RAMA UNIVERSITY

www.ramauniversity.ac.in

FACULTY OF MEDICAL SCIENCES

SOILS OF INDIA

Geographic location: Asian continent, North of Equator, Between $8^0 4'$ & $37^0 6'$ N latitude and $68^0 7'$ & $97^0 25'$ E longitude **Extent:** 329mha or $329 X 10^4$ sq.km (3.29 msq.km)

ALLUVIAL SOILS

Extent: 75 mha

Soil formation: Parent material: River alluviums from erosion products of rivers, coastal alluviums from coastal sands; and deltaic alluviums from Heterogeneous sediments

Salient features:

Texture is variable. Coarser near source & finer in proximity to the sea (delta) Fluvial in nature, stratified which is reflected in their texture and OM distribution. Colour depends on parent material Depth depends on geographic position, Calcium carbonate content is variable

Mostly alkaline (aridic & ustic SMR) or acidic (udic SMR only) in reaction. Profile development is variable A – C to A-B-C profiles

Inherently rich in plant nutrients – fairly sufficient in P and K but deficient in N and OM.

Potentialities: River alluviums and deltaic alluviums are best agricultural soils. Wheat, rice, sugarcane and other crops can be grown well

Constraints:

Stratification restricts leaching and drainage

Extreme sandy nature that promotes excessive leaching of water and plant nutrients

Hydromorphic condition that promotes reduction and results in poor aeration for plant growth.

They can be rendered saline where evaporation exceeds rainfall (aridic).

The river alluviums and deltaic alluviums are becoming waterlogged and salt affected due to injudicious use of irrigation water.

Due to intensive use for cultivation, secondary problems are arising like deficiency of S and Zn.

Receding ground water and rising ground level in some areas.

Management:

Judicious use of I.W & fertilizers. Providing drainage facilities

BLACK SOILS

Extent: 74Mha

Soil formation:

Parent material: Generally basic parent material like basalt rich in lime, soda feldspars and clay. Semiarid - subhumid climate, Lower/ plain topography

Soil Properties:

Black colour - clay humus complex / titaniferous magnetite,

30-80%clay (highly argillaceous), clay - clay loam, smectite clay, Extremely hard on drying and very sticky and very plastic on wetting Becau se of swell-shrink nature, they develop deep wide cracks, gilgai relief, slickensides in lower depths due to churning / argillopedoturbation.

SiO_2/R_2O_3 3 –3.5, high B.D (1.5 – 1.8 Mg m^{-3}) due to compaction in lower layers, high total pore psace, pH (7.8 - 8.7/9.5), CEC (35 – 55 cmol/kg), BS up to 100%, $CaCO_3$ (up to 40%), WHC (150 - 250 mm/m)

Generally low OM. High nutrient hodling capacity.

Llow HC and permeability. Hence ill drained and more runoff.

Constraints:

Deep black soils: Narrow workable moisture, poor traficcability, high draft power (heavy soils), low permeability, poor drainage, low HC,

High EC and salinity in sub-soil. Micronutrient deficiency in calcareous soils. **Potentialities & Land Use:**

Inherently fertile, suitable for dry farming, unde r rainfed conditions cotton and millets, under irrigation rice, sugarcane etc., can be grown

Management: ICRISAT – Dry season / pre -monsoon sowing, BBF

RED SOILS

Extent: 25 to 30% of GPA of the country. 70Mha

Extent in AP: Geographical area of the state 27.4Mha (2,74,000sq.km, 100sq.km = 1 ha). Red soils 65, laterite soils 1, black soils 25, alluviasl 5 and coastal sands 3% in AP. Present in all the districts of the state.

Other names: Morphologically they are red loams, red earths, red & yellow soils. Brown soils are called parwa while red soils are called rakar.

Soil formation:

The name red is given to soils rich in **sesquioxides** that have developed of archean origin (granites, gneisses).

Generally red soils are formed on well drained, **stable higher landforms** (higher topography).

Under hot, semi-arid to humid sub-tropical climate,
The weathering is **moderately intense** and leads to enhanced decalcification.

Some weathering products are **leached out** leaving behind the less mobile elements (Si, Fe, Al). The Fe and Al under **oxidized** conditions, form sesquioxides imparting **red colour**.

Salient features:

Red to yellow (hydration & coatings of Fe and Al oxides 30 – 40%), ls to c texture, Shallow to deep,

Low to high clay, kaolinitic / illitic, low WHC & NHC

Well to excessively drained as evident from their colour, CN ratio 10:1, pH 6 - 7.5,

CEC low (25 –40 cmol/kg of clay) and BS is low to medium,

SiO_2/R_2O_3 2.5 –3.0, Low nutrient status (O.C, N, P, K, lime)

Constraints: Shallow depth if formed on elevation s, soil erosion, sub-surface hardening, sub-surface ahrd pans, surface crusting, rapid drying, excessive drainage or some times runoff, high surface soil temperature in dry areas, deficient in OM, N, P Ca. High in Fe_2O_3 & Al2O3, kaolikinite, allophanes - P fixation, though K is sufficient - fast depletion due to continuous cropping.

Crusting and hardening of red sandy soils (chalkas): Reasons: Proportion of clay to sand+silt ratio (3:7) – strenghth 36kg/cm^2 on drying

Presence of free iron oxides which form irreversible bonds with clay fraction

Sealing pores by rain drops force – dispersion of soil particles. Management: tillage with spike roller, pulling thorny bush to break the crust.

Mulching of seed lines Sowing on the sides of the ridges

Incorporation of slowly decomposable organic residues– paddy husk, grounut pod shells, coir pith etc.

Potentialities & Land use:

Under good mangement practices, these soils are good for agricultural, horticultural and plantation crops.

Management: Application of organic materials and proper fertilization.

LATERITE SOILS

Extent: 25 Mha

Other names: The term 'laterite' was coined by Buchanan in 1807 for highly ferruginous, vesicular, unstratified deposits of Malabar hills.

Soil formation: Basic parent mate rial, sub-tropical to tropical climate,

higher topography under rain forest vegetation. The siliceous matter is leached during weathering and sesquioxides are left behind.

Lateritic soils are formed under same climatic conditions but alternate wet and dr y conditions are not required.

Soil Properties: Red colour (5YR or redder), highly weathered hence very deep soils, high clay % (not due to migration but due to *in situ* alteration), open texture, massive structure, narrow SiO_2/R_2O_3 (<2) ratio ,strongly acidic,

LAC (<16cmol/kg clay), BS = 40% (low), kaolinite dominant, low OM

Constraints: High permeability, low AWC, highly leached,

Chemically degraded, low nutrient reserve, deficiency of P, K, Ca, Zn, B etc., Strongly acidic, high P fixation, Al & Mn toxicity.

Land Use: Generally usaed for plantation crops & shifting cultivation (should be 20 years or more), In low level areas - rice, banana coconut & high level areas- coffee, cocoa, rubber, tea are grown

Management: Liming and fertilization (rock phosphates and silicates)

COASTAL SANDS

Occur all along coast 3 to 12 km away on both east and west coast. They are derived from marine sediments

Properties: Deep to very deep, Ground water at as depth of 2to 5 mts. Brackish ground water, Occationally saline with neutral pH. Sandy texture with neglisible clay content, Single grain structure .Loose consistence, Light soils. Rapid permeability, excessively drained . Low WHC and NHC. Low OM, low fertility, low CEC and BS

Land use: Owing to extreme sandy nature, th ese soils are able to wityhstand irrigation with high saline water – Doruvu technology can be followed

Constraints: During cyclone periods – these soils are inundated due to tidal over – flow.