

The Soils of India

Geography, Chemical Composition,
and Agricultural Economy

A Study Companion based on ICAR & USDA Classifications



Alluvial
Alluvial Gold

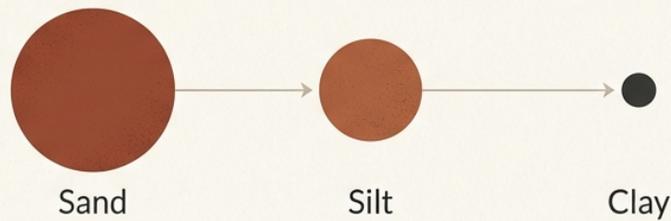
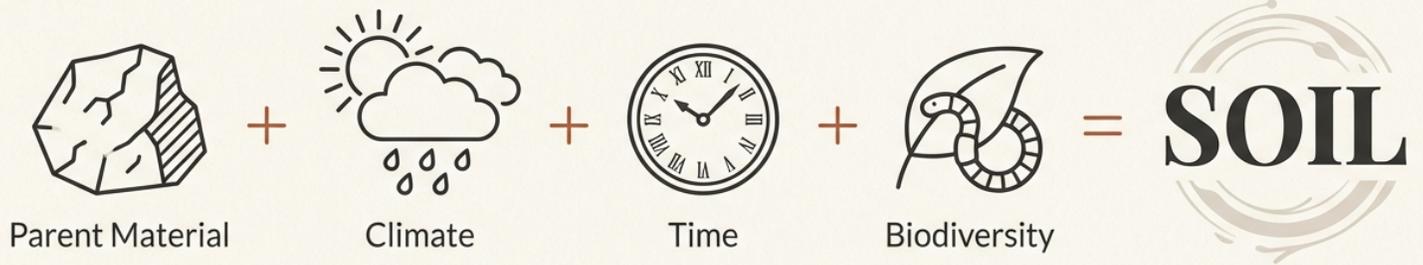
Black
Regur Black

Red
Ferrous Rust

Laterite
Laterite Brick

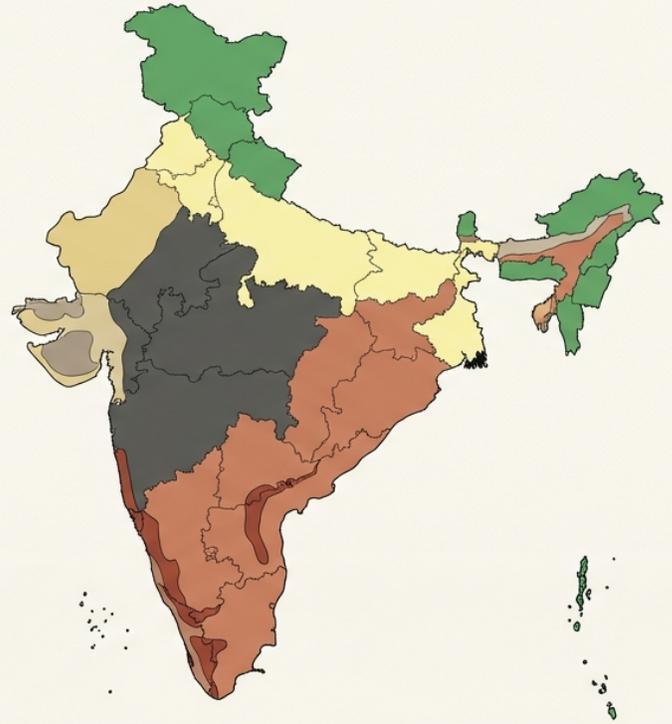
From Bedrock to Breadbasket: What is Soil?

Soil is a mixture of rock debris and organic materials developed on the earth's surface.



The 8 Major Groups (ICAR Classification)

-  1. Alluvial Soils
-  2. Black Soils
-  3. Red Soils
-  4. Laterite Soils
-  5. Forest and Mountain Soils
-  6. Arid and Desert Soils
-  7. Saline and Alkaline Soils
-  8. Peaty and Marshy Soils



Alluvial Soils: The Agricultural Backbone



Key Stats

Coverage: 45.6% of land area (15 lakh sq km)

Formation: Deposition of sediments by rivers (Indus, Ganges, Brahmaputra)

Classification

Khadar: New alluvium, lighter color, deltaic.

Bhangar: Old alluvium, darker, clayey, lime nodules (kankar).

Chemical Profile

Rich In



Potash



Lime

Lacks



Nitrogen



Phosphorous



Wheat



Rice



Sugarcane



Cotton



Jute

Black Soils: The Volcanic Legacy (Regur)



Origin Story

Formed by solidification of lava (Deccan Trap).
High clay factor (62%+).

Chemical Profile

✓ Rich In

Lime
Iron
Magnesia
Alumina

⚠ Lacks

Phosphorous
Nitrogen
Organic matter



Economic Impact

Also known as Black Cotton Soil.



Cotton



Sugarcane



Tobacco

Red Soils: The Ancient Iron Foundation



Geology

Formed by weathering of ancient crystalline and metamorphic rocks.

Chemical Profile

✓ Rich In
Iron [Fe]
Potash [K]

⚠ Lacks
Nitrogen [N]
Phosphorous [P]
Humus

The 'Red' Factor:

Color due to wide diffusion of iron content. Turns yellow/brown when hydrated.

Crops

(Grown with irrigation)



Wheat



Rice



Cotton



Pulses

Laterite Soils: The Brick Rock

From Latin 'Later' = Brick.



Formation

Result of intense leaching in high temperature & high rainfall regions.

Chemical Profile

✓ Rich In

Iron Oxide
Potash

⚠ Lacks

Organic matter
Nitrogen
Phosphate
Calcium

Agriculture

Best suited for Plantation Crops.



Cashew Nut



Tea Leaf



Coffee Bean



Rubber

The Drylands: Arid, Desert, & Saline Soils

Desert Soil

Location

Rajasthan, Haryana,
South Punjab.



Traits

Sandy, saline, poor organic matter. High
Calcium in subsoil.

Crops

Drought-resistant: Millet, Barley, Cotton.



Saline & Alkaline (Usar)

Location

Punjab, UP, Gulf of
Khambhat.



Chemistry

Accumulation of Sodium, Potassium, and
Magnesium salts.

Impact

Generally unfit for agriculture due to salt
efflorescence.

The Wet & The Wild: Peaty and Mountain Soils

Peaty & Marshy Soils (Kari)

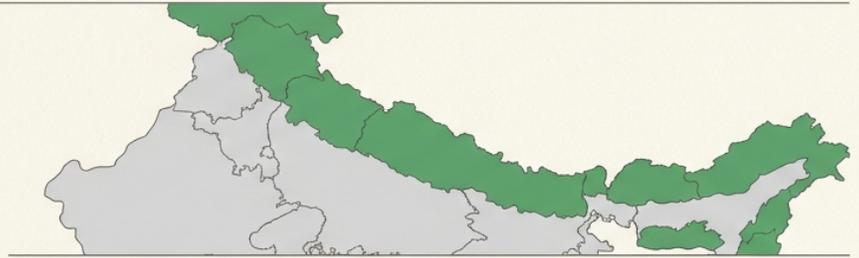
Heavy, black, highly acidic. Formed in humid regions with 10-40% organic matter.

Location

Kerala (Alappuzha), Sunderbans, Orissa Coast.

Forest & Mountain Soils

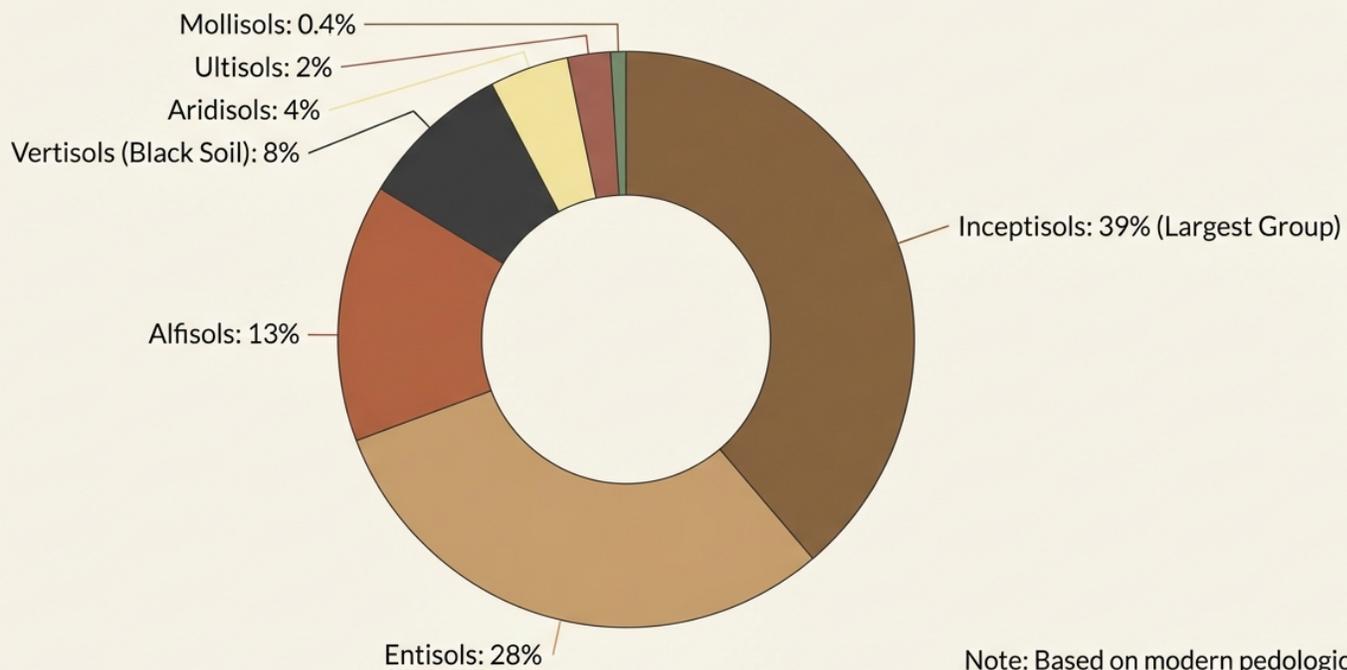
Composition varies with altitude.
Rich in humus but often acidic.



Comparative Matrix: Chemical Composition & Crops

Soil Type	Rich In ✓	Lacks ✗	Primary Crops
Alluvial	Potash, Lime	Nitrogen, Phosphorous	Wheat, Rice, Jute
Black	Lime, Iron, Alumina	Phosphorous, Nitrogen, Organic Matter	Cotton, Sugarcane
Red	Iron, Potash	Nitrogen, Phosphorous, Humus	Pulses, Rice, Cotton
Laterite	Iron Oxide, Potash	Organic Matter, N, P, Ca	Cashew, Tea, Coffee

USDA Soil Taxonomy in India



Note: Based on modern pedological profile development.

Historical Perspectives

Ancient Era

Ancient Classification

Urvara (Fertile)

Usara (Sterile)

Medieval Era

Medieval Classification

Lato

Based on texture: Sandy,
Clayey, Loamy

*“ Even the most competent
pedologist would find it difficult
to present an accurate...
generalized account of Indian
soils.” ”*

The Foundation of Food Security



India's soil diversity—from the fertile Alluvial plains to the mineral-rich Deccan trap—dictates the agricultural economy.

Key Takeaway:

Successful agriculture requires matching the crop to the chemical profile.

- Irrigation management
- Fertilizer logic (N-P-K balance)
- Crop rotation

