


































➔  **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**


-  **(introduction...)**
-  **Preface**
-  **Plan of work**
-  **Why we study the soil**
- Different kinds of land**
  -  **(introduction...)**
  -  **The soil**
  -  **The subsoil**
  -  **The parent rock**
  -  **Examples of different soils**
- What is soil made of ?**
  -  **(introduction...)**
  - Sand**
    -  **(introduction...)**
    -  **Sandy soils**
  - Clay**
    -  **(introduction...)**
    -  **Clay soils**
  - Silt**

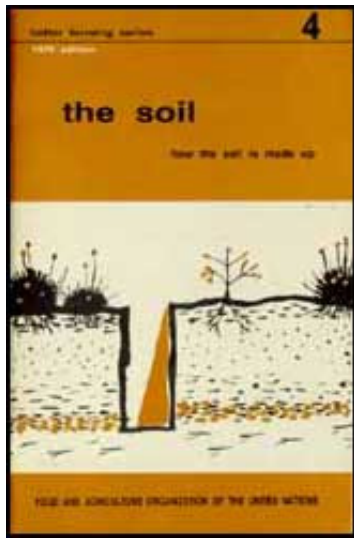
-  **(introduction...)**
-  **Silty soils**
-  **Humus**
  -  **(introduction...)**
  -  **What humus does**
  -  **Some practical advice**
-  **Air in the soil**
-  **Water in the soil**
  -  **(introduction...)**
  -  **Circulation of water in the soil**
  -  **Practical advice**
-  **Living creatures in the soil**
  -  **Earthworms**
  -  **Rats and other animals**
  -  **Termites**
  -  **Other insects**
  -  **Microbes**
-  **Suggested question paper**









[Home](#)  [ar](#) [cn](#) [de](#) [en](#) [es](#) [fr](#) [id](#) [it](#) [ph](#) [po](#) [ru](#) [sw](#)

---

 **Better Farming Series 04 - The Soil: How the Soil is Made up  
(FAO - INADES, 1976, 37 p.)**



- ➔  **(introduction...)**
-  **Preface**
-  **Plan of work**
-  **Why we study the soil**
- Different kinds of land**
- What is soil made of ?**
-  **Air in the soil**
- Water in the soil**
- Living creatures in the soil**
-  **Suggested question paper**

**Published by arrangement with the  
Institut africain pour le dveloppement conomique et social  
B.P. 8008, Abidjan, Cte d'Ivoire**

**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
Rome 1976**

**FAO Economic and Social Development Series No. 3/4**

**First edition 1970**

**Reprinted 1972**

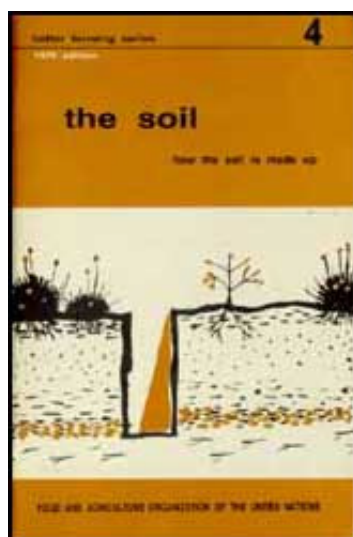
**Second edition, revised, 1976**

**Reprinted 1983, 1986**

**P-69**

**ISBN 92-5-100143-X****© French edition, Institut africain pour le dveloppement conomique et social (INADES) 1970****© English edition, FAO 1976**

[Home](#) > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)



 **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

 **(introduction...)**

 **Preface**

 **Plan of work**

 **Why we study the soil**

**Different kinds of land**

**What is soil made of ?**

 **Air in the soil**

**Water in the soil**

**Living creatures in the soil**

  **Suggested question paper**

**Suggested question paper****FILL IN THE MISSING WORDS**

**The ... is the layer of earth where ... find their food.  
Good land should have ... soil.  
All soils are not alike. A ... soil contains a lot of sand.  
A clay soil contains a lot of ... .  
In the soil there is also humus. Humus returns to the soil the ... used by the plant.  
Humus improves the ... of soils.  
Crop remains ... and ... add humus to the soil.  
There are also many microbes in the soil. They ... organic matter and give the soil  
... .**

### **ANSWER THE FOLLOWING QUESTIONS**

**What is the soil?**

**Why do we call clay soils heavy?**

**What do you do to get good reserves of water in the soil?**

**What is the depth of soil of your field?**

**What is fallow?**

**Why do you have fallow land?**


**How can you improve the soil structure?**

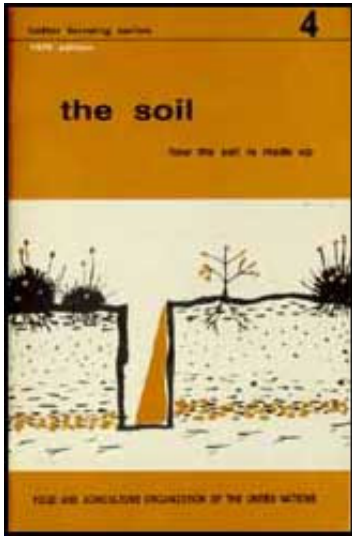
**Is it good to make a brush fire?**








**[Home](#) > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)**

---

 **Better Farming Series 04 - The Soil: How the Soil is Made up  
(FAO - INADES, 1976, 37 p.)**



- ➔  **(introduction...)**  
**Preface**
-  **Plan of work**
-  **Why we study the soil**
- Different kinds of land**
- What is soil made of ?**
-  **Air in the soil**
- Water in the soil**
- Living creatures in the soil**
-  **Suggested question paper**

## Preface

**The first twenty- six volumes in FAO's Better Farming Series were based on the Cours d'apprentissage agricole prepared in Cote d'Ivoire by the Institut africain pour le developement economique et social for use by extension workers. Later volumes, beginning with No. 27, have been prepared by FAO for use in agricultural development at the farm and family level. The approach has deliberately been a general one, the intention being to constitute basic prototype outlines to be modified or expanded in each area according to local conditions of agriculture.**

**Many of the booklets deal with specific crops and techniques, while others are intended to give the farmer more general information which can help him to understand why he does what he does, so that he will be able to do it better.**

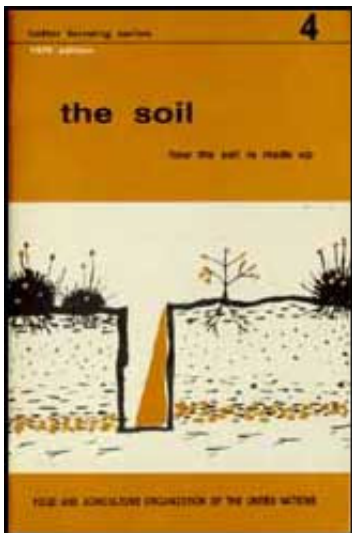
**Adaptations of the series, or of individual volumes in it, have been published in**









**Amharic, Arabic, Bengali, Creole, Hindi, Igala, Indonesian, Kiswahili, Malagasy, Siswati and Turkish, an indication of the success and usefulness of this series.**

**Requests for permission to issue this manual in other languages and to adapt it according to local climatic and ecological conditions are welcomed. They should be addressed to the Director, Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.**



**[Home](#)** > **[ar.cn.de.en.es.fr.id.it.ph.po.ru.sw](#)**



-  **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**
-  **(introduction...)**
-  **Preface**
-   **Plan of work**
-  **Why we study the soil**
- Different kinds of land**
- What is soil made of ?**
-  **Air in the soil**
- Water in the soil**
- Living creatures in the soil**
-  **Suggested question paper**

## **Plan of work**

### **FIRST WEEK**

#### **Why we study the soil**

#### **The soil layers**

- **Read pages 4 to 12.**

**Is there a big hole in your village? If there is, look at it carefully. If there is not, dig one.**

- **Compare what you see with the drawings. Perhaps you don't see all the layers shown in the drawings.**
- **Take a good look at the part of the soil where the roots are.**

### **SECOND WEEK**

#### **What is soil made of?**

#### **Sand, clay and silt.**

- **Read pages 13 to 21.**

- **Do the experiment described on page 13.**

**Take a good look at it.**

- **Learn to see what the soils are like where you live.**



**Are they clay soils?  
Or sandy?  
Or silty?**

- **Do carefully all the experiments shown.**

### **THIRD WEEK**

**Humus and the soil.**

- **Read pages 22 to 27.**
- **To help your memory reread pages 4 to 21.**
- **Look carefully at the drawing on page 23.  
It will help you to understand.**
- **Find out what crops make the soil poor in humus.**

**How is humus added to the soil?**

### **FOURTH WEEK**

**Water and the soil.**

- **Read pages 28 to 36.**
- **Do the two experiments described on pages 30 and 32.**

- **Take a good look at the drawing on page 31.**  
**It shows you all the movements of water in the soil.**

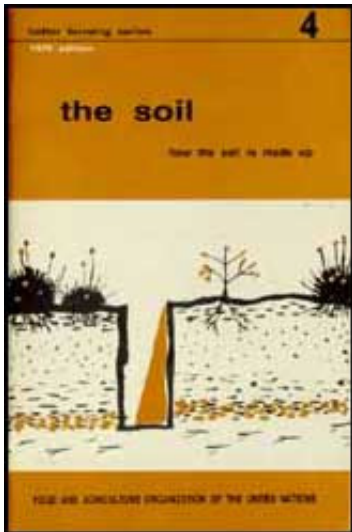
- **Reread the whole booklet.**

- **Answer the question paper.**

**When you have understood fully, try to answer all the questions.**  
**Do not rush.**  
**Make sure you understand before you write.**



[Home](#) > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)



 **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

 **(introduction...)**

 **Preface**

 **Plan of work**

 **→ Why we study the soil**

**Different kinds of land**

**What is soil made of ?**

 **Air in the soil**

**Water in the soil**

**Living creatures in the soil**

 **Suggested question paper****Why we study the soil**

- **In the old days people knew the land very well.**

**They knew how to choose their fields.**

**They knew how to work each field.**

**They knew when to give their fields a rest.**

- **But in traditional farming, people did not produce much; they needed very little.**

**There were few tools.**

**There was little trade.**

**People had few needs; food was always the same, and people did not often go outside the village.**

- **Now people have new needs.**

**The number of people grows; they dress better, they eat better, and look after themselves better.**

**More roads are needed, more hospitals, schools, more food and clothes.**

- **So farming must yield more.**

**This means that farming techniques must change; farmers must evolve; farmers must produce more.**

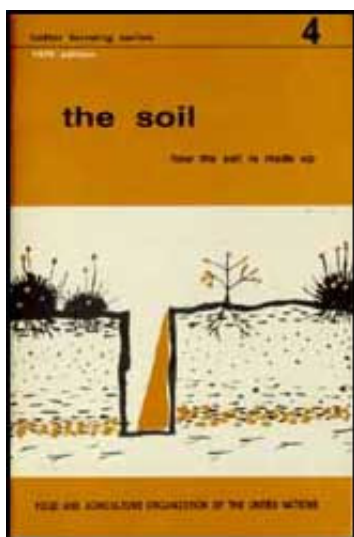
## • To produce more food, farmers must

know their fields better;  
choose their fields well;  
work their fields well;  
conserve and improve their fields.







All land is not the same; every piece of land has its qualities and its defects.



[Home](#) > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)



### Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)

- ➔  Different kinds of land
  -  (*introduction...*)
  -  The soil
  -  The subsoil
  -  The parent rock
  -  Examples of different soils

**Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

## Different kinds of land

**There are several kinds of land, for example:**

**cultivated land the fields that are farmed;  
cultivable land fields that can be farmed only if they are cleared;  
land that cannot be farmed, because nothing grows on it; you cannot farm stone  
or laterite.**

**WHAT IS THE LAND LIKE IN YOUR VILLAGE?**

**In your village maybe a hole has been dug, in order to make a well, or to get earth  
to make bricks.**

**Or maybe a ditch has been dug between two fields.**

**Let us dig a hole ourselves.**

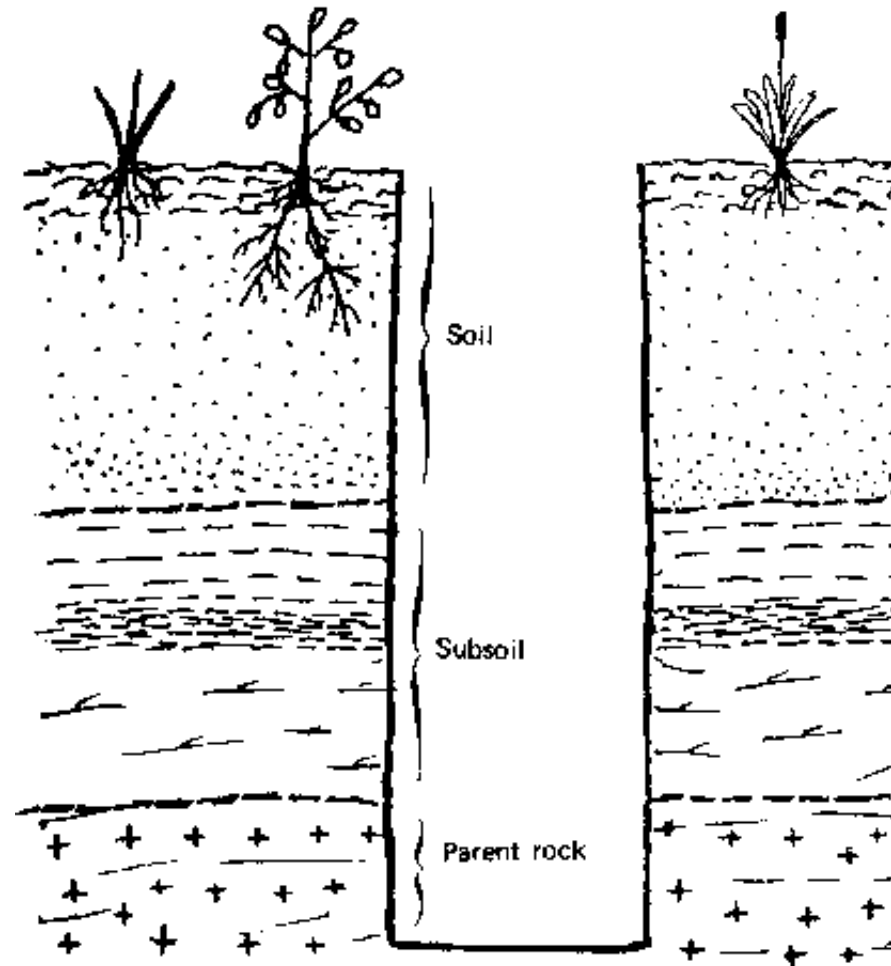
**Let us dig it deep, and quite straight.**

**What do we see?**

**The soil is made up of different kinds of earth, of different layers.**

**These layers**

- **are not of the same colour; that on top is often darker.**
- **are not of the same depth.**



By making a hole you can see the layers of soil

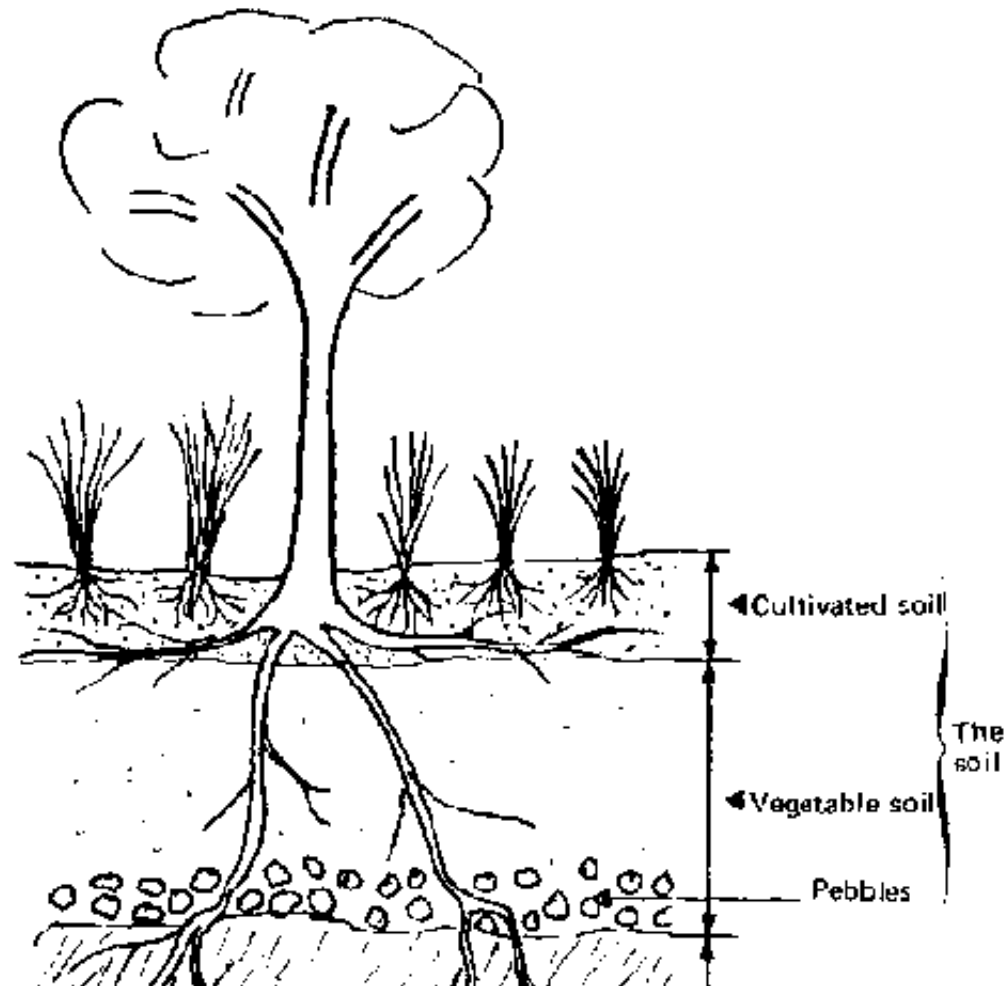
## By making a hole you can see the layers of soil

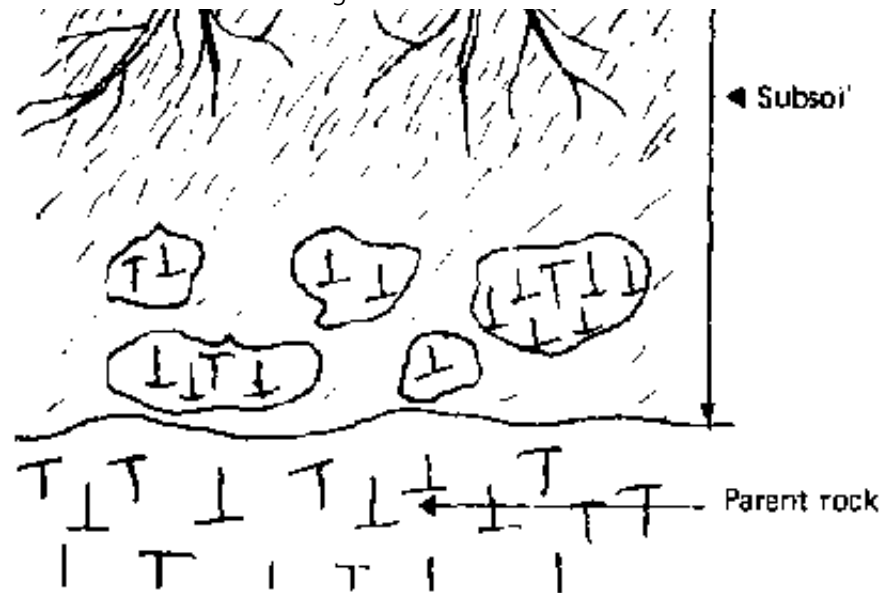
- **In the first layer we find roots; this is the soil.**  
The soil is the layer of earth where roots find their food.  
The soil is more or less deep.  
The soil is more or less rich in food.
- **Below the soil is a harder layer.**

**It is difficult to make a hole in it.  
This is the subsoil.**

- **Even deeper is rock, called the parent rock.**

**Sometimes you can very clearly see the difference between two layers.  
Sometimes the layers are alike.  
You cannot see the difference very clearly.**





Good land: it has deep soil

**Good land: it has deep soil**

## The soil

**Let's take a look at the hole we dug.  
The earth where we find roots is the soil.  
The soil has several parts.**

- **On the surface is the cultivated soil.**

**This first layer is what we work; we turn it over with a hoe or a plough; we pile it up in mounds or ridges.**

**In this layer you find living roots, for example, creeping roots (see Booklet No. 1) or fibrous roots (see Booklet No. 1). This is where they find their food. You also**



**see dead roots and rotting leaves and stems.**

**The more this layer is deep and rich, the more fertile the soil is and the finer the plants are.**

- **Below this layer is the vegetable soil.**

**It is often lighter in colour and contains more sand.**

**Tap-roots go through this layer when it is not too deep (see Booklet No. 1, page 23).**

**There are often little pebbles below this layer.**

**The subsoil**

**The subsoil is often very deep.**

**It is always very poor.**

**It has little mineral salts (see Booklet No. 1 page 19).**

**It is hard and difficult to dig.**

**It is here that tree roots find their water during the dry season.**

**The parent rock**

**Below the soil and the subsoil we find stone or rock.**

**This rock is very hard.**

**It changes very slowly into earth.**

**This is the parent rock.**

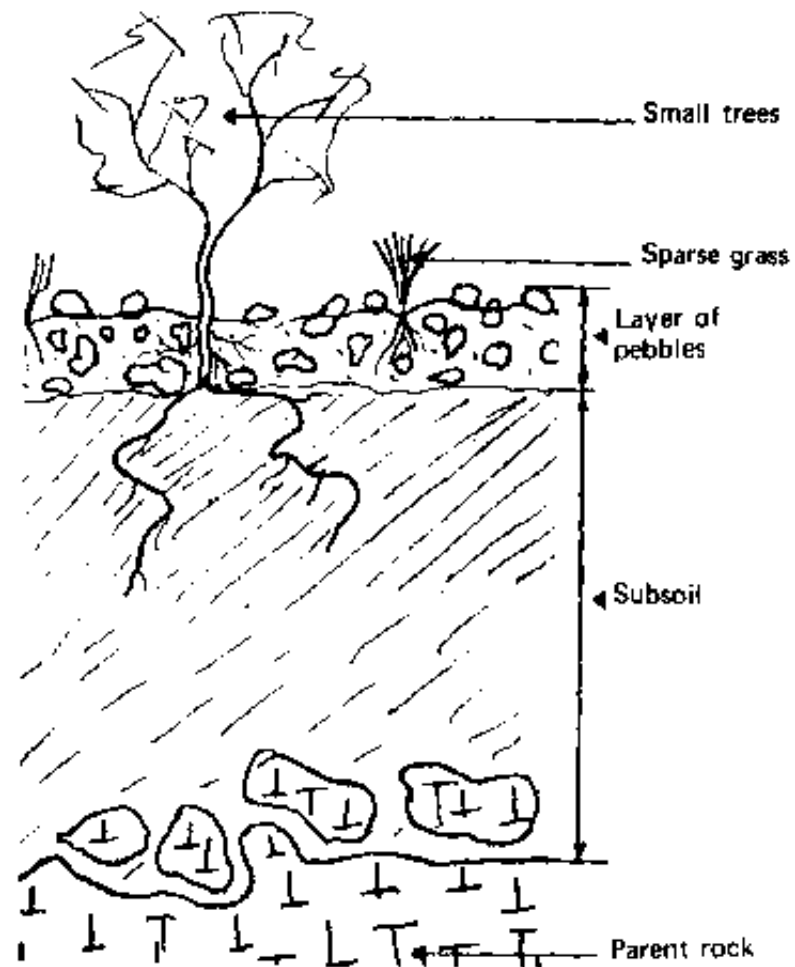
**Note**

**Fields are very different one from another.  
The depth of the different layers varies a great deal.  
Some layers may be missing altogether.**

### **Examples of different soils**

- **Savanna soils**

**The depth of soil varies a great deal.  
Often the soil is missing.  
You can see the pebbles.**



Bad savanna soil

**Bad savanna soil**

**The subsoil is very unstable.  
It may become very hard.  
Then a hardpan forms.  
Roots cannot penetrate it.  
Nothing can be grown on it.**

- **Mountain soils**

**In the mountains there is often neither soil nor subsoil.**

**You can see the parent rock and nothing grows.**

**If there is a little soil on the parent rock, a few small trees and some grass grow among the stones.**

- **Forest soils**

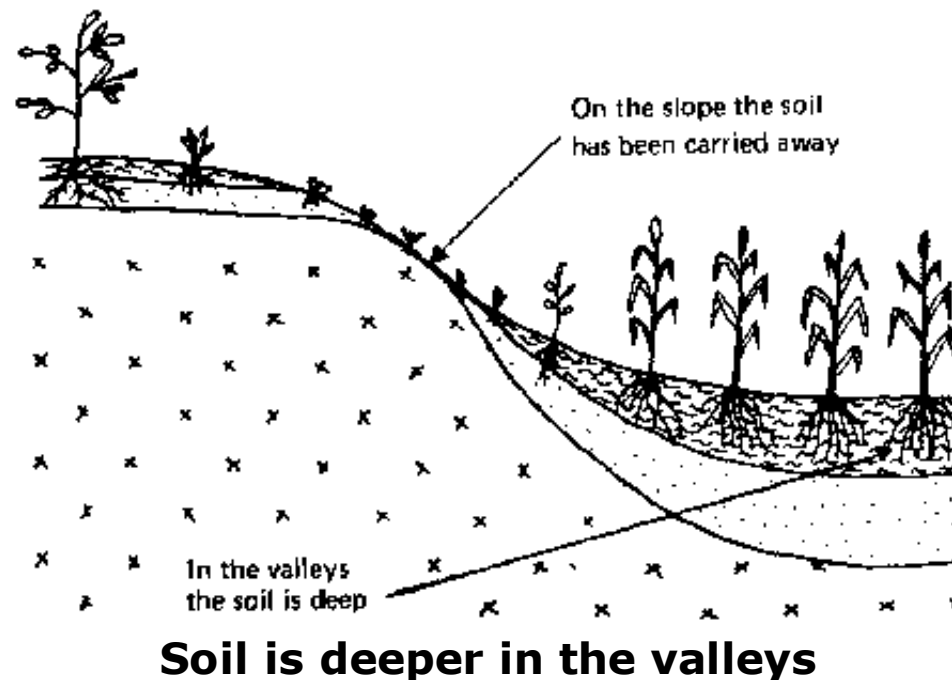
**The soil is rich.**

**The subsoil is always very poor; it contains no mineral salts; it does not become hard and does not form a hardpan.**


- **Soils of the same village**

**In various fields of the same village the layers of soil can be very different. On the slopes, for example, the soil may have been carried away by the rain.**

**That is why the soil is deeper in the valleys.**



[Home](#) > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)

 **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

  **What is soil made of ?**

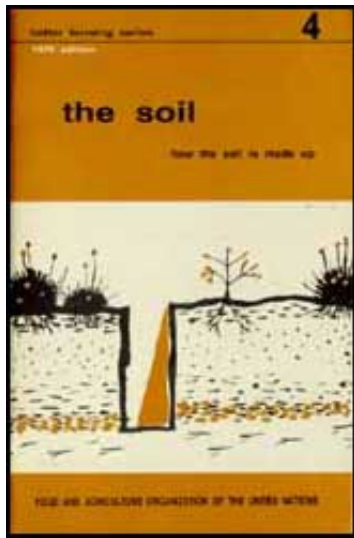
 **(introduction...)**








**Sand**

 **(introduction...)**

 **Sandy soils**

**Clay**



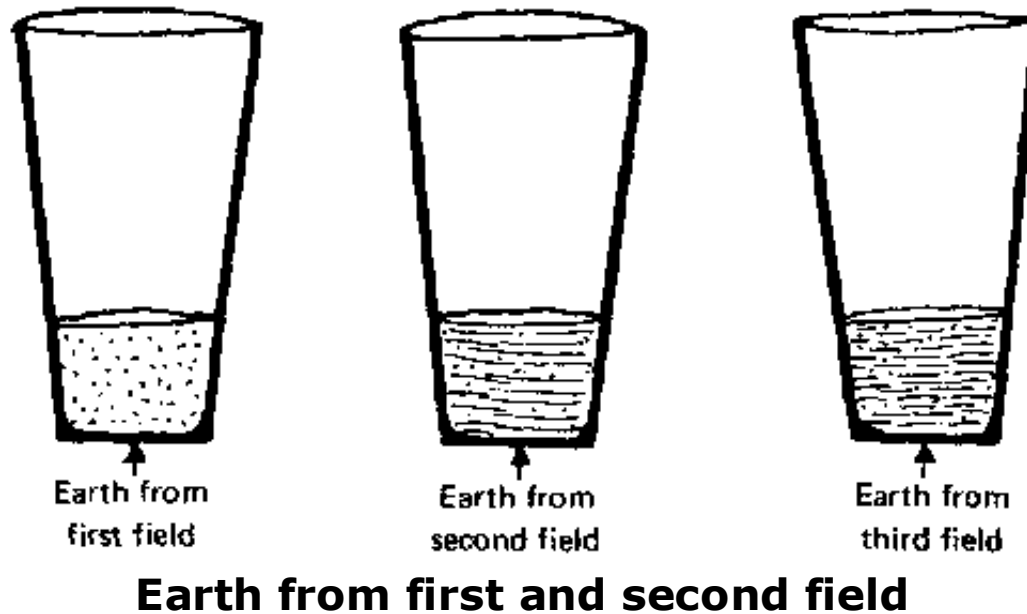
-  **(introduction...)**
  -  **Clay soils**
  - Silt**
    -  **(introduction...)**
    -  **Silty soils**
  - Humus**
    -  **(introduction...)**
    -  **What humus does**
  -  **Some practical advice**

**Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

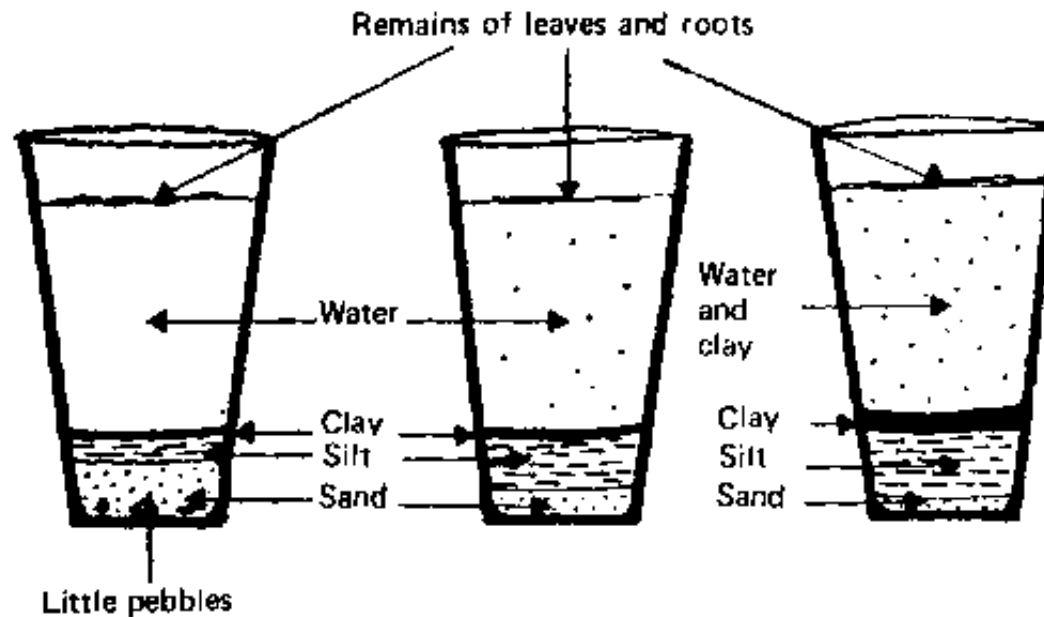
**What is soil made of ?**

**Soil is a mixture.**

**Get a little earth from a valley, from a plateau and from the side of a slope.  
Put the earth from each field in a different glass. (If you haven't got glasses, use empty bottles.)**



- **In each glass or bottle put two fingers of earth. Fill up with water.**
- **Stir the mixture well in each glass. Put it down and do not touch it for Jive minutes.**
- **Stir the mixture well in each glass once more. Put it down and do not touch it for an hour.**



**An hour later, what do we see?**

**The earth has dropped to the bottom of the glass and the water is clear.**

**Look at the earth: several layers have formed.**

- **At the bottom of the glass there is a layer of sand and some little pebbles.**
- **In the middle is a layer of silt.**
- **Above is a thin layer of clay.**

**If the water is not clear, that is because clay is still mixed with the water.**

- **On top of the water float pieces of leaves and roots. The leaves and roots rot and form humus.**



**Thus the soil is a mixture.**

## **Sand**

**Sand is found everywhere.**

**Rain carries sand into hollows and streams. It is then white- or yellow and shining because it is clean.**

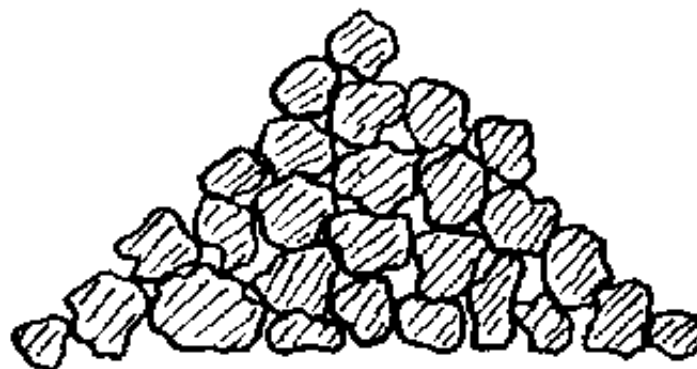
**In the soil, sand is grey and does not shine, because it is mixed with earth.**

**Let us take a closer look at some sand.**

**It is made up of little grains.**

**These grains are not all alike.**

**They are very hard. If you rub a piece of iron with them, they scratch the iron because sand is harder than iron.**



Grains of sand

**Grains of sand**

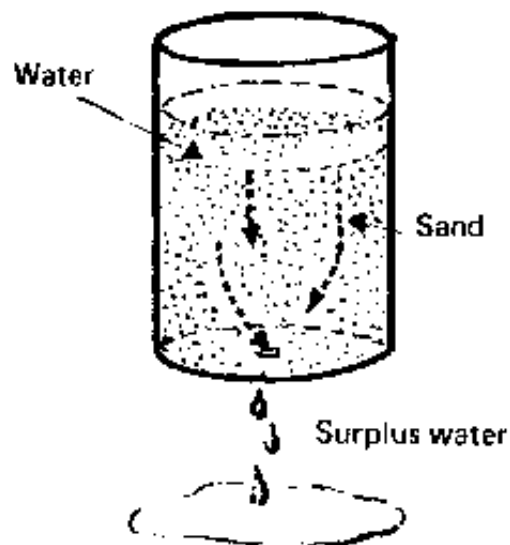
- **Sand is permeable.**

**Take a can.**

**Make a hole in the bottom of it.**

**Fill the can with sand.**

**If you pour water on to the sand, it goes through.**



**If you pour water on to the sand, it goes through**

**We say sand is permeable because it lets water through.**

• **Sand is unstable.**

**Take some dry sand in your hand and let it run gently.**

**The grains slide over each other; you cannot make a ball of sand.**



## **Sand runs like water**

- **Sand in the soil.**

**Almost all soils contain sand.**

**Soils that contain a lot of sand are called sandy soils.**

### **Sandy soils**

**Like sand itself, sandy soils are:**

- **permeable.**

**When it rains on sandy soil, the water passes through easily.**

**You can walk on sandy soil after rain.**

**Sand does not stick to the feet like clay.**

**Sand does not make mud. It is**

- **easy to work.**

**After the first rains, sandy soils are easy to work; they do not stick to tools like clay.**

## **Sandy soils are called light soils.**

- **unstable.**

**The grains of sand do not stick together.**

**In the rainy season, water easily carries them away.**

**In the dry season, the wind can lift them up and carry them a long way. In the northern savannas people speak of a sand wind.**

**Groundnuts, cassava, yams and coconut trees grow very well in sandy soils; the roots easily penetrate them.**

**But sandy soils hold water and mineral salts badly.**

## **Clay**

**Adobe walls and pots are made of earth.**

**This earth is called clay.**

**Usually the clay is found in the third soil layer: the red layer.**

**Because of this, a hole has often to be dug to get earth for bricks.**

**Usually the clay is mixed, which is what gives it a red or sometimes a brown or black colour.**

**When the clay is not mixed, it is white. This is kaolin. It is pure clay. Kaolin is used to whitewash houses.**

- **Clay and water**

**Wet clay takes whatever shape it is given, such as bricks, pots and stoneware Jars.**

**Wet clay sticks to the fingers; it makes mud.**

**When it is dry, clay forms hard lumps.**

**If you crush a lump of clay, it becomes dust finer than flour.**

**When it is dry, brown or black clay loses its water and cracks.**

**Red clay also loses its water, but does not crack.**

**Red clay can be used to make bricks and stoneware jars.**

**If dry clay is made wet again, it becomes soft and sticky.**

**If clay is baked, it becomes very hard. The stoneware jars keep their shape.**

**Clay is impermeable.**

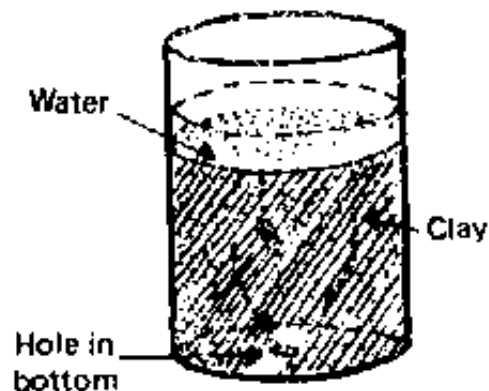
**Take a can.**

**Make a hole in the bottom of it.**

**Fill the can with clay.**

**If you pour water on to the clay, it does not go through.**

**We say clay is impermeable because it does not let water through.**



Water does not go through

**Water does not go through**

## **Clay in the soil**

**Almost all soils contain clay.**

**Soils that contain a lot of clay are called clay soils,**

### **Clay soils**

**Like clay itself, clay soils are:**

- **impermeable.**

**When it rains on a clay soil the water does not go through the soil easily. The water takes a long time to disappear. You can see the mud. So clay soils are**

- **difficult to work.**

**Wet clay sticks to the hands. It also sticks to tools.**

**For this reason clay soils are very difficult to work after the rains.**

**Clay soils are called heavy soils.**

**During the dry season clay soils become very hard. Cracks form in them.**

**The lumps are difficult to break.**



Clay soil in the rainy season.

Water remains in the soil.



Clay soil in the dry season.

Cracks form in the hard soil.

## **Water remains in the soil; Cracks form in the soil**

**Soils with much clay are difficult to work and are often too wet.**

**Soils with little clay are easily carried away by water and by the wind.**

### **Silt**

**Certain soils are neither sandy nor clay soils. They are made of silt.**

**Silt is made up of grains much smaller than sand grains.**

**Because of this, silt does not let water through as easily as sand does.**

**Silt does not form dust as fine as clay dust; because of this it is not impermeable like clay.**

**Wet silt does not stick like clay. However, silt can be made into lumps.**

**Soil that contains a lot of silt is called silty soil.**

### **Silty soils**

**Like silt itself, silty soils are:**

- **not as light as sandy soils.**

**The silt grains are closer together than the grains of sand.  
Thus water does not go through so easily; silty soils do not dry quickly.  
They are harder to work than sandy soils.  
Wind and rain do not carry them away so easily.**

- **Iess heavy than clay soils.**

**Silty soils stick less than clay soils.  
They are less hard to work.  
They do not crack when dry.**

## **Humus**

**In the soil there are dead leaves and roots.  
They rot and change into humus.  
You cannot see humus as you see sand, clay and silt.**

- **Dead plants change into humus.**

**Leaves, branches and dead trees rot in the soil.  
We say they decompose.  
Even big trees rot in a few years on wet soil.  
Many worms and insects live in a rotting tree. You can often see them.  
But other living things cannot be seen. They are too small.  
These are called microbes.  
There are very, very many of them. In a lump of earth as big as a lump of sugar  
there are millions and millions of microbes.  
They feed on leaves, on dead branches, on organic matter (see Booklet No. 2, page**



**23).**

**They also need air to breathe, and water.**

**If there is no air and water, the plant does not rot. The organic matter does not decompose.**

**Organic matter decomposed by the microbes in the soil is humus.**

**What humus does**

- **Humus makes soils richer.**

**From the soil the plant gets mineral salts (see Booklet No. 1, page 19).**

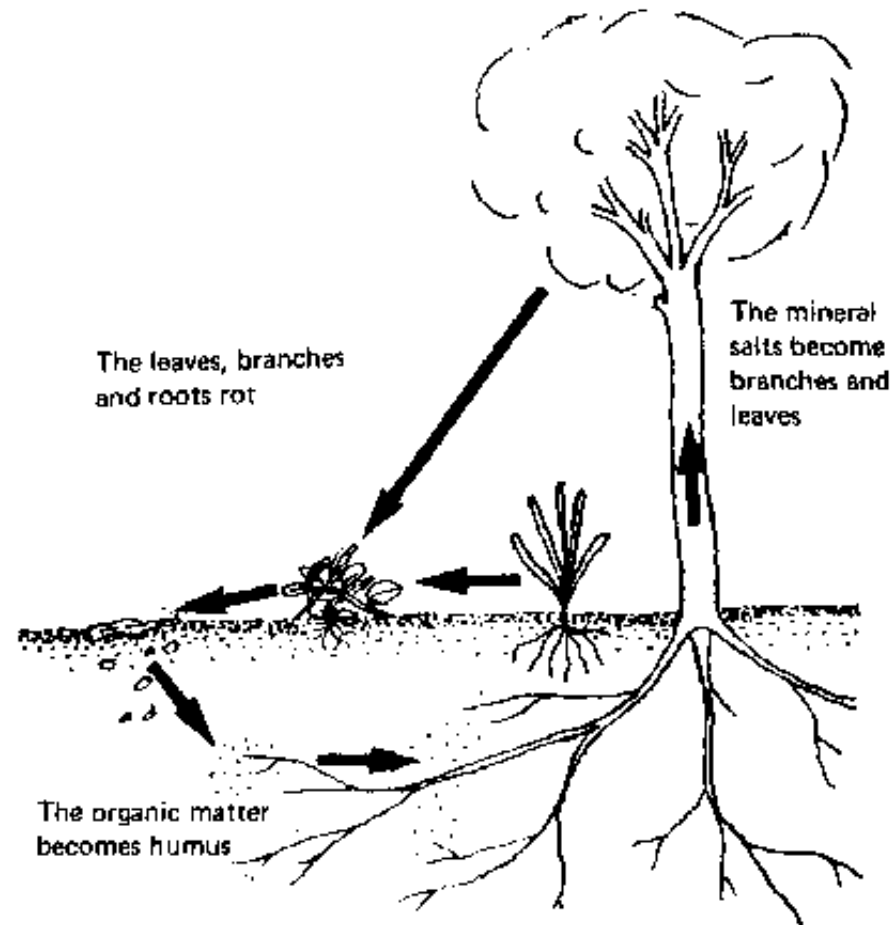
**The leaves turn the raw sap into elaborated sap (see Booklet No. 2, page 20).**

**The plant feeds on elaborated sap.**

**Wood and leaves are organic matter rich in mineral salts and carbon.**

**Organic matter rots and makes humus.**

**Humus returns to the soil the mineral salts used by the plant.**



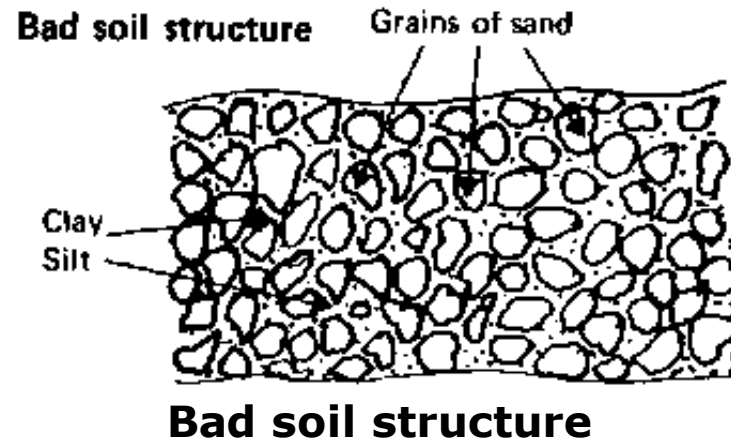
## Humus returns the mineral salts to plant

### Humus improves soils

**Heaps of bricks, cement and sheet iron do not make a house.  
To make a house they must be arranged, must be joined together.  
Sand, clay, silt and pebbles without humus do not make a good soil.  
They must be arranged, must be joined together to make a good soil.**

**The way in which sand, clay, silt and pebbles are joined together is called the soil structure.**

**It is the humus which joins together sand, clay, silt and pebbles.  
Humus is necessary for soil structure.**



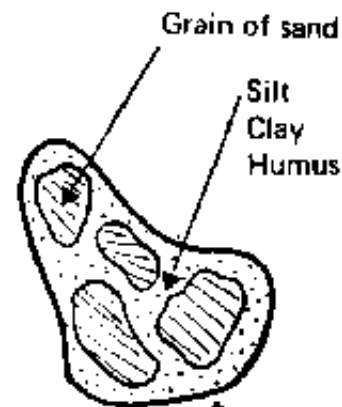
**This structure is bad because there is no humus.  
The sand, clay and silt are not joined together.  
Air and water circulate badly.  
Roots penetrate badly, breathe badly and feed badly.  
This is a bad soil structure.**

### **Good soil structure**

**The structure is good, because the sand, clay- and silt are joined together by a mixture of clay and humus.  
Air and water circulate well.  
Roots penetrate well, breathe well and feed well.**

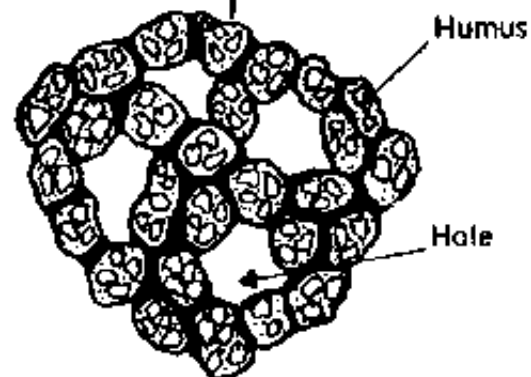
**Good soil structure**

The structure is good, because the sand, clay and silt are joined together by a mixture of clay and humus.



Air and water circulate well.

Roots penetrate well, breathe well and feed well.

**Good soil structure**

- **Humus improves sandy soils.**

**Sandy soils with humus hold water better.**

**They are less easily carried away by wind and rain.**

- **Humus improves clay soils.**

**Clay soils with humus are less hard.**

**Air and water circulate better.  
Soil without humus is not good soil.**

**Some practical advice**

- **Brush fires**

**In traditional farming; leaves and branches are burned.  
The fire destroys the organic matter, so that no organic matter is left to make humus.**

**The brush fire destroys the organic matter and changes the soil structure.  
Modern farmers do not make brush fires.**

- **Fallow**

**Cassava gives an example.**

**When cassava is harvested, the whole plant is lifted: the root for eating and the stems for replanting.**

**Almost nothing is left either on the soil or in the soil.**

**The cassava has taken humus from the soil, but the organic matter of the cassava is not returned to the soil. So the soil is less rich.**

**After growing, cassava farmers let the soil rest. They let it lie fallow.**

**During the fallow, the soil gets all the dead plants; it gets the organic matter from**

**the dead plants, and the soil improves.**

**Soil must be given organic matter. The remains of the crop, grass, manure, provide organic matter.**

- **Some crops improve the soil.**

**When you harvest a bean plant, you take only the fruits.**

**The stems, roots and leaves are left to rot on the soil.**

**They decompose and give humus.**

**Beans are a crop that leaves organic matter in the soil.**

**The beans take humus from the soil but return organic matter to it.**

- **Manure**

**Modern farmers use animal manure.**

**Manure returns to the soil the organic matter taken out by the crop.**

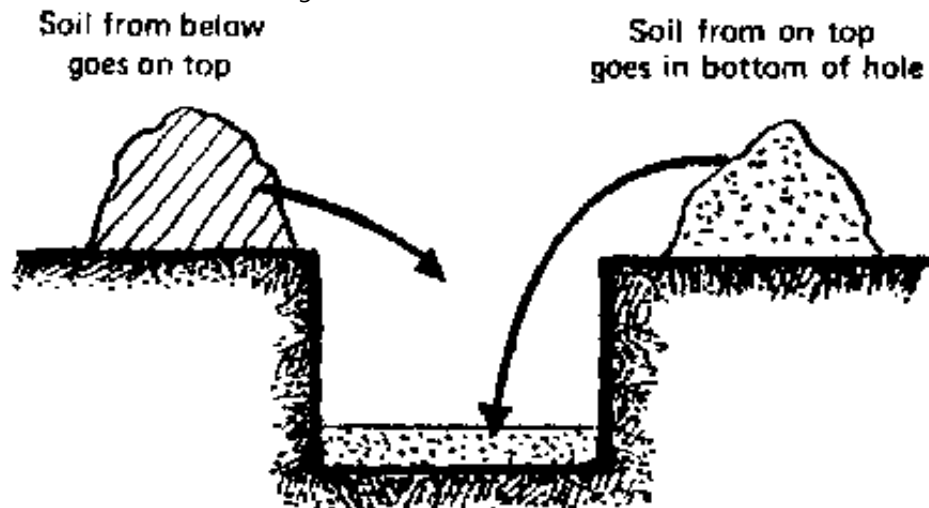
- **Do not mix the soil and the subsoil.**

**The soil is rich in humus.**

**The subsoil has no humus.**

**In tilling, the farmer should never mix the soil and the subsoil, so as to keep his soil rich.**

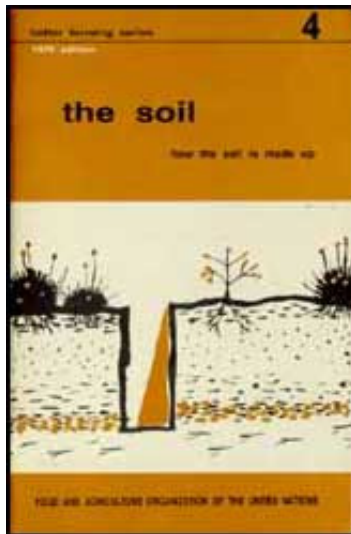
**In planting a tree, do not mix the layers of soil.**



**Do not mix the layers of soil**



[Home](#) > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)



 **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

 ***(introduction...)***

 **Preface**

 **Plan of work**

 **Why we study the soil**

**Different kinds of land**

**What is soil made of ?**

  **Air in the soil**

**Water in the soil**

 **Living creatures in the soil**

 **Suggested question paper**

## **Air in the soil**

- **Air must circulate in the soil.**

**The microbes, which are living things, need air to breathe.**

**To live, they decompose the organic matter in the soil.**

**If there is no air, the microbes cannot breathe.**

**They cannot change the organic matter into humus.**

**Roots too need air to breathe.**

**Without air, roots die.**

**They cannot go on feeding the plant (see Booklet No. 1, page 28).**

- **How to give the soil air.**

**When you work the soil, air enters into the soil.**

**If there is too much water the air does not circulate well.**

**Water prevents air entering the soil.**

**So ditches are made to get rid of the surplus water.**

**If the soil structure is good the air circulates well.**

**To get a good soil structure, there must be humus.**

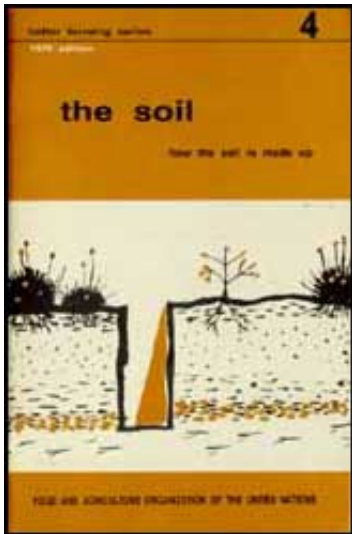
**Humus makes it easier for air to circulate in the soil.**

**XXXXXXXXXXXXXXXXXX**





[Home](#) > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)



 **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

➔  **Water in the soil**

 **(introduction...)**

 **Circulation of water in the soil**

 **Practical advice**

**Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

**Water in the soil**

• **To live, a plant needs water (see Booklet No. 2, page 26).**

**When plenty of rain falls, the harvest may be good.**

**But when very little rain falls, the harvest is bad.**

**To get a good harvest, there must be enough water.**

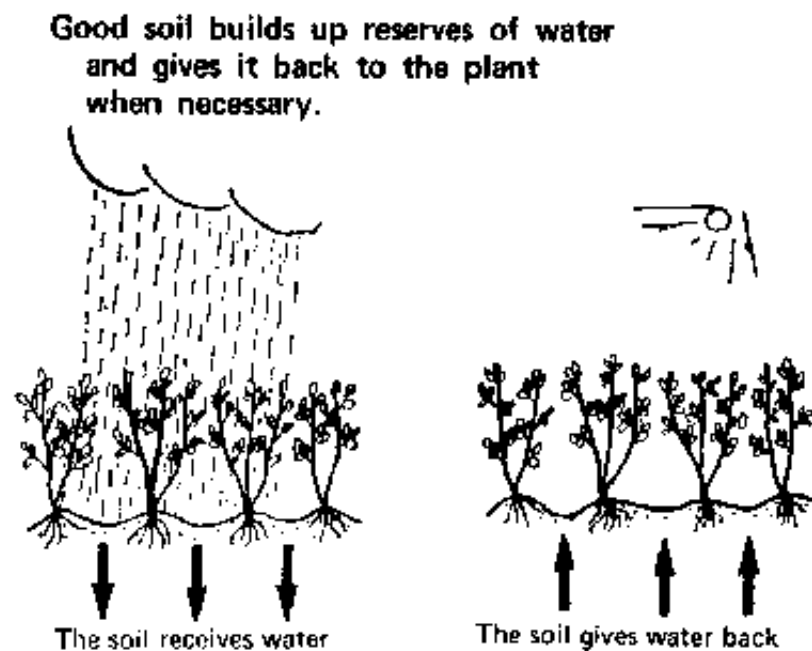
• **A plant needs water every day.**

**But it does not rain every day.**

**When it does not rain, the plant must be able to find water in the soil.**

**Thus the soil must build up reserves of water.**

**Good soil builds up reserves of water and gives it back to the plant when necessary.**



**Good soil builds up reserves of water and gives it back to the plant when necessary**

## **Circulation of water in the soil**

- **Water goes from above downward during the rainy season.**

**Water enters easily into soil which has a good structure.  
It also enters easily into light soils.**

**Water enters badly into a soil which has a bad structure, into soil which is too dense.**

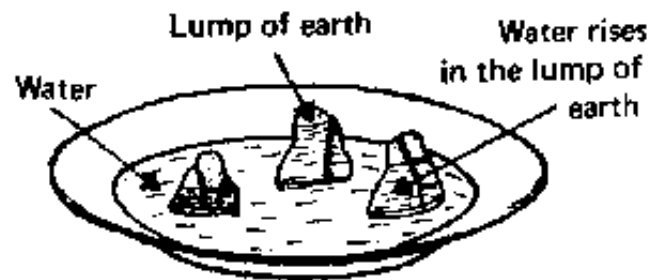
- **Water goes from below upward during the dry season.**

**Let us make an experiment.**

**Put a little water in a plate.**

**Take some lumps of earth from three different fields.**

**Put these lumps in the plate.**



**What do we see?**

**In each of the lumps the water rises higher than it is in the plate.**

**In the same way, the water rises from the wet subsoil up to the roots.**

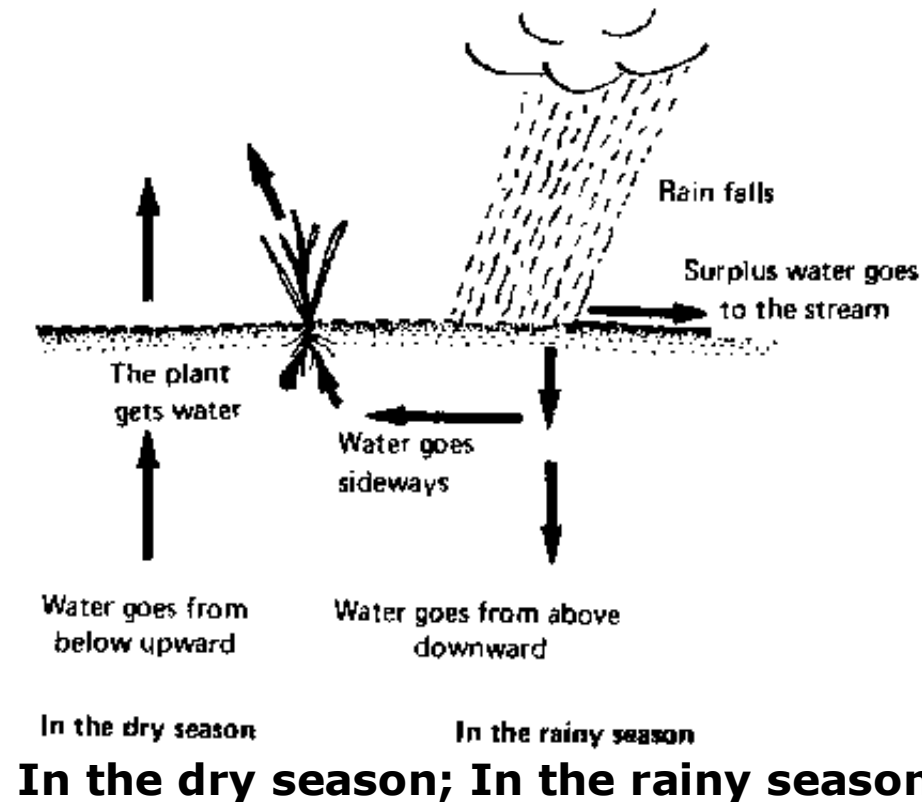
**In some lumps the water rises more quickly.**

**In clay soils the water rises more quickly than in silty soils.**

- **In soils with a good structure, water rises more quickly than in soils with a bad structure.**

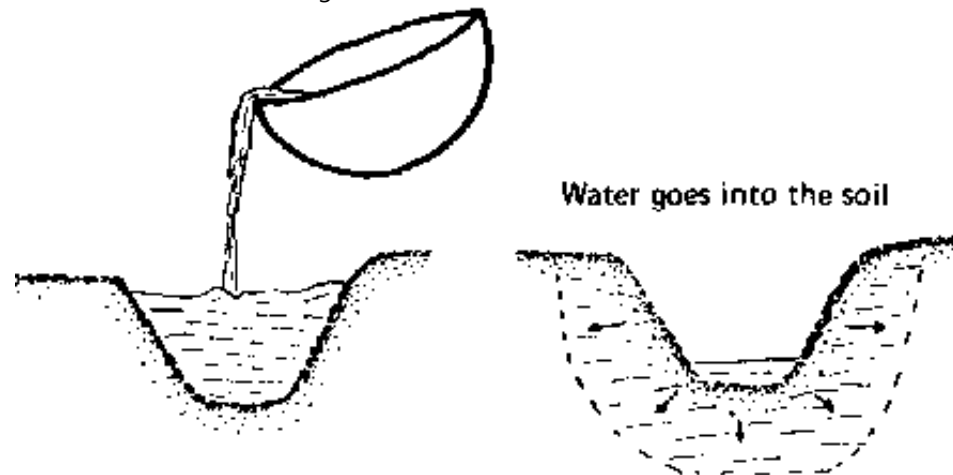
**If the structure of the soil is good, the water goes in better and stays there; the earth builds up reserves.**

**A clay soil holds water better than a sandy soil.  
 When it rains a lot the water may sink very deep into the earth.  
 If it meets an impermeable layer of soil, it remains there.  
 When we dig a well, we may find this water.**



- **Water goes sideways.**

**Let us make a hole in the earth and then pour water into the hole.  
 The water goes into the hole from above downward, but it also makes the sides of the hole wet.  
 In the soil water also goes sideways.**



**PRACTICAL ADVICE**  
**Practical advice**

## Practical advice

**To get good reserves of water in the soil, it is necessary to:**

- **improve the soil structure, by adding organic matter such as manure and the remains of plants.**

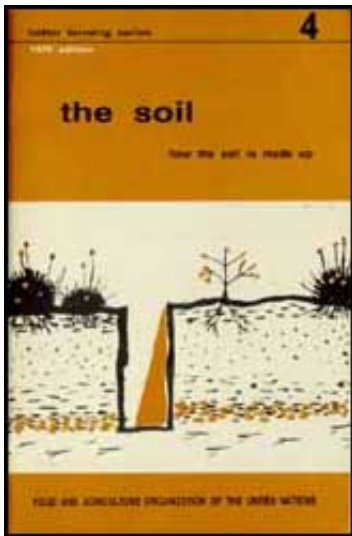
**The organic matter becomes humus.**

- **work the soil, since water does not go into soil that is too dense.**

**Working the soil at the beginning of the rainy season enables the soil to put a lot of water into reserve.**



**Home** > [ar](#).[cn](#).[de](#).[en](#).[es](#).[fr](#).[id](#).[it](#).[ph](#).[po](#).[ru](#).[sw](#)



 **Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

  **Living creatures in the soil**

 **Earthworms**

 **Rats and other animals**

 **Termites**

 **Other insects**

 **Microbes**

**Better Farming Series 04 - The Soil: How the Soil is Made up (FAO - INADES, 1976, 37 p.)**

**Living creatures in the soil**

**Earthworms**

**There are a lot of worms in the soil.**

**If we put together all the worms living in a hectare of soil (in a football field), they would make a big heap and would weigh as much as two oxen.**

**Worms eat the remains of plants that are mixed with the earth.**

**Worms also eat a lot of earth.**

**You often see on the surface of the soil the little heaps of earth that worms have left.**

**Worms make a lot of holes in the soil.**

**Worms improve the soil structure.**

**By making holes and by eating earth, worms mix humus, sand, silt and clay. They work the soil like the farmer with his hoe. So worms are very useful in the soil.**

## **Rats and other animals**

**Rats, rabbits and lots of other animals dig big holes. These animals eat roots, young stems and leaves. They are not useful.**

## **Termites**

**Termites destroy dead plants. They make holes in dead plants. For instance, they destroy wood. Part of the organic matter remains on the spot, mixes with the soil and produces humus. The rest is taken away by the termites to their nests. Termites bring up fine earth. They go deep into the soil to get fine earth. They bring it up to make their nests. When a nest is destroyed, the fine earth is mixed with the cultivated layer. This layer becomes deeper. But termite nests are sometimes very big and very hard. They are a nuisance to the farmer.**

## **Other insects**

**In the soil there are also many other insects such as ants and caterpillars. These insects disturb the soil as worms do and decompose organic matter. Certain insects eat leaves or roots and kill the plants. Insects, both good and bad, change the soil.**

## **Microbes**

**We saw that there are very many microbes in the soil. Some microbes change organic matter into humus. Other microbes bring nitrogen to plants. We know that leaves get carbon from the air (see Booklet No. 2, page 21). There is also nitrogen in the air. To grow, plants need nitrogen. But leaves cannot take nitrogen from the air. In the soil there are microbes that can take the nitrogen in the air for their own food. When these microbes die, they remain in the soil and decompose. The microbes' nitrogen is changed into mineral salts. The roots of plants can absorb these mineral salts through their root hairs (see Booklet No. 1). Everywhere in the soil there are microbes that can take in nitrogen. Some of them gather on plant roots where they form little beads, or nodules. The microbes in these little beads bring nitrogen to the plants. Not all plants have these little beads. They are found only on plants of the legume family. Groundnuts, Dolichos bean, Crotalaria, beans, peas, Stylosanthes are all legumes.**



