

7. Soils



Let's recall.

- What are the different constituents of soil?
- From where do the abiotic factors become available for soil formation?
- On which factors does the variety in the soil depend?

While answering the questions above, you must have gathered some information about soil and realized some of its characteristics. Let us consider the soil in more detail.

The **parent rock**, the climate of the region, the biotic material, the slope of the land and time are factors that influence soil formation.

Factors necessary for soil formation:

Parent rock: Remember that the parent rock in a region is an important factor in soil formation. Depending on the hardness of the rock and the climate of the region, the rock gets weathered. The rock turns into powdery material which further turns into earthy material. For example, the basalt rock of the Deccan Plateau in Maharashtra turns into black soil after weathering. This soil is also referred to as 'regur' soil. Rocks like granite or gneiss in South India give rise to red soil.

Regional climate: This is also an important factor influencing soil formation. Weathering of the rock is the first step in the process of soil formation. The process of weathering depends on the climate of the region. The climate decides the intensity of weathering. That is why one and the same type of rock gives rise to different types of soils when the rock is exposed to different climates. In the dry climate of Deccan Plateau, weathering of basalt leads to the formation of black soil whereas in the humid climate of the Western Sahyadris the **leaching** of the same basalt rock leads to the formation of lateritic soil.

Biotic material: The weathering of rocks turns them into powdery material but this powdery material is not soil. To turn such powdery material into soil, it is necessary that biotic material gets mixed into it. The biotic material comes from the decomposition of the remains of the plants and animals in that region. The vegetal litters, roots of plants, remains of animals, etc. get decomposed due to water. Microorganisms, and certain other organisms help decompose the dead remains of organic materials. The biotic material thus produced gets mixed into the soils and is called '**humus**'. If the proportion of humus in the soil is greater, the soils become fertile.

The process of decomposition by living organisms takes place continuously. Now-a-days production of vermicompost is undertaken on a large scale. Try to understand the process of producing vermicompost or compost. Production of compost needs sufficient period of time and elements like organic waste, water, heat etc.

Time: Soil formation is a natural and slow process. It needs a very long period of time. To form a 2.5 cm thick layer of top soil, it takes thousands of years. From this you may understand that soils are invaluable. In the region of high rainfall and higher temperatures, the process of soil formation is faster. Comparatively, in regions of low temperatures and low rainfall soil formation takes more time.

Humans use the soil gifted by nature as a resource. It is mainly used for agricultural purpose. For getting higher production, different types of chemical fertilizers, insecticides are used profusely. However, this leads to the degradation of soils.



Always remember—

Earth doesn't mean soil :

Soil contains the powdered form of weathered rock, partially or completely decomposed organic material and innumerable microorganisms. Interactions between biotic and abiotic components in the soil go on continuously. Plants get nutrients required for their growth from the soils. Soil is a complete ecosystem. Earth is also a substance. The potter uses it as raw material. A farmer uses soil as an ecosystem.



Try this.



Figure 7.1 : Soil experiment

- ❖ Take three flower pots of the same size
- ❖ Keep one pot empty. Fill the second pot with water after closing the hole at the bottom and third pot with soil.
- ❖ Put a few seeds in all of them. (You may use aserio, peas, gram, fenugreek, wheat, green gram, coriander seeds, etc.)
- ❖ Keep all the three pots in the sun and water the empty pot and the soil-filled pot for 4-5 days. Observe and answer the following.
- What happened to the seeds put in the empty pot and the pot filled with water?

- What happened to the seeds put in the pot filled with soil?
- What do you learn from this?

Geographical explanation

An important component of the living world on the earth is 'plants'. For the production and growth of plants, soil is indispensable. They provide support to plants. Vegetation is abundant in the regions that have fertile soils, e.g., the equatorial regions. However, in the areas where the soils are not fertile, vegetation is scanty, e.g., in deserts. And where there is a shortage of soil, vegetation is not seen, e.g., in the polar areas.

Though favourable climate, availability of abundant water and sunlight are necessary for the growth of a plant, these alone are not sufficient. Fertile soils favour plant growth.



Think about it.

- ✎ Why do equatorial regions have fertile soils?
- ✎ Why is the vegetation sparse in deserts?

When man realized that sowing of seeds in the soil leads to the growth of plants and yields crops, he started using soil as a resource. Gradually, he realized that the fertile soils along the river beds give higher yields. Hence he settled in the valleys and started living there in groups. This led to the rise of ancient river valley civilizations, e.g., the Indus civilization.

For the growing population, man started producing greater amount of food crops. He realized that crop production and prosperity in agriculture mainly depends on the fertility of soil and the optimum availability of water. Hence, there emerged competition among

people to discover fertile lands and settle there. Later, for getting richer harvests he made efforts to increase the fertility of soils. In the process, use of different fertilizers became a practice, which led to record agricultural productions.

Food crops, fruits and flowers are produced according to the type of soils. Food crops like jowar and bajra are produced in the regur soils of Maharashtra Plateau while soils in Konkan, Kerala, Tamilnadu and Karnataka region produce rice. In Madhya Pradesh, potato is cultivated in regions where the soils are well drained. The local agricultural produce determines the staple diet of the people.

The regions where soils are not arable need to fulfil their food requirements through import. For example, countries like Saudi Arabia, Qatar, Oman, etc. fulfil their requirements by importing food from China, India and the USA.

The regions where soils are fertile can be self-reliant as far as the food production is concerned. Hence, human settlements get concentrated in such areas. Agro-based industries flourish in these areas at a later date. For example, sugar factories develop in the sugarcane producing areas; fruit processing industries develop in the areas of fruit production, etc. These regions later show the signs of development.

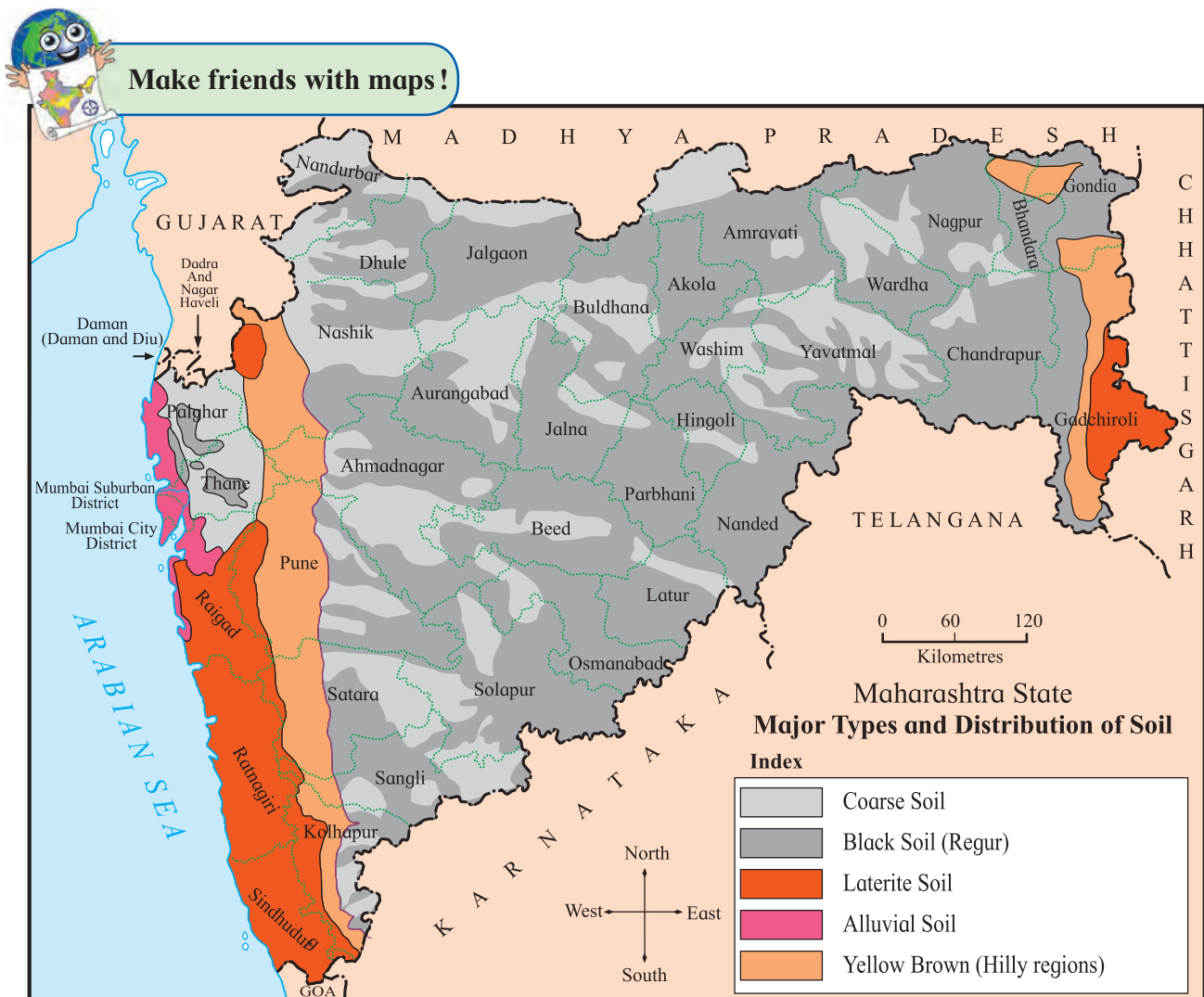


Figure 7.2 : Maharashtra –Types and Overall Distribution of Soil

Observe the map given in fig. 7.2 and answer the following questions:

- Which soil occupies most of the area in Maharashtra?
- In which areas are laterite soils found?
- Which soil is found in the river valleys of Maharashtra?
- Which soil is found in parts of the Sahyadri ranges?
- In which region is alluvial soil found?

Geographical explanation

You have studied the major soil types of Maharashtra. On the basis of the soil's colour, texture, formation process, thickness of layers, etc. we can divide the State's soils into 5 major types.

Coarse soil : This soil type is a result of weathering and low rainfall. This soil can be found in the hilltops of the western part of the plateau, e.g., Ajanta, Balaghat and Mahadeo hills. The proportion of humus is negligible in this soil.

Regur or Black soil : It is found in areas of medium rainfall in the valleys and alluvial plains of river basins. Two types of this soil are found. Dark black soil is found in the western part of Deccan Plateau while medium black soil is found in the eastern part (Vidarbha). Though it is black in colour, proportion of organic components is less in the soil.

Laterite Soil : This type of soil is found in the coastal belt of Konkan to the west of the Sahyadris and in the east of Vidarbha. In areas of very heavy rainfall, the eroded rocks get washed away in a large quantity. As a result, the parent rock lies bare open. The iron in the rock reacts with the oxygen in the air and causes chemical reactions. This gives the reddish - orange colour to the soil which is thus formed.

Alluvial soil of the coastal strip: Majority of the rivers flowing in the Konkan region are short and flow with great speed. Therefore, the alluvium brought by them gets deposited at the mouth of the rivers. This soil is found at the mouth of the rivers in the western coastal strip, e.g., the areas around Panvel -Uran coast, Dharamtar creek, etc.

Yellow brown soil : These soils are found in areas of extreme rainfall. They are not very fertile. Therefore, they are not very useful for agriculture. They are mainly found in Chandrapur, eastern part of Bhandara and parts of Sahyadri mountains.



Try this.

- ❖ Make two small heaps of soil.
- ❖ On one of them, sow wheat or any other fast growing seeds.
- ❖ Keep watering that heap for 4-9 days.
- ❖ After the saplings surface, water both the heaps with a watering can. Observe. See fig. 7.3.

(Note for Teachers : Start this activity 10 days before teaching this lesson so that the saplings grow a little.)



Figure 7.3 : Soil heap experiment

Soil erosion and degradation:

A layer of soil (top layer of soil) gets removed due to wind or water. This means that the soil gets eroded. Running water, climate and diversity in physiography are reasons of **soil erosion**. The soil quality may get lowered due to certain reasons. This is called degradation of soil. To obtain a higher agricultural yield, chemical fertilizers, insecticides, weedicides, etc. are used. The excessive spraying of chemicals and use of chemical fertilizers leads to **soil degradation**.

Excessive irrigation draws the salts from the soil upwards and makes the soil saline and then unproductive. Due to excessive use of chemicals their residues remain in the soils for many years. They become a threat to the existence of microorganisms in the soils. It leads to lowering of the humus content in the soil and the plants do not get micronutrients. If the **pH** of the soil thus gets disturbed it is a sign of soil degradation.



Figure 7.3 a : Soil degradation



Do you know ?

Geographic Indication (GI) :
Certain soils are best suited for certain crops. Hence, the crop production of that crop becomes the speciality of

that area. Such crops are given the status of Geographic Indication (GI). For example, Haapus mango of Sindhudurg, custard apple from Beed district, the oranges of Nagpur, etc.



Figure 7.3 b : Soil erosion



Figure 7.3 c : Soil erosion

Soil conservation :

Considering the importance of soils, it is necessary to conserve it. It is necessary to protect the fertile soils of farmlands from getting washed out due to rains. Soil conservation includes the works like construction of embankments and, planting trees on them, construction of gully plugs against the steep slopes etc. Such works are taken up by the Department of Soil Conservation.

Planting trees can also control the velocity of the wind. This helps reducing the erosion of soil by wind. The plant roots hold the soil and this also reduces the erosion of soil. Under soil conservation, the continuous **contour trenches**

(CCTs) are constructed along the slopes. Construction of such trenches at different heights checks the velocity of water running along the slopes and hence reduces soil erosion. The water arrested in these trenches percolates into the ground. See fig. 7.5.

The Government of Maharashtra has implemented the watershed (catchment area) development program under which constructing embankments along slopes in rural areas, introducing CCTs along steep slopes etc. are undertaken. This led to the success of the scheme 'Arrest water, let it percolate'. This has resulted in raising the ground-water levels and reducing the erosion of soil. Recently, the Government has launched the scheme called Jalayukt Shivar. Under this scheme, works like construction of farm bunds, arresting waters of small streams, connecting the streams etc. are being carried out on a large scale.

It is advisable to reduce the excessive use of chemical fertilizers and pesticides. If organic manures, vermicompost, compost are used regularly, it helps maintain the pH

Weir



Think about it.

☞ Rohit and Prateeksha noted that their field had yielded a bumper crop. But they also noted that a part of their field had a stunted growth of plants. What investigation will you suggest to them?

Figure 7.4 : Soil conservation

Afforestation



CCT



Contour Bunding



balance, increase the proportion of humus, and retain the fertility of soil.

Keeping the farmland fallow for some period and cultivating different crops alternatively is important to help retain the fertility of soils.



Look for me elsewhere!

- ☞ Class Seven - Science - Lesson Three
- ☞ Class Six - Geography- Lesson Seven Map 7.5
- ☞ Class Four- Environmental Studies - Food for All



Exercises



Q. 1. Complete the following table.

Factor / Process	Role in the formation of soils
Parent Rock	
Regional Climate	
Organic material	
Microorganisms	

Q. 2. Why do the following occur ?

- (1) To the west of Sahyadris, laterite soils are formed from basalt rock.
- (2) Humus content in the soil increases.
- (3) Soil formation process is faster in the equatorial climate.
- (4) The salinity of the soil increases.
- (5) Rice is the staple diet of the people from Konkan.
- (6) Soil erosion
- (7) Soil degradation.

Q. 3. Give information on:

- (1) Measures of soil conservation.
- (2) Organic manures
- (3) Place where you will get the information about the suitability of a soil for a particular crop.
- (4) Importance of soils for plant growth.



Q. 4. Complete the following table with reference to soil.

Action	Effect	Result (w.r.t. fertility)
Construction of embankments		
	Wind speed decreased	
Farm land is kept fallow for some period		
	Humus content increased.	
Trenches are dug across a slope.		
Litter is burnt in the farm.		
	Proves favourable for micro organisms	
	Salt content in the soil increases	
Chemical fertilizers used excessively		

Activity :

- (1) Visit a soil testing centre/laboratory and note the work that is carried out in the centre.
- (2) Prepare compost at home or in your housing society.
- (3) Visit a place where 'Arrest water, let it percolate' is being implemented. Collect information about it and make a note of it.
