Soils in India

Soil

Soil is a renewable natural resource. It supports various living organisms and is a medium of plant growth. Topsoil is the uppermost layer of the Earth. It consists of humus. Factors such as variation of temperature, parent rock, decomposers and running water affect the formation of soil.
Fertile soil is essential for agricultural production. It has the following characteristics:

- It has enough moisture to supply essential nutrients to plants.
- It should have sufficient depth to enable the plants to grow their roots.
- It is rich in nutrients such as nitrogen, potassium and phosphorus.
- It contains organic matter.

The fertility of soil can be improved by adding fertilisers.

Classification of Soil

Based on its formation, soil can be classified into the following categories:
Sedimentary or Residual Soil: When soil is formed in its original position by fragmentation of the parent rock, it is called ***in situ*** or residual soil. This includes black soil, red soil, laterite soil and desert soil.
Transported Soil: These soils are formed after being transported and deposited by various agents of erosion such as water and wind. This includes alluvial soil.
Soil in India can be classified based on their texture, thickness, age, chemical and physical properties.

Map of India showing the regions of alluvial soil

Alluvial Soil

- It is formed by the deposition of sediments brought down by the rivers. Very fine particles of soil called alluvium are deposited by the rivers in plains.
- It is also called riverine soil because it is mainly found in the river basins. It consists of sand, clay and silt known as loam.
- It has been deposited by the three Himalayan river systems—the Ganga, the Indus and the Brahmaputra. It is also found in deltas formed by rivers Mahanadi, Godavari, Krishna and Kaveri.
- Alluvial soil is classified into two types—khadar and bhangar.

Characteristics of Alluvial Soil

- It is formed by the deposition of sediments by the rivers as it flows from its upper to its lower course.
- While in the upper plains of the river valleys, the soil is coarse; it has fine soil particles in the lower river valleys.
- While the alluvial soil is dry, porous, sandy and faint yellow in the lower Ganga Valley, it becomes compact, less coarse and moist in West Bengal and Bangladesh.
- It is fertile as it is rich in minerals such as lime and potash. It is suitable for the growth of kharif and rabi crops.

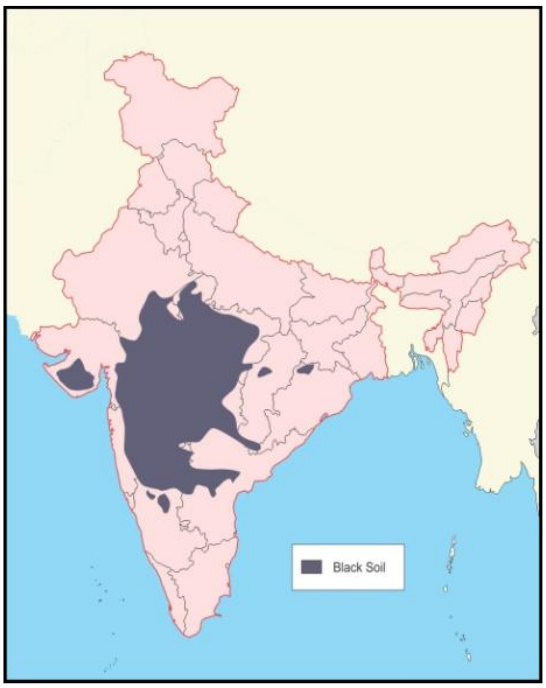
- It is however deficient in nitrogen and humus. Only the alluvial soil of the Ganga delta is rich in humus.
- The alluvial soil is alkaline in drier areas.

Differences between bangar and khadar soils

Bangar Soil	Khadar Soil
It is old alluvial soil.	It is new alluvial soil.
It has higher concentration of kankar nodules.	It has less concentration of kankar nodules.
It is comparatively less fertile.	It is more fertile as it is deposited every year during the monsoon floods.

Black Soil

This soil is also known as regur soil or black cotton soil (it is suitable for the growth of cotton). It is a residual soil as it is formed at the place of its origin.



Map of India showing the regions of black soil

Characteristics of Black Soil

- It is clayey and is finely textured soil.
- Because it is formed from weathered lava rocks, it is black.
- It has about 50% of clayey material and hence is highly water retentive.
- When the soil becomes wet, it expands making ploughing difficult. During the dry season, the black soil shrinks and develops cracks which help in air circulation.
- The soil is suitable for the cultivation of cotton, jowar, sugarcane, wheat, linseed and gram. Besides, it is suitable for the growth of oilseeds, pulses, cereals, tobacco and vegetables.
- Its subsoil has moisture content even during rainy season.

Red Soil

Ancient crystalline and metamorphic rocks of the Peninsular Plateau fragmented to form the red soil. This soil differs from place to place on the basis of the parental rocks. They are red as they contain large amounts of iron oxide. It looks yellow when it occurs in a hydrated form.

Characteristics of Red Soil

- It is porous and contains large quantities of iron oxide.
- It is shallow, loose and aerated.
- It is deficit in nitrogen, phosphorus, potassium and organic matter. Small quantities of soluble salt are present in it.
- Because it is not very fertile, fertilisers are added to it.
- The soil requires irrigation.
- Red soil is suitable for the cultivation of rice, ragi, tobacco, groundnut and potatoes.

Laterite Soil

- It is formed because of the atmospheric weathering of rocks caused by high temperature and high rainfall. This residual soil is formed by leaching because of tropical rains.
- Leaching is a process in which the nutrients of the soil percolate down into the soil because of heavy rainfall. This makes the topsoil infertile. This is also called desilication.
- There are two types of laterite soils—upland laterites and lowland laterites. The former are formed over hills and uplands. When these soils are transported by streams of rivers to lowlands, it is called lowland laterites.

Characteristics of Laterite Soil

- It is red because of the presence of iron oxide formed during leaching.
- It has a coarse texture and is porous.
- It is deficient in lime, magnesium and nitrogen.
- It is not fertile as it does not retain moisture.
- It is acidic because of the leaching of alkalis.

Mountain Soil

The mountain soil is found in the hilly mountainous regions. This includes peat, meadow, forest and hill soils.

Desert soil: It is sandy soil. It is formed because of weathering of rocks in the desert regions.

Saline and alkaline soils: It has large amount of salts and alkalis. It is formed when the tidal water accumulates in areas located near the coasts because of poor drainage.

Marshy soil: This soil is found in waterlogged areas, especially in coastal regions or near the deltas. It contains iron and organic matter.

Distribution of soils in India

Alluvial soil	Inland Alluvium: Plains of Indus, the Ganga and Brahmaputra rivers. It extends from Punjab to Bangladesh and Assam. It is also found in Haryana, Uttarakhand, Uttar Pradesh, Bihar, West Bengal and some parts of Gujarat and Rajasthan.
	Deltaic Alluvium: Deltas of Rivers Ganga–Brahmaputra, Mahanadi, Godavari, Krishna and Kaveri.
	Coastal Alluvium: Coastal strips of Peninsular India and in the plains of Gujarat.
Black Soil	Deccan lava traps including parts of Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, Rajasthan, Uttar Pradesh and some parts of Tamil Nadu.
Red Soil	Parts of Tamil Nadu, Chhattisgarh, Jharkhand, Bundelkhand, Odisha, Meghalaya, Mizoram, Manipur and Nagaland. It is found in the Plateau regions of Peninsular India.
Laterite Soil	Highland areas of the Peninsular Plateau. It is found in some parts of Madhya Pradesh, Maharashtra, Odisha, West Bengal, Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.

Soil Erosion

The wearing away (due to the action of winds) and washing down of soil cover (due to running water) is known as soil erosion.

Soil Erosion by Water

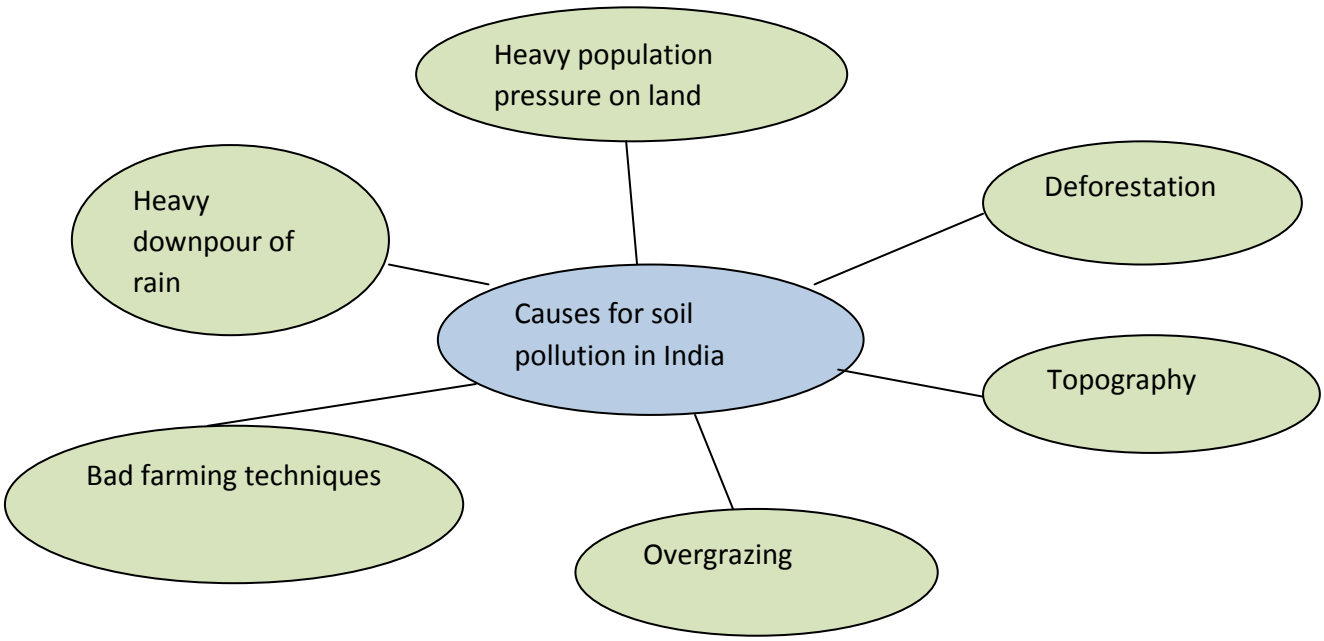
Gully Erosion: This occurs during heavy rainfall when running water cuts through the soil making deep channels. The land thus becomes unsuitable for cultivation and is known as **bad land**.
Rill Erosion: It occurs when runoff water forms small channels running down the slope. It is an intermediate stage between sheet and gully erosion.
Sheet Erosion: The washing away of the topsoil because of flowing of water as a sheet over large areas is known as sheet erosion.
Leaching: When soil is bare of any vegetation, nutrients present in the soil percolate below the soil because of heavy rainfall. It makes soil infertile.
Stream Bank Erosion: It occurs when streams of rivers change their course by cutting one bank and depositing the silt on the other bank of the river.
Sea or Shore Erosion: The powerful waves of the sea dash against the coast and break the cliff rocks. The fragmented material is then removed by the retreating sea waves. Eastern and western coasts have experienced this kind of soil erosion.

Soil Erosion Due to Human Action

- Deforestation has resulted in soil erosion. Absence of any vegetation on the land leads to washing away of the soil.
- Overgrazing by domestic animals also leads to soil erosion.

Soil Erosion by Winds

- When the wind blows away the topsoil, it is known as wind erosion.
- When a bare land is exposed to high speed winds, smaller soil particles are removed in bouncing and hopping manner along the surface of the ground. This is known as saltation.
- The rolling and sliding of larger soil particles along the ground surface is known as soil creep.



In India, the following regions are affected by soil erosion:

- Badlands of Chambal and Yamuna rivers
- Western Himalayan region
- Chotanagpur Plateau region
- Tapti Sabarmati valley region in Gujarat
- Regur soil area of Maharashtra
- Dry areas of Rajasthan, Gujarat and Haryana

Methods to Prevent Soil Erosion

Soil can be conserved in the following ways:

- **Contour Ploughing**: When one ploughs along the contour lines, it is called contour ploughing. It decreases the flow of water down the slopes and thus helps in soil conservation.
- **Terrace Farming**: When steps are cut out on the slopes of the hills making terraces, it reduces soil erosion.
- **Strip Cropping**: When strips of grass are grown between the strips of crops, they are known as strip cropping. It breaks down the speed of winds.
- **Shelter Belts**: When trees are planted in a row, it breaks the force of the winds. This method has proved very useful in the station of dunes in the deserts of western India.

Terrace farming

- **Plugging of Gullies**: The gullies made in the soil are plugged with deposition of silt during heavy rainfall.

  Soil conservation is required to prevent the loss of soil fertility and agricultural productivity. Soil erosion may also increase the risks of droughts and floods. Landslides also occur because of deforestation and soil erosion.

In India, many programmes have been undertaken to prevent soil erosion. These are

1. Integrated watershed management programme was launched during the Sixth Plan in flood-prone rivers. The programme enhances the ability of the catchment by absorbing rainwater and reducing erosion.
2. A scheme for reclamation and development of ravine area was launched in 1987–88 in Madhya Pradesh, Uttar Pradesh and Rajasthan. The scheme included afforestation and reclamation of ravines.
3. The scheme was also launched for controlling shifting cultivation in the states of Arunachal Pradesh, Mizoram, Nagaland, Tripura and Assam.
4. National Project on Development and Use of Biofertilisers and National Project on Quality Control were implemented during the Seventh Five Year Plan. It aimed at balancing the use of fertilisers.

Shelter Belt