killed by fire.

Certain seeds produce strong plants.

These strong plants resist diseases and insects better

Sow seeds which resist diseases and insects.

To kill insects or to prevent diseases, pesticides can be used.

These pesticides are poisons.

You cover the leaves with them and the insects are killed.

Often you need a sprayer, so that the pesticide covers the whole plant:

These pesticides can be dangerous to men and animals. You have to be very careful.

You must use exactly the quantity written on the containers, no more and no less.

- Animals also eat leaves.

Leaves and plants must also be protected against animals, such as goats, cows, agoutis, monkeys.

Put fences round the fields, keep a watch on cows and goats; put them in a paddock.

