

# SOILS IN INDIA

## Soil Profile

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Soil is the upper layer of earth in which plants grow and is usually composed a mixture of rock particles and humus.

Soil is a natural resource that is essential for life. Soil is used as a source for food, clothing, shelter, minerals, coal, bricks, mortar, pottery and porcelain. Soil provides water and minerals to plants for their growth. Thus all living organisms depend on soil.

## Soil Formation - Weathering:

Soil is formed when rocks are broken down by the action of wind, water and climate. This process is called weathering. The characteristic features of a soil depend upon the rocks from which it has been formed and the kind of plants that grow in it.

**Weathering Types:** Weathering is of two types

- Physical Weathering
- Chemical Weathering

Physical Weathering: Physical weathering is also termed as mechanical weathering, in which the composition of the original rock is unaffected. In this process the rocks and landforms are broken down into smaller pieces by physical forces like wind, frost, ice and temperature changes.

Chemical Weathering: In this process the

mineral composition of the rock get changed due to the action of chemical agents like water, oxygen, carbon dioxide, etc. This is caused when chemical agents like water reacts with minerals in rocks to form new minerals and soluble salts.

Soil Profile: If you examine the sides of a ditch that has recently been dug up or the sides of a road on a hill, you will find that the soil forms layers of particles of different sizes. You will notice that each layer is different from the other in texture, colour and chemical composition. Even the thickness of each layer is not the same.

A vertical section that shows different layers of soil is called a soil profile. Each layer is called a horizon.

Horizons are classified into 4-types. They are,

- Top soil or Horizon-A
- Middle layer or Horizon-B

- Horizon-C
- Bed rock

### Horizon-A:

The topmost layer is dark in color, and contains the remains of dead plants and animals. This rotting matter is called humus.

This layer of soil is called topsoil or A-horizon.

It is made up of humus and minerals, and makes the soil fertile.

It is soft and porous, and can retain more water than the other layers.

Many tiny organisms, such as beetles, worms and rodents, live in the topsoil. The roots of small plants do not go down very deep and can be found in the topsoil.

### Horizon-B:

The layer below the topsoil is called B-horizon or the middle layer.

The middle layer is less porous than the

topsoil, and is, therefore, harder.

It contains more minerals as compared to the topsoil, but less quantity of humus.

### Horizon-C:

It is not as compact as the two layers above it. This layer is called C-horizon.

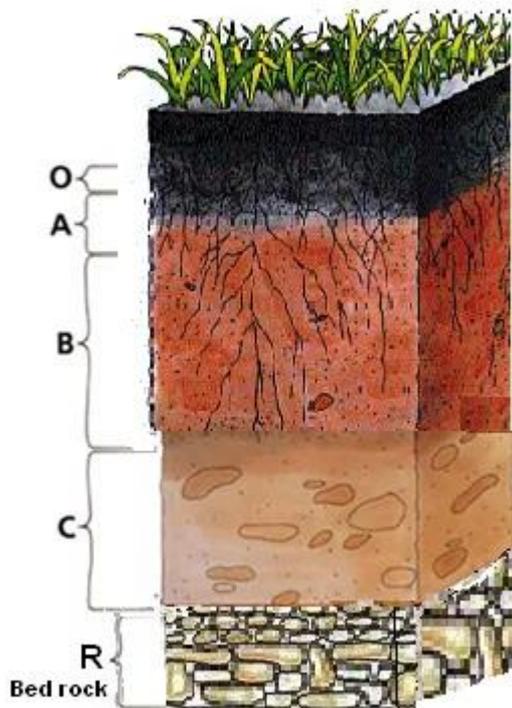
It has cracks running through it.

It is mostly made up of rocks.

### Bedrock:

The bottom-most layer in the soil profile is called bedrock.

This is far more solid in composition than the other layers and is very hard. This layer consists of the parent rock.



## Soil erosion:

Soil erosion is removal of land surface by agents like floods, wind and ice. Plant roots firmly bind to the soil. When trees are removed soil become loose and it easily carried away by wind or flowing water. Soil erosion is severe in areas of little or no surface vegetation, such as deserts and barren lands. Therefore, cutting of trees and deforestation should be prevented and efforts should be made to increase greenery.

Due to soil erosion the fertile soil is washed away. This causes a decrease in the net fertile land available for cultivation.

The major causes of soil erosion:

- Deforestation
- Overgrazing
- Floods and heavy rain fall
- Improper farming

Prevention of soil erosion:

- Afforestation – Planting large number of trees.
- Constructing dams - Floods can be controlled by constructing dams.
- Construction of embankment or mud walls around hill slopes to prevent flow of water.
- Adopting terrace farming in hilly areas - In this method the ground is cut into large steps called terraces. On each

level suitable crops are grown. This reduces the speed with which water flows down, water stops at each level. In this way higher terrace will get enough water and soil erosion is reduced.

### Soil As a Resource

Soil is formed over millions of years by weathering of rocks and minerals and also by natural agents like variation in temperature, climate, wind, glaciers and running water. The important factors that influence soil formation are Relief, Parent rock, Vegetation and other life forms and Time.

Soil is a natural, abiotic, renewable resource containing inorganic and organic matter, like humus. Soil is an essential resource that supports a majority of plant and animal life on the Earth. Based on their physical and chemical properties, age,

texture, and colour, soils in India can be classified as: alluvial, black soil, red and yellow soil, laterite, arid and forest soil.

The northern plains of India are made of fertile alluvial soils, extending to Gujarat and Rajasthan, the Ganga and the Brahmaputra river systems. Alluvial soils are also found in the eastern coastal plains and deltas of the Godavari, the Mahanadi, the Krishna and the Kaveri.

Alluvial soil is a mixture of sand, silt and clay. The new alluvial soils called Khadar found in the Gangetic plains have small particles and a fine texture. The old alluvial soils called Bangar found near the river valleys are coarser and contain more pieces of rocks called Kanker. The fertile alluvial soils are rich in potash, phosphoric acid and lime and are ideal for growing sugarcane, wheat, rice, pulses and cereal crops.

Black soil (also called regur) is found in the Deccan plateau spread over Maharashtra, Saurashtra, Malwa, Madhya Pradesh and Chhattisgarh. Black soil is rich in calcium carbonate, potash, magnesium, lime and good water retention properties. It is ideally suited for the cultivation of cotton.

Red and yellow soils are found in southern and eastern parts of Deccan plateau, southern Gangetic plains, along the Western Ghats and some parts of Orissa and Chhattisgarh. The high iron content makes this type of soil good for cultivating various types of grams, groundnuts and castor seeds. Laterite soils are found in Kerala, Karnataka, Madhya Pradesh, Tamil Nadu and parts of Orissa and Assam. Laterite soil is good for cultivation of tea, coffee and cashewnuts.

Arid soil is found in western Rajasthan and parts of Kutch region in Gujarat that receive very little rainfall. Arid soil is low in moisture and organic content and has high salt content. Arid soil is being used for cultivation of bajra and wheat crops in some places of western Rajasthan where irrigation facility is available.

Forest soils are found in the mountainous regions of the Himalayas from Kashmir to Arunachal Pradesh. Wheat, rice, sugarcane, and oil seeds are cultivated in forest soils of many parts in Jammu and Kashmir and Arunachal Pradesh.

## Soil

Soil is the thin layer of matter that covers the earth's surface, made up of organic matter, minerals and weathered rocks.

Weathered rocks are a result of the

breakdown and decay of rocks by changes in temperature, frost and actions of living organisms. This process is very slow, and is called weathering. During weathering, rock debris gets mixed with organic matter and minerals, increasing the fertility of the soil.

There are a number of factors that affect the physical and chemical properties of soil in a landform.

The primary factors are parent rock and climate in the area. The parent rock from which the soil is formed, influences its: Colour, Texture, Chemical properties, Mineral content and Permeability.

Climatic conditions, like temperature and rainfall, determine the rate of weathering and the formation of humus. The other factors that affect soil formation are:

Relief, Flora, fauna and micro-organisms and Time.

Steep slopes are more prone to soil erosion, so the layer of soil on them may not be very thick. Low-lying, flat areas retain the layers of sediments for longer periods, and thus, have a thick layer of soil. Living or organic matter, like plants, animals and micro-organisms, influence the rate of humus formation.

Humus is the degraded organic material in soil and helps increase its fertility. The process of decomposition is helped by micro-organisms that break down the organic matter when they feed on it.

The thickness of the soil profile is affected by the time taken for the soil to form. Older soil has a thicker soil profile, as over

time, several layers of soil have been deposited and formed. The types of soil found in India include: Alluvial, Black, Red, Laterite, Desert and Montane soil.

Soil erosion occurs when soil and rock particles are carried away by wind, water or ice, and deposited in another location. Soil depletion takes place when the nutrients in soil are removed and are not replaced. It affects the quality and fertility of the soil.

Soil degradation is caused by:  
Deforestation, Overgrazing, Excessive use of chemical fertilisers and pesticides, Rain wash, Landslides and Floods.

Some methods to conserve soil quality are:  
Mulching, Contour barriers, Rock dams, Terrace farming, Intercropping, Contour

ploughing and Shelter belts.

Mulching helps to trap moisture in the soil and moderate soil temperature and involves covering the bare ground between plants with a layer of organic material like straw.

Contour barriers refer to barriers of stone, grass and soil built along the contour lines of a slope. Trenches are built in front of the barriers to collect water and prevent it from flowing down the contours and washing away the soil.

Rock dams are dams created from piles of rocks that are stacked up to slow down the flow of water and prevent the formation of gullies. This curtails soil erosion.

To provide flat surfaces for farming on

steep slopes, terraces are created. This is called terrace farming. Using terraces also prevents soil erosion and surface run-off.

Intercropping is a widely used practice in China to reduce soil erosion due to rain wash. In this method, different crops are grown in alternate rows and are sown at different times.

Contour ploughing is the method of soil conservation in which the land is ploughed parallel to the contours of a slope. This creates a barrier that prevents water from flowing down the slope.

In coastal and dry areas, rows of trees are planted to control the movement of wind, thus protecting the soil from being blown away. These rows of trees act as shelter belts.

## Soil Erosion and Conservation

Soil is an essential natural resource that supports a majority of plant and animal life on the earth. It is a renewable resource.

The loss of soil cover due to natural agents like wind and running water is called soil erosion. The roots of plants and trees keep the soil moist and hold the soil particles together. Humans destroy vegetation cover by deforestation, overgrazing, construction and mining activities.

Without vegetation cover, soil becomes dry and loose, and gets easily eroded.

Defective farming methods, like ploughing up and down a slope, increase the speed of water flowing down the slope increase the rate of soil erosion.

Running water carves deep channels through clayey soils, called gully erosion, which converts the land into bad-land making it unsuitable for cultivation.

When flowing water washes away the entire sheet of top soil in a region, it is called sheet erosion. Wind erosion occurs generally in areas of little or no vegetation. It happens in places that receive scanty rainfall.

The prevention of soil erosion is called soil conservation and the ways can be:

- . Terrace farming is one way to do so and involves cutting terraces along a slope. These terraces reduce the speed of water flowing down the slope and help in soil conservation.
- . Contour ploughing is also beneficial in reducing the flow of water down the

slope and involves ploughing at right angles to the natural slope of land.

- Effective farming techniques further help in soil erosion. In plain areas, strip cropping can be used for soil conservation where strips of grass are allowed to stand between crops in large fields. These strips of grass reduce the force of wind and thus prevent soil erosion.

Planting rows of trees along farmland also help break the force of wind and help in soil conservation. Shelter belts of trees, when planted along sand dunes, help stabilise them and prevent the desert from extending into land available for cultivation.