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Study Notes

Soil Types of India

Major soil types

India has a diverse range of soils due to its varied climate, topography, and geological history.

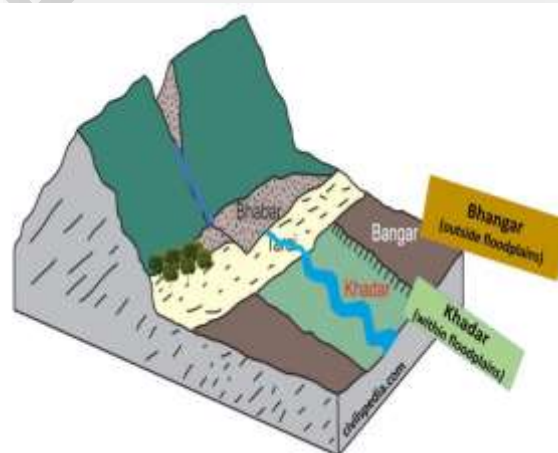
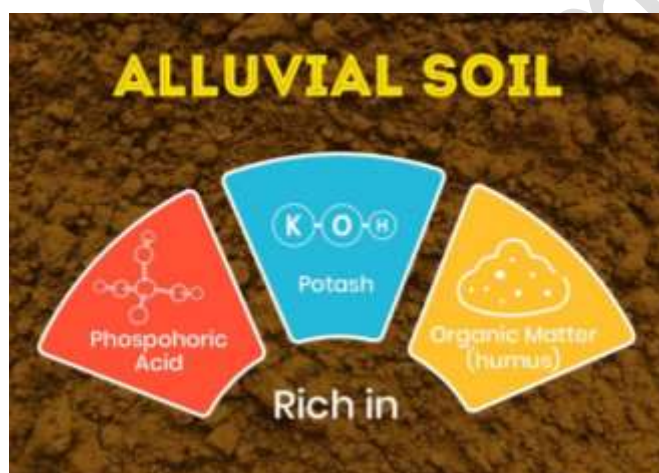
The Indian council of Agricultural Research (ICAR) set up an All-India Soil Survey Committee which divided the Indian soils into eight major groups.

1. Alluvial soils
2. Black (or Regur soil)
3. Red soils
4. Laterite soils
5. Arid and desert soils
6. Saline and alkaline soils
7. Peaty and marshy soils
8. Forest and mountain soils

Soil Types	States	Rich in	Lack in	Crops Grown
Alluvial	Plains of Gujarat, Punjab, Haryana, UP, Bihar, etc.	Potash and Lime	Nitrogen and Phosphorous	Large variety of rabi and kharif crops such as wheat, rice, sugarcane, cotton, jute, etc.
Black	Deccan Plateau, Maharashtra, Madhya Pradesh, etc.	Lime, Iron, Magnesia, Alumina, Potash	Phosphorous, Nitrogen, and organic matter	Cotton, sugarcane, jowar, tobacco, wheat, rice, etc.
Red	Eastern and southern Deccan Plateau, Chhattisgarh	Iron and Potash	Nitrogen, Phosphorous, and humus	Wheat, rice, cotton, sugarcane, and pulses
Laterite	Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, etc.	Iron oxide and Potash	Organic matter, Nitrogen, Phosphate, Calcium	Cashew nuts, tea, coffee, rubber
Arid and Desert	Western Rajasthan, North Gujarat, southern Punjab	Soluble salts, phosphate	Humus, Nitrogen	Only drought-resistant and salt-tolerant crops such as barley, rape, cotton, millets, maize, pulses
Saline and Alkaline	Western Gujarat, deltas of eastern coast, Sunderban areas of West Bengal, Punjab, Haryana etc.	Sodium, Potassium, Magnesium	Nitrogen and Calcium	Unfit for agriculture

1. Alluvial soil

- Alluvial soil is one of the most fertile soils found in India.
- It is formed by the deposition of sediments brought by rivers, streams, and other water bodies.
- These sediments are deposited on the floodplains and deltas and gradually build up over time, creating **alluvial soil**.
- Such soils include deltaic alluvium, calcareous alluvium, coastal alluvial and coastal sands, formed by transportation in streams and rivers and are deposited in flood plains or along coastal belts.
- Geologically, the alluvium of the Great plain of India is divided into newer or younger **khadar** and older **bhangar** soils.
- Khadar is sandy, light in colour, found in the low areas of valley bottom which are flooded almost every year.
- **Bhangar** is old alluvium more clayey composition and is generally dark coloured.
- A few metres below the surface of the bhangar are beds of lime nodules known as **kankar**.
- Due to their softness of the strata and fertility the alluvial soils are best suited to irrigation and respond well to canal and well/tube-well irrigation.
- When properly irrigated, the alluvial soils yield splendid crops of rice, wheat, sugarcane, tobacco, cotton, jute, maize, oilseeds, vegetables and fruits.



2. Black Soil

- Dark-grey in colour due to clay-humus complex.
- This soil is also called **black cotton soil**.
- Dominant Mineral: **Montmorillonite**
- Self mulching and Self ploughing property
- The black soils are also called **regur soils** (from the Telugu word Reguda)
- It swells greatly and becomes sticky when wet in rainy season. Under such conditions, it is almost impossible to work on such soil because the plough gets stuck in the mud.
- Because of their high fertility and retentivity of moisture, the black soils are widely used for producing several important crops.
- Some of the major crops grown on the black soils are cotton, 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.



3. Red soil

- Based on the colour (due to presence of **ferric oxides**) it is called as red soil.
- The “**omnibus group**,” often known as red and yellow soil.
- The soil is light textured, with **Kaolinite** type of clay.
- Well drained with moderate permeability.
- Low cation exchange capacity and low water holding capacity.
- They are shallow in depth because they are degraded or drained soil.
- These soils are spread on almost the whole of Tamil Nadu, parts of Karnataka, south-east of Maharashtra, eastern parts of Andhra Pradesh and Madhya Pradesh, Chhattisgarh, Orissa and Chota Nagpur in Jharkhand.
- The texture varies from sand to clay.
- On the uplands, the red soils are thin, poor and gravelly, sandy and porous, but in the lower areas they are rich, deep dark and fertile.
- Give excellent yields of cotton, wheat, rice, pulses, millets, tobacco, oil seeds, potatoes and fruits.



4. Laterites and Lateritic soil

- Laterite soils are formed due to the process of **laterisation**. i.e., leaching of all cations leaving **Fe and Al oxides**.
- Formed under conditions of high temperature and heavy rainfall with alternate wet and dry periods.
- This soil is formed under high intensive down pour of rainfall. It is modified form of red soil, clay content is minimum.
- Rich in organic matter content and rich in fertility and medium water holding capacity.
- Poor in lime and magnesia and nitrogen.
- They are mainly found on the summits of Western Ghats, Eastern Ghats, the Rajamahar Hills, Vindhyas, Satpuras and Malwa Plateau.

5. Arid and Desert Soils

- Arid and semi-arid region in Rajasthan and adjoining areas of Punjab and Haryana
- Receiving less than **50 cm** of annual rainfall.
- Common in coastal regions of Orissa, Tamil Nadu and Kerala.
- The desert soils consist of aeolian sand (**90 to 95 per cent**) and clay (**5 to 10 percent**).
- More prone to wind erosion
- In large areas of desert soils, only the drought resistant and salt tolerant crops such as barley, rape, cotton, wheat, millets, maize and pulses are grown.

6. Peaty and Marshy soil

- These soils are very **rich in organic matter**.
- Originate in humid regions as a result of accumulation of large amounts of organic matter in the soils.
- Contain considerable amount of soluble salts.
- The peaty soils are black, heavy and highly acidic.
- They are deficient in potash and phosphate.
- **Marsh is a type of wetland ecosystem characterized by poorly drained mineral soils.**
- Occur in the coastal areas of Orissa and Tamil Nadu, Sundarbans of West Bengal, in Bihar and Almora district of Uttaranchal.

7. Problem soil

Parameters	Saline soil	Saline alkali	Alkali soil
EC (dS/m)	> 4	> 4	< 4
ESP (%)	< 15	>15	>15
pH	< 8.5	< 8.5	> 8.5

Characteristics of Saline soils: -

- Saline soils contain high concentration of soluble salts in the root zone.
- Soluble salts are chlorine and sulphate of Na, Ca and Mg.
- The accumulation of these salts makes the soil infertile and renders it unfit for agriculture.

Characteristics of alkaline soils:

- High exchangeable sodium percentage interferes with plant growth.

8. Forest and Mountain Soils

- Apart from the Himalayan region, the forest soils occur on Western and Eastern Ghats as well as in some parts of the Peninsular plateau.
- The forest soils are very rich in humus but are deficient in potash, phosphorus and lime.
- They are especially suitable for plantations of tea, coffee, spices and tropical fruits in Karnataka, Tamil Nadu and Kerala and wheat, maize, barley and temperate fruits in Jammu and Kashmir, Himachal Pradesh and Uttaranchal.



Soil Orders in the soil taxonomy:

1. Alfisols
2. Aridisols
3. Entisols
4. Histosols
5. Inceptisols
6. Mollisols
7. Oxisols
8. Spodosols
9. Ultisols
10. Vertisols
11. Gelisols
12. Andisols

Type	Description	Type	Description
Entisols	Little, if any horizon development	Inceptisols	Beginning of Horizon development
Aridisols	Soils located in arid climates	Mollisols	Soft, grassland soils
Alfisols	Deciduous forest soils	Spodosols	Acidic, coniferous acidic soils
Ultisols	Extensively weathered soils	Oxisols	Extremely weathered, tropical soil
Gellisols	Soils containing Permafrost	Histosols	Soil formed in organic material
Andisols	Soil formed in volcanic material	Vertisols	Shrinking and swelling of clay soils



Entisols



Aridisols



Vertisols



Gelisols



Andisols



Histosols



Spodosols



Oxisols



Mollisols