

---

### Lesson at a Glance

- **Soil:** *Soil* is the substance which makes up the surface of the earth. It holds inorganic and organic substances and dead parts of plants and animals. Many living bacteria, algae, fungi, insects and worms live in the soil. If you turn a stone or a brick in moist shady place, you may find such organisms there. Soil also holds water and gases in variable proportions.
- **Soil as Natural Resource:**
  - Soil is essential for the growth of land plants. Without soil we cannot obtain products from crops and trees. Trees provide us timber for buildings, wood for fuel, paper and many other products as gum and resin.
  - Soil is also used as the raw material for making bricks and mortar, pottery, toys and other materials. Clay is used in making pots and crockery and in building huts.
  - Soil is porous. It allows water from rivers, streams and rains to percolate (trickle) through its porous body. This water accumulates beneath and forms the *water table*. We pump this water out for our use. Without soil, all surface water (river, streams and rains) would run off to the sea.
  - Soil absorbs substantial amount of the rainfall and reduces floods, especially in hilly regions. Soil also provides water in the dry season to keep plants and animals alive.
  - Thus, soil is one of the most important natural resource available to us. It is indispensable for providing food for man and animals. Soil plays a vital role in sustaining life on the earth. So, it becomes essential for us to conserve it.

- **Formation of Soil:** Soil which you see today has formed in thousands of years. It involves two processes (a) Breaking of rocks and (b) decomposition of organic matter.

(a) **Breaking of Rocks:** Factors such as air, water, temperature and humidity act on rocks and cause breaking of rocks into small pieces. This process is called *Weathering of rocks*.

Large pieces of rocks, after being broken by weathering, are transported by strong wind, rain, mountain streams and rivers. The pieces of rocks keep on rubbing against each other during transportation and break into finer sand particles.

(b) **Decomposition of Organic Matter:** In the fine soil particles formed as a result of weathering of rocks, micro-organisms, algae, insects, and worms grow and die. The dead parts of animals and plants (dead organic matter) are decomposed by microbes. The decomposed organic matter forms a dark and spongy product called *humus* which mixes with the soil. Decomposition of dead organic matter also releases locked up nutrients into the soil.

- **Soil Profile:** A vertical section through different layers of the soil is called the *soil profile*.

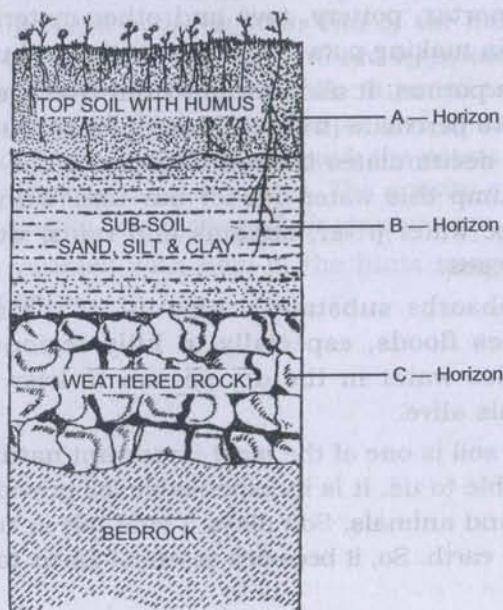


Fig. 9.1 Soil profile.

The upper crust of earth, which is capable of supporting vegetation is called soil. We usually see the surface of the soil, i.e. top soil. If you look at the sides of a trench, sides of a hill or steep river banks you will notice clearly visible different zones or layers. The side-view of soil zones or layers is known as *soil profile*.

- **Horizons:** The soil profiles show three distinct layers. These layers are called *horizons*. Each layer of soil profile differs in feel (texture), colour, depth and chemical composition.

The upper most layer of the soil is called the *A-horizon* or *top soil*. It absorbs maximum water. The top soil consists of soil particles, minerals, water and humus. The decomposed organic matter (decayed plant and animal remains) forms a spongy and brownish or blackish material known as humus. The humus makes the soil very fertile. It also increases water holding capacity of the soil.

Worms, insects, algae and fungi are found in the top soil. You will also find roots of plants in this layer. Plants get essential nutrients from the top soil through roots.

The second layer, called *B-horizon*, is more compact and harder than the top soil. It consists of sand, silt and clay. This layer contains very little organic matter. It is rich in soluble minerals and iron oxides.

The third zone, called *C-horizon*, consists of weathered rocks. It is made up of small lumps of rocks with cracks and crevices. Below the C-horizon is found the *bed-rock*.

- **Types of soil:** The mixture of rock particles and humus is called the soil. The soil is classified on the proportion of particles of various sizes.

- **Sandy soil.** The soil with about 60% of sand particles in it is called *sandy soil*. It has some clay also.

- **Clayey soil.** The soil with large amount of clay particles in it is called *clayey soil*. Its water holding capacity is the highest among all soils. It is rich in minerals.

- **Loamy soil.** The soil with a mixture of humus, sand and clay is called *loam* or *loamy soil*. The best top soil for growing plants is loamy soil because

- (i) It has good water-holding capacity.
- (ii) It holds enough air for respiration of microbes, insects and roots of plant.
- (iii) It is fit for cultivation.

• **Properties of Soil:**

- (i) **Percolation rate:** Percolate means filter or ooze gradually, especially through a porous surface. Here *percolation* means passage of water from the surface into the soil.

The rate of percolation can be calculated by using the following formula:

Percolation rate (mL / min)

$$= \frac{\text{amount of water (mL)}}{\text{percolation time (min)}}$$

Percolation of water is highest in the sandy soil and least in clayey soil.

- (ii) **Moisture in soil:** (a) Soil absorbs water and also holds water in it, which is known as *soil moisture*. The capacity of a soil to hold water is important for various crops.

- (b) **Percentage of moisture in soil:** Take 100 g of soil and dry it in the sun for two hours. Weigh the dry soil. Apply the following formula to calculate percentage of moisture.

Percentage of moisture in soil

$$= \frac{\text{wt. of moisture (g)}}{\text{original wt. of soil sample (g)}} \times 100$$

where wt. of moisture = wt. of original sample - wt. of dried soil sample

- (c) **Simmering of Air:** On a hot summer day, the air above the land seems to simmer. It happens because the vapour coming out of the soil reflect the sunlight and the air above the soil seems to simmer.

- (d) **Percentage of water absorbed** can be calculated by applying the following formula:

Percentage of water absorbed

$$= \frac{\text{amount of water absorbed (mL)}}{\text{amount of soil (gm)}} \times 100$$

• **Various types of crops are grown on different types of soil:**

- (i) Clayey and loamy soils are both suitable for growing cereals like wheat and gram. Such soils are good at retaining water.
- (ii) Soils rich in clay and organic matter and having a good capacity to retain water are very good for crops such as paddy.
- (iii) Loamy soils which drain water easily are suitable for lentils (*masoor*) and other pulses.
- (iv) Sandy Loam or Loam which drain water easily and hold plenty of air are more suitable for cotton crop.
- Clayey soil is used to make pots, toys and statues.

■ **TEXTBOOK QUESTIONS SOLVED** ■

Tick the most suitable answer in questions 1 and 2.

- Q.1.** In addition to the rock particles, the soil contains

- (i) air and water                      (ii) water and plants  
(iii) minerals, organic matter, air and water  
(iv) water, air and plants

- Ans.** (iii) minerals, organic matter, air and water.

- Q.2.** The water holding capacity is the highest in:

- (i) sandy soil                              (ii) clayey soil  
(iii) loamy soil  
(iv) mixture of sand and loam

- Ans.** (ii) clayey soil.

- Q.3.** Match the items in Column I with those in Column II:

Column I	Column II
(i) A home for living organisms	(a) Large particles
(ii) Upper layer of the soil	(b) All kinds of soil
(iii) Sandy soil	(c) Dark in colour
(iv) Middle layer of the soil	(d) Small particles and packed tight
(v) Clayey soil	(e) Lesser amount of humus

Ans.	Column I	Column II
	(i) A home for living organisms	(b) All kinds of soil
	(ii) Upper layer of the soil	(c) Dark in colour
	(iii) Sandy soil	(a) Large particles
	(iv) Middle layer of the soil	(e) Lesser amount of humus
	(v) Clayey soil	(d) Small particles and packed tight

**Q.4.** Explain how soil is formed.

- Ans.**
- The big and heavy rocks are broken into smaller pieces come on the surface of the earth.
  - Soil is formed by breaking down of rocks by the action of wind, water and climate. This process is called weathering.
  - The smaller particles of the rocks obtained due to weathering get further decomposed on long exposure to air and moisture.
  - Finally the decomposed parts of dead plants and animals get mixed up with soil formed by above processes. This gives the soil enough energy in the form of organic matter.

**Q.5.** How is clayey soil useful for crops?

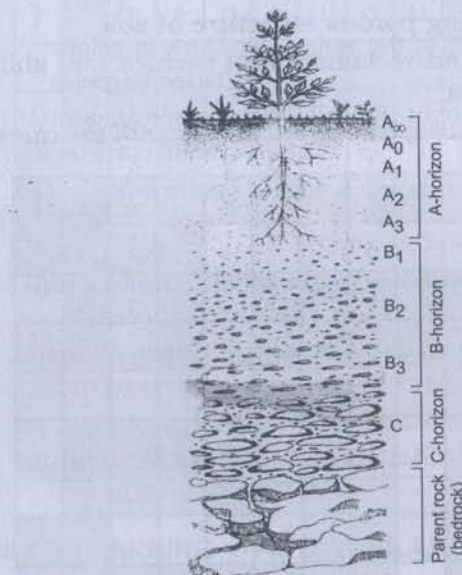
- Ans.** Clayey soil have good water retaining capacity. It is rich in humus and is very fertile. This is the reason why this soil is useful for growing crops like wheat and rice.

**Q.6.** List the differences between clayey soil and sandy soil.

Ans.	Clayey soil	Sandy soil
	(i) Proportion of fine particles is more than big particles.	Proportion of big particles is more than fine particles.
	(ii) It has less percolation rate of water.	It has more percolation rate of water.
	(iii) It has good water holding capacity.	It has poor water holding capacity.

**Q.7.** Sketch the cross-section of soil and label the various layers.

**Ans.**



**Fig. 9.2** Cross-section of soil.

**Q.8.** Razia conducted an experiment in the field related to the rate of percolation. She observed that it took 40 min for 200 mL of water to percolate through the soil sample. Calculate the rate of percolation.

**Ans.** Given that

Amount of water = 200 mL  
Time taken = 40 minutes

$$\begin{aligned} \text{Rate of percolation (mL/min)} &= \frac{\text{amount of water}}{\text{percolation time}} \\ &= \frac{200 \text{ mL}}{40 \text{ min}} \\ &= 5 \text{ mL/min} \end{aligned}$$

**Q.9.** Explain how soil pollution and soil erosion could be prevented.

**Ans.** Prevention of soil pollution:

- There should be a ban on polythene bags and plastics.
- Waste products and chemicals should be treated before they are released into the soil.
- The use of pesticides should be minimised.



justified? Discuss this problem with your parents, teachers and other experts of your area and prepare a report.

**Ans.** The soil has a capacity to replenish itself gradually, so her fear is not correct. But when the soil is used at a very higher rate than the rate of replenish of the soil, then her fear is correct. Discuss this with your teachers, parents and friends.

**Q.3.** Try to find out the moisture content of a soil sample. One method is given here.

**Activity:** Take 100 g soil. (Take help from any shopkeepers to weigh the soil.) Place it on a newspaper in the sun and allow it to dry for two hours. This activity is best done in the afternoon. Take care that the soil does not spill outside the newspaper. After drying it, weigh the soil again. The difference in the weight of the soil before and after drying gives you the amount of moisture contained in 100 g of soil. This is called the percentage moisture content.

Suppose your sample of soil loses 10 g on drying. Then  
Per cent of moisture in soil

$$= \frac{\text{wt. of moisture (g)}}{\text{Original wt. of soil sample (g)}} \times 100$$

In this example

$$\text{Per cent of moisture in soil} = \frac{10 \times 100}{100} = 10\%$$

**Ans.** Do it yourself according to the activity. Calculate the percentage of moisture by taking samples of soil from different places and compare them.