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POPULAR SCIENCE ARTICLE

Major Soil Groups of India

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Abstract

Soil is one of the world's most important natural resources. Most of the living being are born in the soil or grow and develop on soil and merge into it after death. All living being directly and indirectly living on soil. Soil is heterogeneous system of solid liquid and gaseous component. India has a geographical area of 329.0 million hectares and lies between latitudes of 8^0 04′ and 37^0 06′ N and longitudes of 68^0 07′ and 97^0 25′ E^0 situated. A characteristic feature of the climate in India is its three (i) Winter season (ii) Summer season (iii) Rainy season. The land surface in the country of 329.0 million hectare is predominantly covered with Alluvial soils, Black soils, Red soils, Desert soils, Laterites soils, Forest soils, Peaty marshy soils and Saline and alkali soils. The soil characteristics imparted by the climate, vegetation, local condition, time or age of land. Water, forests and land are the primary assets of any nations, of these, soil is the most vital.

Keywords: Soil, Climate, Heterogeneous, Characteristics, Alluvial soils

Introduction

The Soils of India are classified into eight major groups (According to ICAR): Alluvial Soils, Black Soils, Red soils, Laterite Soils, Desert Soils, Peaty Marshy Soils, Forest Soils and Saline and Alkali Soils. The soils of India are classified on basis of climate, vegetation, topography, parent materials, time or age of land and their agricultural significance.

Major Soil Groups of India

Alluvial Soils

Found in the Indo-Gangetic plains. Cover almost 24% of the geographical area of India. In general, they are fairly sufficient in P, K but deficient in Humus.

Types of Alluvial Soil:

Alluvial soils are categorized into two types:

New alluvium (Khadar) is lighter and deposited in flood plains and deltas. More clay deposition.**Old alluvium (Bhangar)** is darker, sandy with lime nodules.

Characteristics: Soil with no differential horizon, predominant clay minerals are Illite and chlorite. Deficient in N and Humus but sufficient in P and K.

Soil pH: 7.0- 8.0 **Soil order:** Entisols, Inceptisol and Alfisols

Clay minerals: Illite and Chlorite. **Area:**75.0 million hectares

Distribution: Cover large parts of Bihar, Uttar Pradesh, Delhi, Haryana, West Bengal, Rajasthan, Punjab etc.

Crops: Rice, Wheat, Sugarcane, Pulses, Oilseeds and Jute.

Black soil

The black soil, also known as Regur or Black cotton soil. Black cotton soils are black due to presence of titaniferous magnetite. Excellent for cotton cultivation. Cover almost 22% of the geographical area of India. In general, they are excess in Fe, Ca, Mg, Al etc. but deficient in N, P and Organic matter.

Characteristics: Made of Basalt rocks, black soils swell on wetting and crack on drying, rich in montmorillonite clay minerals. Deficient in N and Humus but sufficient in P and black soils are best suitable for dry land agriculture.

Soil pH: 7.5- 8.5 **Soil order:** Vertisols, Inceptisol and Entisols

Clay minerals: Montmorillonite **Area:**72.0 million hectares

Distribution: Cover large parts of Maharashtra, Gujarat, M.P., Rajasthan, U.P., A.P. etc.

Crops: Cotton, Groundnut, tobacco, and Pulses.

Red soil

Cover almost 20% of the geographical area of India. Red soils in Tamil Nadu occupies the largest area 2/3 lands. In general, they are excess in Fe and Al oxides. but deficient in N, P, K, Ca and Humus.

Characteristics: Made of Gneiss, Schist and Granite rocks. Red soils are best suitable for irrigated agriculture.

Soil pH: 6.0- 8.0 **Soil order:** Alfisols, Ultisols and Inceptisol

Clay Mineral: Kaolinite **Area:**70.0 million hectares

Distribution: Cover large parts of Tamil Nadu, Andra Pradesh., Assam, Jharkhand, West. Bengal, Uttar Pradesh. etc.

Crops: Rice, Wheat, Millets (Ragi, Jowar), Pulses etc.

Laterite soils

Found in high temperature and heavy rainfall areas (Western Ghats, Eastern Ghats and parts of Northeastern region) Lower layers are made of Fe and Al oxides. but deficient in P, K and Ca and generally rich in organic matter. Shifting Agriculture is mainly practiced in these areas.

Characteristics: Generally rich in organic matter (10- 20% organic matter). Predominate in Kaolinite type of clay minerals. The alternations of wet and dry season lead to the leaching away of the siliceous matter of the rocks and the formation of laterite soils takes places.

Soil pH :5.0- 6.0 **Soil order:** Alfisols, Ultisols and Oxisols

Clay Minerals: Kaolinite & Illite **Area:**25.0 million hectares

Distribution: Cover large parts of Kerala, Karnataka, Maharashtra, Assam, Meghalaya, Tamil Nadu, Andra Pradesh etc.

Crops: Rice, Banana, Coconut, Cashew nut, Tea, Coffee, Rubber, Pineapple, Banana etc.

Desert soils

Deficient in Humus and N. It is well supplied with K content, phosphate of Ca and Mg etc.

Characteristics: Sandy in Soil texture. Characterized by low fertility and high salt content

Soil pH: Above 8.0 **Soil order:** Aridi sols

Clay Mineral: Illite, Montmorillonite and Kaolinite **Area:** 29.0 million hectares

Distribution: Cover large parts of Rajasthan and parts of Gujarat, Haryana etc.

Crops: Barley, rape, Pearl millets, Maize and Pulses etc.

Peaty Marshy Soils

Deficient of Potash and Phosphorus. Rich in Nitrogen content and toxicity of Fe and Al.

Characteristics: These soils are black, heavy and acidic. Black colour due to humus & Fe^{++}. Found in heavy rainfall and high humidity areas, high in organic matter (20- 40%). Suited for paddy cultivation. Requirement of proper drainage

Soil pH: Above 3.0- 4.0 **Soil order:** Histosols

Clay mineral: Chlorites **Area:** 0.6 lakh square kilometres

Distribution: Found in India's coastal of Kerela, coastal Orissa, Tamil Nadu, Sundarbans delta in West Bengal, parts of Bihar, Almora district of Uttarakhand etc.

Crops: Paddy, carrots, tuber crops (Potatoes) etc.

Forest Soils

14% of total land of India is under forest. Deficient of Potash, Phosphorus, Calcium and rich in organic matter and humus.

Characteristics: These soils are rich in organic matter, humus etc. Generally acidic and rich in Potassium and Manganese, more bacteria and fungi in top soils. Silty to loamy soil texture and granular in soil structure because soils are very rich in organic matter and nitrogen.

Soil pH: Above 3.5- 6.0 **Soil order:** Histosols

Clay mineral: Vermiculite, Illite, chlorite Kaolinite **Area:** 2.9 lakh square kilometres

Distribution: Found in Himachal Pradesh, Uttar Pradesh, West Bengal, Assam, Meghalaya, Mizoram, Tripura, Kerala, Karnataka, Tamil Nadu etc.

Crops: Tea, Coffee, Apple, pears, plums, blue berries, black berries, coconut, maize, various medicinal plants etc.

Saline and Alkali Soils.

Deficient of Nitrogen, Phosphorus and Calcium. Occur most commonly under arid and semi and arid regions of Uttar pradesh, Punjab, Haryana, Rajasthan, Gujarat, Maharashtra, West Bengal etc. The saline and alkali soils are known under various names: reh, Kallar, Usar in the north India. The pH of nonsaline-alkali soils usually ranges between 8.5-10.0. The word usar is derived from a Sanskrit word **"Ustra"** meaning sterile or Barren. Poor drainage, blowing of salt by wind, oceanic flood near land is mainly responsible for saline and alkali soils. Dhaincha-Paddy-Berseem is the suitable crop rotation in

saline and alkali soils.

Characteristics: In alkali soils $Na_2 CO_3$ is highly toxic. Saline soil is white in colour due to presence of NaCl, Na_2SO_4. Phosphate fixation in alkali soils may occur in the form of Ca-P, Mg-P (pH 6.0- 10.0). Generally, Prism like soil structure.

Soil pH: Above >7.0 **Soil order:** Inceptisol, Aridi Sol, Alfisols

Clay mineral: Illite, chlorite **Area:** 7.0 million hectares

Distribution: Uttar pradesh, Gujarat, West Bengal, Rajasthan, Punjab, Maharashtra, Haryana, Odissa, Karnataka, Madya pradesh, Andra pradesh, Delhi etc.

Crops: Rice, Sugarbeet, Wheat, Barley, Cotton, Sugarcane, Pearl millet etc. may be grown on these soils.

Besides this, there are also present Acidic and Calcareous soils.

Acidic soils

Acidic soils have relatively high amount of exchangeable H^+ and Al^{3+}.Poor microbial activity. Platy type soil structure. In India, acid soils comprise about 28 % of the total geographical area 329 million hectare. Acid nature of rocks such as granite, quartz, rhyolite, pitchstone are responsible for development of acid soils. $CaCO_3$ (Liming materials) more than 90 % use in India. Acid soils occur in almost all the major groups except black soils (Vertisols). pH below 5.5 is about 25 million hectares, where as pH between 5.6-6.5 is about 24 million hectares.

Characteristics: Poor organic matter content. Poor water holding capacity. Light soil texture.

NH_4^+ is found mainly in acid soils. Areas receiving high rainfall are generally acidic. Fixation of phosphate is more in acid soils, phosphate fixation in acid soil may occur in the form of Al-P, Fe-P (pH2.0- 5.0). Deficiency of P, K, Ca, Mg, Mo and B. Toxicity of elements Al, Mn, Fe and H.

Soil pH: Above <7.0 **Soil order:** Oxisols, Ultisols, Histosols, Andisols, Inceptisols.

Clay mineral: Kaolinite and Illite **Area:** 49.0 million hectares

Distribution: Large area of acid soils is in Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura (North Eastern Region), Kerala, West Bengal, Odissa, Jharkhand etc.

Crops: Paddy, Maize, Cotton, Tobacco, Soybeans, Tea, Potato, Sweet potato Citrus, Radish, Papaya, Mango, Pineapple, Strawberries etc.

Calcareous soils

Calcareous soil is formed in arid and humid regions. Calcareous soil contains sufficient amount of $CaCO_3$, there is visible effervescence when treated with cold 0.1 N HCl Acid.

Characteristics: Availability of nutrients like P, K and Zn decreases. It is more common in arid areas. Increases drainage in clayey soil, and decreases water holding capacity in sandy soil. Calcareous soil becomes hot quickly, due to presence of lime in the soil. Light texture due to flocculation of clay, $CaCO_3$ is present in clay is called as**" Mellow"** or **"soft".**

Soil pH: Above 7.0-8.5 **Soil order:** Oxisols, Ultisols, Histosols, Andisols, Inceptisols.

Clay mineral: Montmorillonite and Illite **Area:** Cover an estimated 229 million hectares

Distribution: Calcareous soils are found in Eastern and Central plains zone of Uttar Pradesh. and North Bihar. **Crops:** Guava, Rose etc. can grow in this soil.

Conclusions

Soil interface of air, mineral, water and life. Soils are dynamic. Soil is a gift of nature and in absentia life is not possible. The filtering, buffering and transformation potentials of soils are important in the struggle against increasing environment pollution. At the present time, more crops have to be produced from the land in modern ways and the environment will have to be green with environment protection. Soil use for posterity and conserve for posterity.