

## 1. Details of Module and its structure

Module Detail	
Subject Name	Geography
Course Name	Geography 02 (Class XI, Semester - 2)
Module Name/Title	Soil Types
Module Id	kegy_20602
Pre-requisites	Basic Knowledge about formation of Soils
Objectives	After going through this module, the learners will be able to know about : <ul style="list-style-type: none"><li>• Different Soils Types</li><li>• Distribution of Soil Types</li></ul>
Keywords	Soil, Alluvial, Black, Red and Yellow, Saline and Alkaline, Forest, Arid and Semi Arid

## 2. Development Team

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- Soil Types

### Introduction:

In the previous module you have seen how various factors like climate, living organisms, nature of parent material, topography and time duration of soil formation determine the nature and type of soil that may be found in a region.

In this module you would learn about the different types of soils that are found on the surface of the earth with special reference to soils found in India.

You would be able to relate the occurrence of those soils in different regions and the characteristic features each of the soil types possess which in turn determine the kinds of uses those soils are generally put to.

### Introduction:

The great diversity in geological structures, landforms and climatic conditions found over the Indian landmass have played their part in the creation of many soil types distributed over the length and breadth of our country.

In the ancient documents compiled in India, soils were classified into two groups depending on their utility and were grouped as *Urvara* and *Usara*. *Urvara* translates to 'fertile soils' while *Usara* as infertile, or soils unfit for cultivation.

Since the 16<sup>th</sup> Century AD, the inherent characteristics of soils were recognized along with their external appearances. It was around that time, that soils in India were categorized on the basis of texture, colour, slope of land, moisture content among other features. On the basis of texture, sandy, clayey, silty and loamy soils were categorized. Black, yellow, red soils were classified on the basis of the colour of the soil. Such classifications were descriptive in nature. A proper scientific investigation into the nature and characteristics of the soils of our country began during the post-Independence period. Several agencies were set up to conduct scientific surveys that preceded the process of classification of soils. The Soil Survey of India, established in 1956, conducted similar surveys related to soil types. The National Bureau of Soil Survey and the Land Use Planning (NBSSLUP) under the aegis of Indian Council for Agricultural Research (ICAR) has been at the forefront in surveying and classifying soils in India. Their research and findings along with their analysis have made way for classifying soils of the country in a manner that is comparable with the international standards.



Fig 1. Logo of The National Bureau of Soil Survey and the Land Use Planning (NBSSLUP)  
<https://www.nbsslup.in/about-institute.html>

As per the United States Department of Agriculture Taxonomy (USDA) Soil Taxonomy the ICAR has classified the soils of India in the following order.

ICAR has classified the soils of India into the following order as per the USDA soil taxonomy			
Sl. No.	Order	Area (in Thousand Hectares)	Percentage
(i)	Inceptisols	130372.90	39.74
(ii)	Entisols	92131.71	28.08
(iii)	Alfisols	44448.68	13.55
(iv)	Vertisols	27960.00	8.52
(v)	Aridisols	14069.00	4.28
(vi)	Ultisols	8250.00	2.51
(vii)	Mollisols	1320.00	0.40
(viii)	Others	9503.10	2.92
<b>Total</b>			<b>100</b>

Source : Soils of India, National Bureau of Soil Survey and Land Use Planning, Publication Number 94

Fig 2: Soil Types found in India as classified by ICAR  
Source: NCERT Textbook

**Inceptisols** –are characterized by weak soil weathering causing alteration of material from its original condition. Inceptisols often occur on more resistant quartz-rich deposits where the rate and degree of weathering is minimum.

**Entisols** – Immature soils that lack the vertical development of horizons. These soils are often associated with recently deposited sediments from wind, water, or ice erosion. Given more time, these soils will develop into another soil type.

**Alfisols** - Pale, grayish brown to reddish in colour with moderate-to-high reserves of basic cations and are fertile. However, their productivity depends on moisture and temperature. They are supplemented by the moderate application of lime and other chemical fertilizers.

**Vertisols** - These are expandable clay soils , composed of more than 30 per cent clays. Vertisol clays are black when wet and become iron hard when dry. When drying, Vertisols crack and the cracks widen and deepen as the soil dries ; this produces cracks 2-3 cm wide. These are productive soils. The regur soils of India are an example of vertisols.

**Aridisols** - Ardisoil is the largest single soil order occurs in dry regions of the world. These soils occupy nearly 19 per cent of the earth’s land surface. These are pale and light near the surface, deficit in moisture. Lack in organic matter. Salinisation is the main problem of these soils. Salinisation complicates farming in Aridisols.

**Utisols** - Highly weathered forest soil, which tend to be reddish in colour because of residual iron and aluminum oxides in the A horizon. The increased precipitation in ultisol regions means greater mineral alteration, more leaching, and therefore, a lower level of fertility. Fertility is further reduced by certain agricultural practices and the effect of soil damaging crops such as cotton and tobacco. These soils need substantial management.

**Mollisols** - Most productive soils of the earth. They are rich in humus content. They have dark –coloured surface. Mollisols are soft, even when dry, with granular pads, loosely arranged when dry. These humus rich organic soils are high in basic cations and have high fertility. Soils of the steppes and prairies of the world belong to this group.

Soils are also classified on the basis of their genesis (the process of their formation), colour, composition and location.

The soils found in India have been classified into eight categories on the basis of a combination of the factors like their genesis, colour, composition and location. These categories are:

1. Alluvial Soils
2. Black Soils
3. Red and Yellow Soils
4. Laterite Soils
5. Arid Soils
6. Saline Soils
7. Peaty Soils
8. Forest Soils

In the map below you can see the distributions of the various soil types.

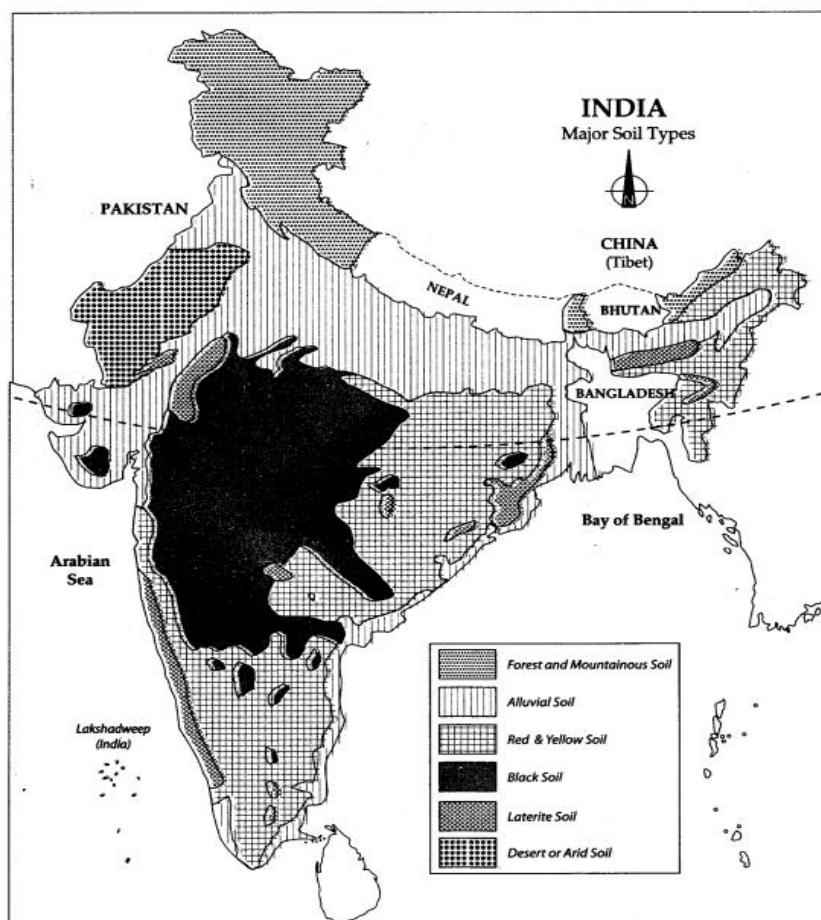


Fig 3. India – Major Soil Types



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Let us now learn about their characteristics of these soil types in details and the kind of crops the soils support.

### 1. Alluvial Soils:

Alluvial soils are the most important soil type found in India and also found over the largest area. The soils cover 7.7 lakh square kilometers which is about 24 percent of the land area of the country. Alluvial soils are made up of sediments deposited by rivers in the interior parts of India while by sea waves help in depositing them over the coastline.



Fig 4: Alluvial Soil

<https://commons.wikimedia.org/wiki/File:AlluvialPlain.JPG>

These soils are found all over the Great Plains from Punjab to Assam and also along other river valleys like the Narmada, Tapi, Mahanadi, Godavari Krishna and Cauvery among other rivers.

Alluvial soils in according to geological classification, can be divided into two types. The *Khadar* and *Bhangar*. *Khadar* soils are the new alluvial deposits which is lighter in colour and has a sandy texture while *Bhangar* soils are the older alluvium, darker in colour and possess a more clayey composition. *Khadar* is deposited near the riverbanks while *Bhangar* may be found away from the banks of the river on higher interfluve zones.



Fig 5 : Khadar and Bhangar

<https://www.differencebetween.com/difference-between-bhangar-and-vs-khadar/>

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The texture and consistency of these soils vary from sandy to loamy to silty depending on how well the soils are drained. Where sodium salts deposits get accumulated infertile *usar* soils may be found. At the foothills of the Himalayas, *bhabhar* soils are found which are characterized by pebbles and swamps may be found in the terai region.



Fig 6: Bhabhar

[https://upload.wikimedia.org/wikipedia/commons/a/a2/Spotted\\_Deer\\_at\\_Rajaji\\_National\\_Park.jpg](https://upload.wikimedia.org/wikipedia/commons/a/a2/Spotted_Deer_at_Rajaji_National_Park.jpg)

The characteristic of alluvial soil also varies according to local climatic regimes, the natural vegetation as well as surface conditions. In parts of North west, alluvial soils may have loess deposits and are sandy in nature, in Uttar Pradesh and Bihar, where flooding occurs frequently, silts dominate. In West Bengal, fine silts are found near riverbanks while in Odisha, stretches of sand occur between deltaic swamps.

Alluvial soils are usually deficient in nitrogen and humus requiring fertilizers for agricultural use. Potash and lime are found abundantly in these soils and these soils are used for all cereals, oilseeds, cotton, sugarcane and vegetables. In the eastern parts jute is an important crop. In arid regions of western parts, irrigation becomes a necessity for growing crops on these soils.

## 2. Black Soils:

Black soils are dark in colour and are locally termed as *regur* soils. These soils are suitable for growing cotton. This variety falls in the category of tropical chernozems. The parent material of the soils are Deccan lavas, gneisses and granites that are found in Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh and Rajasthan and make up over 5.15 square kilometers of land area of our country. In the southern and eastern parts of the country, in areas of high rainfall, Black soils may be found close to zones of red soils. Black soils vary in colour from deep black to chestnut. The presence of 'titaniferous magnetite' compounds of iron and magnesium gives the soil its dark black colour.



Fig 7: Regur Soil

<https://pixabay.com/photos/black-soil-regur-tropical-chernozem-286768/>

In the upland regions, the soil may be less fertile compared to the soils found in the valleys and lowlands. The soils are sticky when wet and crack up when dry and this process helps in absorption of nitrogen from the atmosphere.



Fig 8 : Cracked Black Soil

<https://pixabay.com/photos/black-soil-dry-dried-cracks-summer-253147/>

Black soils are well known for their fertility. They help in getting good yields even after years of cultivation over the same land surface. Cotton, cereals, oilseeds vegetables and citrus fruits are grown over the soils.

### **3.Red and Yellow soils:**

These soils comprising red loams and yellow earths are derived from crystalline and metamorphic rocks rich in ferromagnesium.





Fig 9: Ferro Magnesium

[https://upload.wikimedia.org/wikipedia/commons/0/0f/Amostra\\_de\\_minerio\\_de\\_ferro\\_III.jpg](https://upload.wikimedia.org/wikipedia/commons/0/0f/Amostra_de_minerio_de_ferro_III.jpg)

These soils add up to 5.18 square kilometers of area and are spread over the peninsular region including the Rajmahal Hills in the east, Jhansi in the north, Kutch in the west. Red soils are found in areas bordering the Black soils and in the slopes of areas where Black soils dominate.

Red earth and Red loams are the two varieties that are commonly found. Red loams are cloddy structures whereas Red earths have loose and friable topsoil. The soils are porous and friable and are usually free of *Kankar* (lime).



Fig 10: Kankar in Soil Profile

[https://upload.wikimedia.org/wikipedia/en/9/9b/Kankar\\_channel\\_fill.jpg](https://upload.wikimedia.org/wikipedia/en/9/9b/Kankar_channel_fill.jpg)

When soils are hydrated, they appear yellow in colour. Yellow soils are found in Western Ghats, Odisha and Chhatisgarh.





Fig 11: Red and Yellow Soil

<https://qsstudy.com/geology/red-yellow-soil-indian-subcontinent>

All types of crops can be grown on these soils. The soils are most suitable for growing rice, ragi, tobacco and vegetables. Potato and ground nut may also be found growing on the coarser textured soils and where the soil is clayey, sugar cane may be grown. These soils require irrigation facilities for growing crops.

#### **4.Laterite soils:**

Laterite soils are formed under climatic conditions of high temperature and high rainfall along with alternate dry and wet seasons.



Fig 12: Laterite Soil

[https://upload.wikimedia.org/wikipedia/commons/f/fb/Laterite\\_steengroeve\\_A.jpg](https://upload.wikimedia.org/wikipedia/commons/f/fb/Laterite_steengroeve_A.jpg)

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These soils are a result of the process of leaching of the bases like silica from the original rock. The depth of the laterite (murum) layer varies with topography. Murum in Tamil means powdered soil.

Very thin layer of topsoil is found on uplands while in the lowlands, the topsoil goes deeper.



Fig 13: Laterite soil in Uplands

[https://upload.wikimedia.org/wikipedia/commons/8/83/Laterite\\_formation\\_on\\_gneiss.\\_C\\_009.jpg](https://upload.wikimedia.org/wikipedia/commons/8/83/Laterite_formation_on_gneiss._C_009.jpg)

Laterite soils are poor in nitrogen, phosphoric acid, potash and lime. The fertility levels are low but with good manuring, crops like rice, ragi sugarcane can be grown.

Laterite soils are found on the higher levels of Sahyadris, Eastern ghats, Rajmahal hills and parts of Eastern ghats.

Laterite soils are found all over Kerala and some parts of Karnataka, Maharashtra, Andhra Pradesh, Odisha, West Bengal, Assam and Garo Hills of Meghalaya. The total area covered by these soils are about 1.26 square kilometers.

These soils are also used for making bricks used for construction of houses.



Fig 14: Laterite Quarry

[https://upload.wikimedia.org/wikipedia/commons/0/07/Laterite\\_quarry.jpg](https://upload.wikimedia.org/wikipedia/commons/0/07/Laterite_quarry.jpg)



## 5. Arid Soils

Arid soils are formed in arid and semiarid conditions found in the north western parts of the country. The area covered by these soils account for almost 1.42 square kilometers.



Fig 15: Arid Soil

[https://upload.wikimedia.org/wikipedia/commons/a/a8/Thar\\_Desert.JPG](https://upload.wikimedia.org/wikipedia/commons/a/a8/Thar_Desert.JPG)

The region around the Aravalli hills in Rajasthan and parts of Haryana and Punjab and the Rann of Kutch are areas where arid soils are found. The colour vary from red to brown; have sandy texture and are saline in nature. Due to arid climatic conditions and associated high temperature along with faster evaporation, the soils do not retain sufficient moisture while being deficient in humus.



Fig 16: Arid Soil

[https://en.wikipedia.org/wiki/Major\\_soil\\_deposits\\_of\\_India#/media/File:Chandeni\\_arid\\_land.jpg](https://en.wikipedia.org/wiki/Major_soil_deposits_of_India#/media/File:Chandeni_arid_land.jpg)

The texture is loose and friable. The soils are rich in phosphates but lack nitrogen. With the introduction of irrigation facilities, a number of crops may be grown on these soils. A good example is the Ganganagar district of Rajasthan where, irrigation with the help of canals have helped the area become a leading producer of cereals and cotton.



Fig 17: Ganga Canal, Rajasthan

[https://upload.wikimedia.org/wikipedia/commons/7/7f/Gang\\_Canal\\_Rajasthan\\_Sivender.jpg](https://upload.wikimedia.org/wikipedia/commons/7/7f/Gang_Canal_Rajasthan_Sivender.jpg)

## 6. Saline Soils:

In arid and semiarid areas of Rajasthan, Punjab, Haryana, Uttar Pradesh and Bihar. Alkaline encrustations of sodium, calcium and magnesium are found in these soils. The saline soils occupy 1.70 lakh square kilometers of the land surface of the country in areas of dry climatic conditions and poor drainage characteristic of waterlogged and swampy areas.



Fig 18: Saline Soil

[https://upload.wikimedia.org/wikipedia/commons/9/9a/Pannonic\\_saline\\_formation\\_on\\_the\\_Tisza\\_plain%2C\\_with\\_large\\_tussocks\\_of\\_Puccinellia\\_limosa.jpg](https://upload.wikimedia.org/wikipedia/commons/9/9a/Pannonic_saline_formation_on_the_Tisza_plain%2C_with_large_tussocks_of_Puccinellia_limosa.jpg)



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Saline soils are locally termed as *reh*, *kallar* and *usar* and is generally infertile and so are unfit for agricultural use. The salt deposits are usually found on the topmost layer of the soil. This occurs due to the process of capillary transfer of saline and alkaline solutions from the lower parts of the soil to the upper layers where canal irrigation is dominant or in places where the water table is situated at a relatively higher level in the subsoil of the coastal areas like Maharashtra and Tamil Nadu. These soils are quite common in western Gujarat, deltas of eastern coastal plains and the Sundarbans delta of West Bengal. In the Rann of Kutch, the monsoon winds laden with sea salts are deposit the salt particles on the soil and forms a crust on the surface.



Fig 19: Rann of Kutch

[https://upload.wikimedia.org/wikipedia/commons/a/a5/The\\_great\\_rann\\_of\\_kutch\\_with\\_lot\\_of\\_tourists.jpg](https://upload.wikimedia.org/wikipedia/commons/a/a5/The_great_rann_of_kutch_with_lot_of_tourists.jpg)

The intrusion of sea water into the deltas also result in the formation of saline soils. In many places, as a result of over irrigation, fertile soils are also turning into saline soils. In Punjab and Haryana, farmers are advised to add gypsum into the soil to check the growing problem of salinity.

### **7. Peaty Soils:**

Peaty soils develop in humid areas where large amounts of organic matter get deposited over the soil along with soluble salts. Peaty saline soils locally termed as *kari* may be found in western parts of Kerala.



Fig 20: Acid sulphate Soil

[https://www.wikiwand.com/en/Acid\\_sulfate\\_soil](https://www.wikiwand.com/en/Acid_sulfate_soil)

Though highly saline, they have a considerable higher content of organic matter and lack in phosphate and potash. Marshy soils are commonly found in the deltaic parts of Tamil Nadu, Odisha and West Bengal and Almora district of Uttarakhand.

### 8. Forest Soil:

Forests soils account for 2.85 lakh square kilometers of land area of our country. These soils are found in higher elevations like the Himalayan region and the Sahyadris and the Eastern Ghats. Forest soils have a heavy accumulation of organic matter due to decomposition of leaves and other parts of plants in the forested regions. Humus predominates in forest soils, and in the upper reaches of the slopes the soils are often acidic in nature.



Fig 21: Forest Soil

[https://upload.wikimedia.org/wikipedia/commons/6/6f/Exposed\\_soil\\_profile\\_on\\_Matley\\_Heath%2C\\_New\\_Forest\\_-\\_geograph.org.uk\\_-\\_116395.jpg](https://upload.wikimedia.org/wikipedia/commons/6/6f/Exposed_soil_profile_on_Matley_Heath%2C_New_Forest_-_geograph.org.uk_-_116395.jpg)

The forest soils in the hilly tracts of Meghalaya and Assam have a high content of nitrogen and organic matter. The terai region on the foothills of the Himalayas are also covered with forest soils. Podzols dominate in the North Western Himalayan region. In Sahyadris and Eastern Ghats, brown soils and laterites are found while in Darjeeling district of West Bengal, have well decomposed humus.

Forest Soils are deficient in potash, phosphorus and lime and require fertilizers for cultivating on the soils. Tea and Coffee plantations, spices and temperate fruits are grown on these soils.