

Board –CBSE

Class –7th

Topic – Soil

Introduction:

Soil

The uppermost layer of the earth's crust (in which plants grow) is called soil.

- Soil is a dark brown (or black) solid material which is a mixture of rock particles of various sizes and decayed plant and animal matter called humus. Soil also contains air, water, and countless living organisms.
- Soil is essential for the existence of life on the earth. Soil supports the growth of plants (and trees) by holding their roots firmly and by supplying them with water and nutrients.

Importance of Soil

- Soil allows the growth of plants. It supplies water and nutrients that are required for the growth of plants.
- The soil is the main part of agriculture. Different types of soils support different kinds of crops. Without agriculture, food, shelter, and clothing are not possible.
- Many microorganisms live in the soil.
- Underground water is used for various purposes.

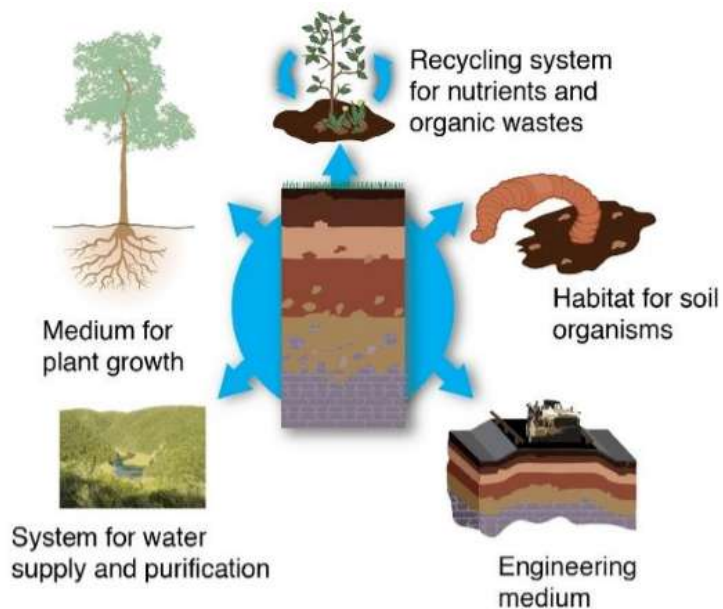


Figure 1: Importance of Soil

What pollutes the soil?

- Dumping non-biodegradable substances such as plastic bags and polythene cause soil pollution.
- Waste products from industries that contain chemicals can affect the soil adversely.
- Excess use of fertilizers and pesticides pollute the soil and decrease its fertility.

Therefore, before dumping anything waste into the soil it must be treated properly. Pesticides and fertilizers should be used in minimum quantity. Lastly, materials like plastic should be banned as we pollute the soil and affect living organisms as well.



Figure 2: What Causes Soil Pollution?

Soil Profile

The soil consists of distinct layers which are also called **Horizons of the Soil**.

The **Soil Profile** is a vertical section of the soil that depicts all the layers of the soil. The layers of the soil can be seen if we dig deep through it while creating a well or while laying the foundation of a building.

- **Humus** – The decaying matter in the soil is called **Humus**.
- **Weathering** - Soil is formed when rocks break down. This process is also called **Weathering**. The weathering of rocks takes place because of rains, flowing water, winds, temperature, and climatic conditions of a place.
- **Parent Rock** - The nature of the soil that is its texture and availability of minerals depends upon the rock from which it is formed. This rock is often called the **Parent Rock**.

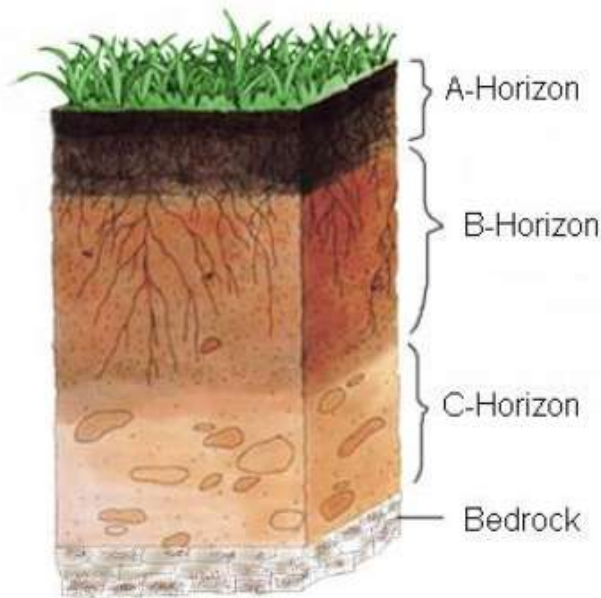


Figure 3: Soil Profile

Layers of the Soil

Horizon A

- This layer is also called the **topsoil**. It is visible to us.
- It contains large amounts of humus and minerals which makes it dark in colour.
- The soil is rich in nutrients because of the presence of humus.
- The topsoil has a soft texture and can retain water easily. That is why plants roots grow in the topsoil region.
- The topsoil is a home to many living organisms as well like insects, worms, beetles, rodents, and moles.

Horizon B or the Middle Layer

- It is the next layer of the soil that does not contain much humus.
- The minerals are found in large quantities in this layer.
- This layer has a hard texture, light colour, and is more compact than the topsoil.

Horizon C or Third Layer

- The third layer of the soil consists of small rocks with cracks in them. These rocks are partly weathered.

Bedrock

- The last layer of the soil is called the Bedrock.
- It contains large pieces of rocks that are not weathered or exposed to any winds or water.
- Bedrock cannot be dug with the help of a spade. It is very hard in texture.

How is Soil Formed?

We know that soil is formed from weathering of the parent rock and the texture of the soil depends upon the parent rocks only. This process takes time, maybe a hundred years, and then the fine soil is formed.

- In the first stage of soil formation, the soil is generally non-porous in nature. Then it slowly turns into soil having air and water in the pores.
- We can define soil as a mixture of rock particles and humus. Based on the size of the particles and the textures of the soil it can be divided into various types.

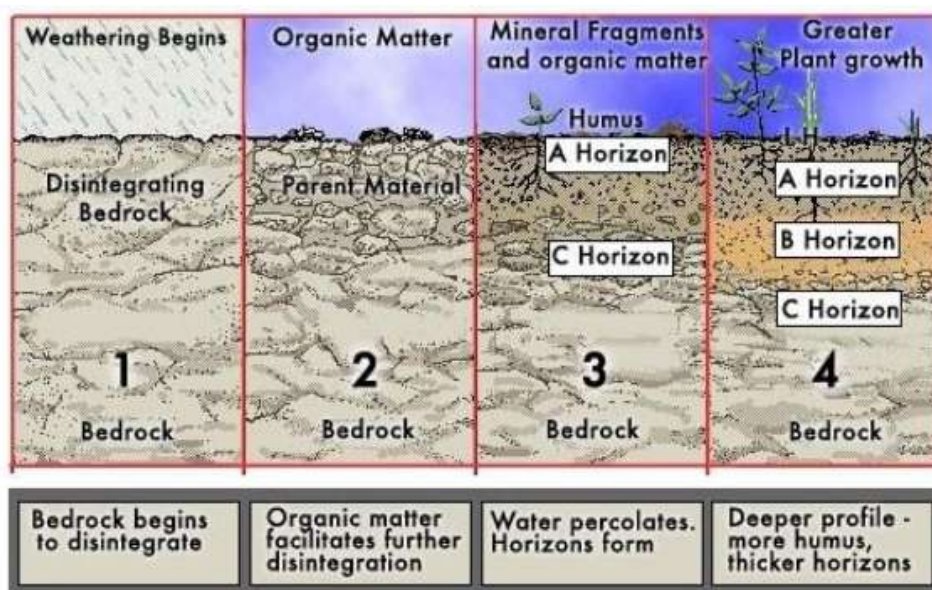


Figure 4: Formation of Soil

Types of Soil



Figure 5: Types of Soil

Sandy Soil

- Sandy soil has big particles that have large spaces between them.
- The spaces between these particles are filled with air. Hence, sandy soils are called well-aerated soils.
- Because of large spaces, water can easily penetrate through the particles of sand. Sandy soils, however, cannot hold water.
- Hence, sandy soils are light aerated and dry in nature.
- Sandy soils lack many nutrients hence do not support the diverse growth of plants.

Clayey Soil

- It consists of fine particles which have less space between them.
- Since there is not much space between the particles clayey soils are not well-aerated like sandy soils.
- The tiny gaps between the particles although allow absorption of water in the clayey soils easily

- They can hold water hence are suitable for the growth of different kinds of plants.

Loamy Soils

- Loamy soil contains a similar amount of large and small particles in them.
- They are a combination of sandy, clayey and silty soil.
- They also contain humus.
- They can hold water in appropriate amounts and therefore support the growth of plants.
- They are also called **Agricultural Soils** because of their fertility and appropriate texture.
- They contain good amounts of calcium and have a high pH level.

Silt Soil

- The silt soil particles are smaller than that of sandy soils but larger than clayey soils.
- Silt soil can hold water to some extent because of its fine quality.
- They are generally found near the water bodies like river banks and lakes.
- They are rich in nutrients, highly fertile and hence are suitable for agriculture.
- They are often mixed with other soils to improve the fertility of the soil.

Sand, Silt, and Clay

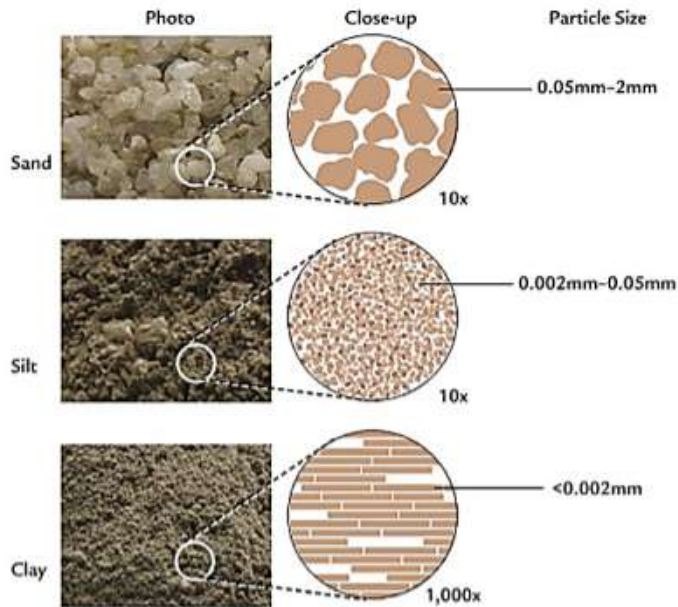


Figure 6: Particle Size in Sand, Silt, and Clay

Properties of Soils

1. Percolation of water through the Soil

Percolation can be defined as the property of the soil by which it allows the flow of water through it. The rate at which water percolates or moves through soils may vary in different kinds of soils. Some soils absorb water while others allow it to flow through them. The rate of percolation can be calculated by:

$$\text{Percolation Rate} \left(\frac{\text{mL}}{\text{min}} \right) = \frac{\text{Amount of water (mL)}}{\text{Percolation time (min)}}$$

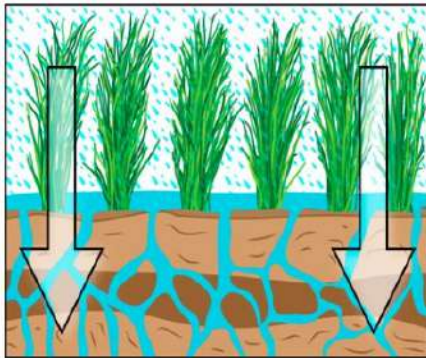


Figure 7: Percolation of Water

2. Moisture

Moisture is the amount of water that is present in the soil. Even a dry soil has some amount of moisture in the air. However, clayey soil has the highest content of moisture.

Why air above farmland appears shimmering during the daytime?

We know that soil contains water. Due to sunlight, the water from the soil begins to evaporate and turns into water vapour. This water vapour when reflects in the sunlight appears as if it is shining and hence the air above the soil makes the land look shimmery.

3. Absorption

Every soil has a water absorption capacity which depends upon how porous the soil is. Clayey and loamy soils are most porous hence can retain water in large quantities. That is why crops can grow over these soils. Sandy soils, on the other hand, do not absorb water and hence do not support much vegetation.

4. Texture

The texture is the size of particles of the soil. Different kinds of soils have a different textures.

5. Colour

Different soils have different colours as well. This is because of the minerals and nutrients present in the soil. For instance, some soils are black in colour because of the presence of humus and minerals while some soils are red in colour because they have iron in large quantities in them.



Figure 8: Soils have different Colors

6. pH of Soil

Soils can have different pH depending upon their acidic, basic or neutral nature. Based upon the pH different types of crops grow in the soil.

7. Air Content

Since soil is made up of particles of different sizes these particles can be loosely bound or tightly bound. The air often occupies the space in between these particles. This allows life to sustain in the soil such as microorganisms.

SOIL PROPERTIES

Properties	Sand	Silt	Clay
Water holding Capacity	Low	Medium to High	High
Drainage Rate	High	Low to Medium	Very Low
Cohesion Between Particles	Very Low	Medium to High	Very High
Organic material Content	Low	Medium to High	Medium to High
Shrink & Swell Potential	Low	Medium to High	High

Figure 9: Different Properties of Soils

Soil and Crops

Different kinds of soils are found in different regions because of the following factors that decide the soil structure of that place:

- temperature
- humidity
- rainfall
- sunlight
- winds

The type of crops that will grow in the soil depends upon these factors as well as the properties of a soil.

Type of Soil	Crops Grown
Sandy	Potato, Lettuce, Corn, Peppers
Clayey	Sprouts, Broccoli, Kale, Beans, Cabbage
Loamy	Apples, Carrots, Tomatoes, Cucumber

What is soil erosion?

- When the top layer of soil gets removed it is called **soil erosion**.
- Soil erosion mainly occurs when the soil is left loose without vegetation or when deforestation occurs.
- In such a situation, strong winds and flowing water or rainwater takes away the topsoil and therefore decrease its quality.
- Also, this kills the organisms living inside the soil.
- The roots of the plants and trees keep the soil together and allow several microorganisms to grow and survive there. Therefore, it is always advised to plant more trees and avoid deforestation.