



GEOGRAPHY

Major Soil Types of India

**Based on GROUP-IV Examination syllabus -prepared by
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NOTE: Dear kalam achievers kindly read at least 4 to 5 times you can easily understand..

Major Soil Types of India

- Geologically, Indian soils can broadly be divided into soils of peninsular India and soils of extra-peninsular India.
- The soils of Peninsular India are formed by the decomposition of rocks in situ, i.e. directly from the underlying rocks.
- Soils of Peninsular India are transported and re-deposited to a limited extent and are known as **sedentary soils**.
- The soils of the Extra-Peninsula are formed due to the depositional work of rivers and wind. They are very deep. They are often referred to as **transported or azonal soils**.

Major groups:

- **Alluvial soils,**
- **Black soils,**
- **Red soils,**
- **Laterite and Lateritic soils,**
- **Forest and Mountain soils,**
- **Arid and Desert soils,**
- **Saline and Alkaline soils and**
- **Peaty and Marshy soils.**

Alluvial Soils

- Alluvial soils are formed mainly due to silt deposited by Indo-Gangetic-Brahmaputra rivers. In coastal regions some alluvial deposits are formed due to wave action.
- Rocks of the Himalayas form the parent material. Thus the parent material of these soils is of transported origin.
- They are the largest soil group covering about 15 lakh sq km or about **6 per cent** of the total area.
- They support more than 40% of the India's population by providing the most productive agricultural lands.

Characteristics of Alluvial Soils

- They are **immature and have weak profiles** due to their recent origin.
- Most of the soil is Sandy and clayey soils are not uncommon.
- Pebbly and gravelly soils are rare. Kankar (calcareous concretions) beds are present in some regions along the river terraces.
- The soil is **porous** because of its loamy (equal proportion of sand and clay) nature.
- Porosity and texture provide good drainage and other conditions favorable for agriculture.
- These soils are constantly replenished by the recurrent floods.

Distribution of Alluvial Soils in India

- They occur all along the Indo-Gangetic-Brahmaputra plains except in few places where the top layer is covered by desert sand.
- They also occur in deltas of the Mahanadi, the Godavari, the Krishna and the Cauvery, where they are called deltaic alluvium (coastal alluvium)
- Some alluvial soils are found in the Narmada, Tapi valleys and Northern parts of Gujarat.

Crops in Alluvial Soils

- They are mostly flat and regular soils and are best suited for agriculture.
- They are best suited to irrigation and respond well to canal and well/tube-well irrigation.
- They yield splendid crops of rice, wheat, sugarcane, tobacco, cotton, jute, maize, oilseeds, vegetables and fruits.

Black Soils

- The parent material for most of the black soil are the volcanic rocks that were formed in the Deccan Plateau (Deccan and the Rajmahal trap).
- In Tamil Nadu, gneisses and schists form the parent material. The former are sufficiently deep while the later are generally shallow.
- These are the region of high temperature and low rainfall. It is, therefore, a soil group typical to the dry and hot regions of the Peninsula.

Colour of Black Soils

- The black colour is due to the presence of a small proportion of **titaniferous magnetite or iron and black constituents of the parent rock.**
- In Tamil Nadu and parts of Andhra Pradesh, the black colour is derived from crystalline schists and basic gneisses.
- Various tints of the black colour such as deep black, medium black, shallow black , a mixture of red and black may be found in this group of soils.

Chemical Composition of Black Soils

- 10 per cent of alumina,
- 9-10 per cent of iron oxide,
- 6-8 per cent of lime and magnesium carbonates,
- Potash is variable (less than 0.5 per cent) and
- **phosphates, nitrogen and humus are low.**

Distribution of Black Soils

- Spread over **46 lakh sq km (16.6 per cent of the total area)** across Maharashtra, Madhya Pradesh, parts of Karnataka, Telangana, Andhra Pradesh, Gujarat and Tamil Nadu.

Crops in Black Soils

- These soils are best suited for cotton crop. Hence these soils are called as **regur and black cotton soils.**
- Other major crops grown on the black soils include wheat, jowar, linseed, virginia tobacco, castor, sunflower and millets.
- Rice and sugarcane are equally important where irrigation facilities are available.
- Large varieties of vegetables and fruits are also successfully grown on the black soils.
- This soil has been used for growing a variety of crops for centuries without adding fertilizers and manures, with little or no evidence of exhaustion.

Red Soils

- Red soils along with its minor groups form the **largest soil group of India.**
- The main parent rocks are crystalline and **metamorphic rocks** like acid granites, gneisses and quartzites.

Characteristics of Red Soils

- The texture of these soils can vary from sand to clay, the majority being loams.
- On the uplands, the red soils are poor, gravelly, and porous. But in the lower areas they are rich, deep dark and fertile.

Chemical Composition of Red Soils

- They are **acidic** mainly due to the nature of the parent rocks. The alkali content is fair.
- They are poor in lime, magnesia, **phosphates, nitrogen** and humus.
- They are fairly rich in **potash and potassium**.

Color of Red Soils

- The red colour is due to the presence of **iron oxide**.
- When limestone, granites, gneisses and quartzites are eroded the clay enclosed within the rocks remains intact with other forms of non-soluble materials.
- In oxidizing conditions, rust or iron oxide develops in the clay, when the soil is present above the water table giving the soil a characteristic red colour.
- The colour is more due to the **wide diffusion** rather than high percentage of iron oxide content.

Distribution of Red Soils

- These soils mostly occur in the regions of low rainfall.
- They occupy about 3.5 lakh sq km (10.6 per cent) of the total area of the country.
- These soils are spread on almost the whole of **Tamil Nadu**.
- Other regions with red soil include parts of Karnataka, south-east of Maharashtra, Telangana, Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Odisha, Chota Nagpur plateau; parts of south Bihar, West Bengal, Uttar Pradesh; Aravalis and the eastern half of Rajasthan (Mewar or Marwar Plateau), parts of North-Eastern states.

Crops in Red Soils

- The red soils are **mostly loamy** and hence **cannot retain water** like the black soils.
- The red soils, with the proper use of fertilizers and irrigation techniques, give good yield of cotton, wheat, rice, pulses, millets, tobacco, oil seeds, potatoes and fruits.

Laterite – Lateritic Soils

- Laterite soils are mostly the **end products of weathering**.

- They are formed under conditions of **high temperature and heavy rainfall** with alternate wet and dry periods.
- Heavy rainfall promotes **leaching (nutrients gets washed away by water)** of soil whereby lime and silica are leached away and a soil rich in oxides of iron and aluminium compounds is left behind.
- ‘Laterite’ means brick in Latin. They harden greatly on losing moisture.
- Laterite soils are red in colour due to little clay and more gravel of red sand-stones.

Chemical composition of Laterite – Lateritic Soils

- Laterite soils are rich in **bauxite or ferric oxides**.
- They are very **poor** in lime, magnesia, **potash and nitrogen**.
- Sometimes, the **phosphate** content may be **high** in the form of **iron phosphate**.
- In wetter places, there may be higher content of humus.

Distribution of Laterite – Lateritic Soils

- Laterite soils cover an area of 2.48 lakh sq km.
- Continuous stretch of laterite soil is found on the summits of Western Ghats at 1000 to 1500 m above mean sea level, Eastern Ghats, the Rajmahal Hills, Vindhyan, Satpuras and Malwa Plateau.
- They also occur at lower levels and in valleys in several other parts of the country.
- They are well developed in south Maharashtra, parts of Karnataka etc. and are widely scattered in other regions.

Crops in Laterite – Lateritic Soils

- Laterite soils lack fertility due to **intensive leaching**.
- When manured and irrigated, some laterites are suitable for growing **plantation crops** like tea, coffee, rubber, cinchona, coconut, arecanut, etc.
- In some areas, these soils support **grazing grounds and scrub forests**.

Economic value of Laterite – Lateritic Soils

- Laterite and lateritic soils provide **valuable building material**.
- These soils can be easily cut into cakes but hardens like iron when exposed to air.
- As it is the end-product of weathering, it cannot be weathered much further and is durable.

Forest – Mountain Soils

- These soils occupy about 2.85 lakh sq km or 8.67% of the total land area of India.
- They are mainly **heterogeneous soils** found on the hill slopes covered by forests.
- The formation of these soils is mainly governed by the characteristic deposition of organic matter derived from forests and their **character changes with parent rocks**, ground-configuration and climate.
- Consequently, they **differ greatly even if they occur in close proximity to one another**.

Distribution of Forest – Mountain Soils

- In the Himalayan region, such soils are mainly found in valleys, less steep and north facing slopes. The south facing slopes are very steep and exposed to denudation and hence do not support soil formation.
- Forest soils occur in Western and Eastern Ghats also.

Chemical properties of Forest – Mountain Soils

- The forest soils are very **rich in humus**.
- They are deficient in potash, phosphorus and lime.
- They require good deal of fertilizers for high yields.

Crops in Forest – Mountain Soils

- They are suitable for **plantations** of tea, coffee, spices and tropical fruits in peninsular forest region.
- Wheat, maize, barley and temperate fruits are grown in the Himalayan forest region.

Arid – Desert Soils

- The desert soils consist of **Aeolian sand** (90 to 95 per cent) and clay (5 to 10 per cent).
- They cover a total area of 1.42 lakh sq km (4.32%).
- The presence of sand inhibits soil growth. Desertification of neighboring soils is common due to intrusion of desert sand under the influence of wind [Aeolian sand].

Distribution of Arid – Desert Soils

- Occur in arid and semi-arid regions of Rajasthan, Punjab and Haryana. The sand here is blown from the Indus basin and the coast by the prevailing south-west monsoon winds.

- Sandy soils without clay factor are also common in coastal regions of Odisha, Tamil Nadu and Kerala.

Chemical properties of Arid – Desert Soils

- They are usually poor in organic matter.
- Some desert soils are **alkaline** with varying degree of soluble salts like **calcium carbonate**.
- Calcium content increases downwards and the subsoil has ten times more calcium.
- The **phosphate** content of these soils is as **high** as in normal alluvial soils.
- Nitrogen is originally low but some of it is available in the **form of nitrates**.

Crops of Arid – Desert Soils

- Phosphates and nitrates make these soil fertile wherever moisture is available.
- There is a possibility of reclaiming these soils if proper irrigation facilities are available.
- In large areas, only the drought resistant and salt tolerant crops such as barley, cotton, millets, maize and pulses are grown.

Saline – Alkaline Soils

- In Saline and Alkaline Soils, the top soil is **impregnated** (soak or saturate with a substance) with saline and alkaline efflorescences (become covered with salt particles).
- Undecomposed rock fragments, on weathering, give rise to **sodium, magnesium and calcium salts and sulphurous acid**.
- Some of the salts are transported in solution by the rivers.
- In regions with low water table, the salts percolate into sub soil and in regions with good drainage, the salts are wasted away by flowing water.
- But in places where the drainage system is poor, the water with high salt concentration becomes stagnant and deposits all the salts in the top soil once the water evaporates.
- In regions with high sub-soil water table, injurious salts are transferred from below by the **capillary action** as a result of evaporation in dry season.

Peaty – Marshy Soils

- These are soils with **large amount of organic matter** and **considerable amount of soluble salts**.

- The most humid regions have this type of soil.
- They are black, heavy and **highly acidic**.

Distribution of Peaty – Marshy Soils

- Kottayam and Alappuzha districts of Kerala where it is called kari.
- Also occur in the coastal areas of Odisha and Tamil Nadu, Sunderbans of West Bengal, in Bihar and Almora district of Uttarakhand.

Chemical Properties of Peaty – Marshy Soils

- They are deficient in potash and phosphate.

Crops of Peaty – Marshy Soils

- Most of the peaty soils are under water during the rainy season but as soon the rains cease, they are put under paddy cultivation.

Characteristics of Indian Soils

- Most soils are old and mature. Soils of the peninsular plateau are much older than the soils of the great northern plain.
- Indian soils are largely **deficient in nitrogen, mineral salts, humus and other organic materials**.
- Plains and valleys have thick layers of soils while hilly and plateau areas depict thin soil cover.
- Some soils like alluvial and black soils are fertile while some other soils such as laterite, desert and alkaline soils lack in fertility and do not yield good harvest.
- Indian soils have been used for cultivation for hundreds of years and have **lost much of their fertility**.

Soil Erosion

- Soil erosion is the removal of top soil by agents like wind and water.
- Top soil has most of the nutrients necessary for a plant's growth. With depth, the fertility of the soil decreases. Thus, erosion results in reduction of fertility of the soil by washing away the fertile top layer.
- Erosion by wind and water is much quicker than the soil formation process. So once fertile soil layer is lost, it requires a lot of time and resources to restore it.
- Prevention is a more practical measure. It is less time and resource consuming.

- In India's case, the problem of soil erosion is particularly severe due to over dependence on agriculture and improper land management.
- Notable Quotable: **“Soil erosion is essentially a problem created by man and also faced by man himself.”**

Water Erosion

- Water erosion leads to rilling, gullying, sheet-wash and rain peeling.
- If erosion continues unchecked for a long time, numerous finger-shaped grooves may develop in the silt laden soils. The whole pattern resembles the shape of a tree. This is called **rill erosion**.
- With further erosion of the soil, the rills deepen and become enlarged and are turned into Gullies formed over a large area gives rise to badland topography (Chambal Ravines).
- When a gully bed is eroded further, the bed gradually deepens and flattens out and **aravine** is formed. The depth of a ravine may extend to 30 metres or more.
- Further erosion of ravine beds gives rise to Canyons are few hundred meters deep and wide. (Grand Canyon on Colorado River).
- When the entire top sheet of soil is washed away by water or by wind, leaving behind barren rock, it is called **sheet erosion**. Sheet erosion attacks a large area of top soil and renders the land almost unfit for cultivation.
- In the coastal areas, waves dash along the coast and cause heavy damage to soil. During the landfall of cyclones, storm surges destroy beaches and wash away the top layer. In estuaries, tidal bores cause extensive damage to the surrounding banks. This is called **sea erosion**.
- In the higher reaches of the Himalayan region, soil erosion is caused by sowing moving glaciers. This is called **glacial erosion**.

Wind Erosion

- Wind erosion or **Aeolian erosion** is quite significant in arid and semi-arid regions.
- Winds usually blow at high speeds in deserts due to absence of trees (physical obstruction).
- These winds remove the fertile, arable, loose soils leaving behind a depression devoid of top soil (the depression formation in deserts is the first step in Oasis formation. Oasis forms in depressions when there is underground water that gets accumulated above rocks).
- Desertification around desert regions is due to wind erosion.

- Wind erosion is accentuated when the soil is dry, soils are subjected to overgrazing and devoid of vegetation cover.
- Very fine and medium sands are moved by wind in a succession of bounds and leaps, known as
- Coarse sand is not usually airborne but rather is rolled along the soil surface. This type of erosion is called **surface creep**.
- Very coarse sand and gravels are too large to be rolled by wind, so wind-eroded soils have surfaces covered with coarse fragments larger than 1.00 mm in diameter. This kind of arid soil surface is known as desert pavement.

Extent Of Soil Erosion In India

- 80 million hectares or about one-fourth of our total area is exposed to wind and water erosion.
- One-eighth of land has undergone serious erosion.
- Wind erosion is a serious problem in arid and semi-arid parts of north west India.
- About one-ninth of land is subject to severe wind erosion in Rajasthan and adjoining areas of Punjab, Haryana, Gujarat and Western Uttar Pradesh.
- It is estimated that 34 lakh tonnes of fertile soils is removed by wind every year.
- The loss due to water erosion is 53.34 million hectares annually.