

LIFE-GIVING SOIL

Soil is a very important natural resource. Forests, crops, grass and bushes grow on the soil. If you uproot any plant you can see particles of soil sticking to its roots. Roots absorb water and minerals from the soil for the plant. Trees have a very large network of roots, which reach deep into the soil.

HOW IS SOIL FORMED?

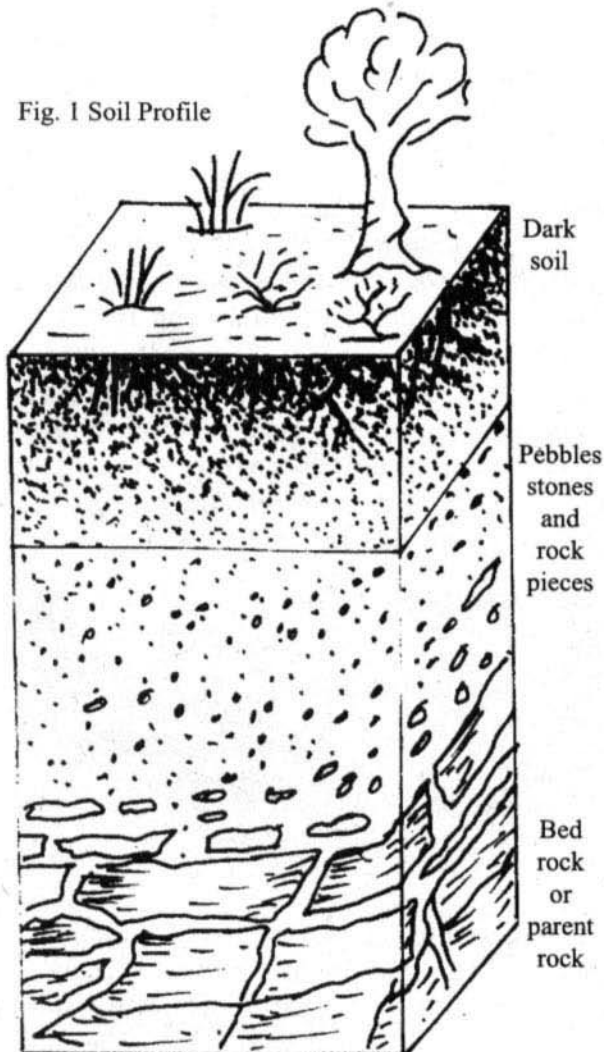
Have you ever wondered where soil comes from? As you know, there are several kinds of rocks on the surface of the earth. These

rocks are worn off due to the action of wind, water, heat and cold and they break up. This process is called 'weathering' and it is a very slow process. Gradually the rocks are turned into small stones or pebbles and these in turn are further broken into sand and soil particles.

If you look around a nearby hill slope you will find pieces of broken rock, pebbles, and large sand particles spread over that area. These have broken off from the hard rocks there. It is from these that the soil of the area is formed.

Since the soil is formed from rocks, soils usually contain all the elements that make up the rocks. For example the soil of Sehore district is made of very fine particles of deep black colour. It is derived from the black rocks, which were formed after the cooling off of volcanic lava. On the other hand in Tikamgarh district the soils are made of coarse particles with a large proportion of sand and are reddish in colour. These soils have been formed through the weathering of red sandstone found in the region.

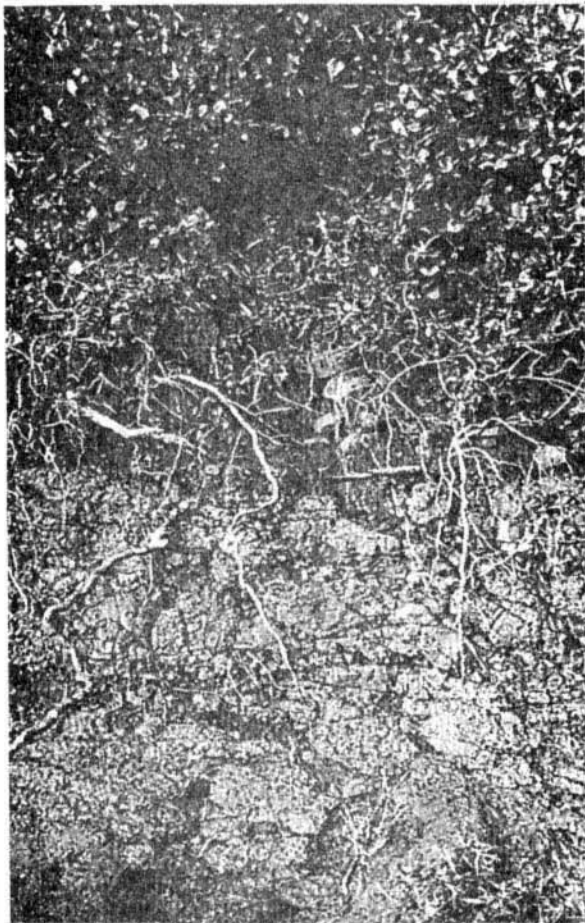
Fig. 1 Soil Profile



- Find out with the help of your teacher what kinds of rocks are found in your region, and what kinds of soils are found.

SOIL PROFILE

Have you ever seen a well or a large trench being dug? If you have seen one being dug you may have noticed that different kinds of soil come out of the same pit. You can clearly see the different kinds of soil on the sides of a freshly dug pit. Figure 1 shows the structure of soil under the ground. Look at the figure carefully.



Plants

Black soil and roots

Hard rock and deep roots

• Look at figure 2 and answer these questions:

Is the spread of the plant roots more in the upper layer of the soil or in the lower layers?

Can you see any cracks in the underlying rocks?

Do you see any root penetrating into the hard rocks?

You can do a little experiment to identify humus in any soil. Put a spoon-full of the top layer of soil in a glass of water and stir it. You will notice that a part of the soil settles down at the bottom and another part floats. Look at the portion that floats in water carefully. This is the humus.

Beneath the topsoil is to be found the 'subsoil'. The second layer of soil is lighter in colour and also harder. The humus content of this soil would be very low.

Below this layer, the proportion of fragmented rock materials in soil increases. These have been formed as the result of breaking up of the hard rocks. Its further fragmentation into finer particles results in the formation of soil. The hard rock, which lies below this layer, is known as 'parent rock'. It takes a very long time for the soil to form through the weathering of this parent rock.

Fig. 2 Photograph of soil profile

- Describe the soil, which is on the very top – in which are found roots of trees and plants.
- Describe the layer of soil, which is below the top layer.
- Describe the layer, which is right at the bottom.

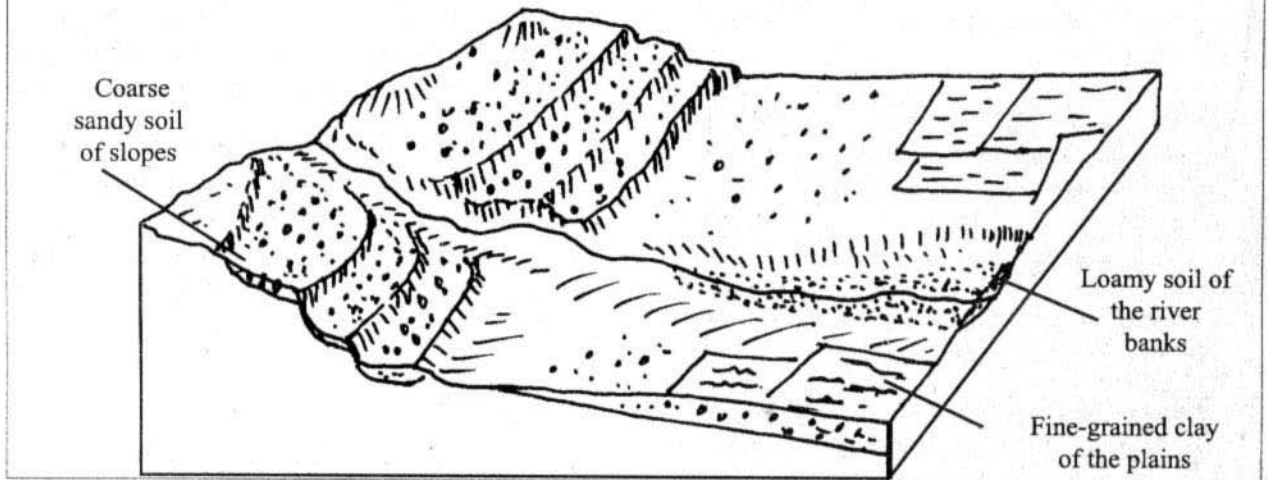
Usually a layer of dark soil is found just beneath the surface. This is the 'topsoil'. The fertility of the soil is determined by the thickness of this upper layer of the soil. If you look at it carefully, you will find that this layer contains the decomposed grasses, leaves, roots, etc. This is organic matter (derived from living things) and is known as 'humus'. Roots of the plants spread out in this upper layer. From here they draw the necessary minerals and salts for the plants.

- List the differences between the top soil and the subsoils.
- What is meant by 'parent rock'?
- Which part of the soil contains maximum plant nutrients

LAND-FORM AND SOIL

The soil is not always found at the same place as the rocks from which it has originated. Rivers, streams and winds transport the soils to other places. That is why you find a thick

Fig. 3 Land-form and soil



layer of soil in river valleys and a very thin layer on sloping hillsides. So, the soil, which is found in any area, may not have been produced from the rocks of the area. It could have been transported from other places.

If you take a tour of a village you will notice that the village has different kinds of soils in different places. Figure 3 shows the soil types in a village we had visited. This village had a rocky upland on one side and also a river flowing near it. We examined the soil near the river and found that the soil here was not sticky and had a mix of both dark clayey soil and sand. This is called loamy soil. The farmers told us that this has been deposited by the river when it floods the surroundings in the monsoon. Evidently this soil on the banks of the river has been transported from elsewhere. Looking at the crops standing on this soil we realised that it must be fertile and well suited to the crops.

- *You had read about soils in the three villages situated on hills (Pahwadi), plains (Kotgaon) and plateau (Balampur), respectively, in the previous class. In which of these villages did you find such 'loamy' soil?*

As we walk towards the rocky upland we notice that broken pieces of rock are strewn all over. There is some soil amidst these rock fragments. The soil is sandy and coarse grained.

It seems that the rainwater has washed away the finer soil particles for the soil deposit there is very thin. We could not see any crops on this land though we could see the stubble of some millet crop harvested after the rains. The farmers told us that the soil here cannot support a crop every year and they had to leave it fallow every alternate year. Only *kharif* crops (monsoon crops) can be raised on this soil, as it does not have the capacity to retain water. You may have read about similar soils in Pahwadi village on the hills.

It is a different picture altogether in the flatlands of the village. The soil here is neither coarse and sandy as in the uplands nor loamy as on the riverbanks. The soil here is made of fine-grained clay. It is fertile soil with a lot of humus, and crops like wheat grow well in it.

- *The soil of these three different places, consisted mainly of these four substances:*

1. 2. 3. 4.

All soils are made of these four substances. The proportion of one or the other substance may vary from one kind of soil to another and they are classified accordingly. If the soil had a higher proportion of sand it is called sandy soil, if it has a high proportion of very fine clay, then it is called clayey soil. If it

is composed primarily of large grained particles and clay, then it is called silt. If the proportion of sand, clay and silt are equal then it is called loamy soil.

- *Does soil vary from place to place in your village or town too? Take samples of different kinds of soil and try to classify them according to the size of their particles.*
- *Trace the uplands in figure 3 with your finger.*
- *Why is it that these uplands are covered with gravel and stones and rock fragments? What happened to the fine soils?*
- *How was the fine soil deposited along the river? What is that kind of soil called?*

Absorption of water in soil

Sandy soil absorbs water very fast while clayey soil absorbs water very slowly. Do you know why? The capacity of soil to absorb water depends on the size of soil particles. Larger the size of soil particles, greater would be the space between different particles. Water gets absorbed in this space. This space also allows water to pass (percolate) through the sand. That is why sandy soil cannot retain moisture as it allows water to pass easily. As a result there is little moisture available for crops in such soils. On this soil, farming is possible only in *kharif* or rainy season or with the help of artificial irrigation.

On the other hand, soils with finer particles are very closely joined and have very small pores, so the process of water seepage is very slow in them. Water takes longer time to pass through this soil. Once the soil gets wet, it retains the moisture for long. In such soils, farming is possible without irrigation also. This soil expands after absorbing the water and shrinks and cracks after drying up. It also becomes very hard on drying up and it gets very difficult to plough this land

when it is dry. On the other hand when it rains this soil gets very sticky and it is again very difficult to plough. That is why such soils are cultivated only in *rabi* season, that is, after the rainy season is over and before it gets too dry.

Loamy soil does not expand or get sticky after rains. It can also retain water longer than sandy soil. That is why it is considered good for agriculture and both *rabi* and *kharif* crops like rice, wheat, gram, sugarcane etc. are raised on it.

Soil Erosion

If you look at fields after rains you can see a number of small drains on the ground. If you walk along a river you can see many such drains or gullies through which water flows after the rains. These also dig out the soils and carry them to the rivers. Thus deep gashes are formed on the land. This is called soil erosion or washing off of soil by water. Soil erosion is also caused by other factors like winds, which blow the soils away. Soil erosion is very harmful, as fertile soils are lost. If you remember, these soils settle down on riverbeds and increase the threat of floods.

Conserving soils

What should we do to stop soil erosion? Observe carefully the gullies where soil has been eroded. You can see how the roots of the grass, plants, trees, etc. hold on to the soil. In fact, they bind the soil and prevent it from being washed off or blown off by winds. Absence of such vegetation tends to greatly increase soil erosion. That is why tree plantations, or even growing of grasses is undertaken in areas worst affected by soil erosion.

You may remember from class 6 that people make terraced fields in Indonesia to conserve water and soils on the hill slopes. This technique can be adopted even in ordinary fields. If farmers raise the *bunds* or boundaries of their fields, water will accumulate in the fields and slowly seep into the soil, and not flow off rapidly with the soil into the rivers. In fact,

in sloping fields, this even helps to increase the depth of the soil. You may remember reading about a farmer adopting this method in Balampur.

• *Are any steps being undertaken in your village or town to conserve soils? Discuss what is done there.*

EXERCISES

1. How is soil formed?
2. Why is the colour of soil in Sehore district black while it is reddish in Tikamgarh district?
3. Why is the topsoil dark in colour?
4. How is soil transported from one place to another?
5. Why do you find gravel and pebbles, in large quantities on hill slopes?
6. Why do you find deep and fertile soil in river valleys?
7. Describe the three layers of soils as we dig from the surface. Draw a diagram to explain your description.
8. Why does water percolate faster through sandy soil as compared to clayey soil?
9. How does thick vegetation help in reducing soil erosion?
10. What do you understand by 'humus' and 'parent rocks'?
11. Draw what you understand by

a) terraced fields	b) gully plugs	c) check dams
d) raised boundaries of fields		

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