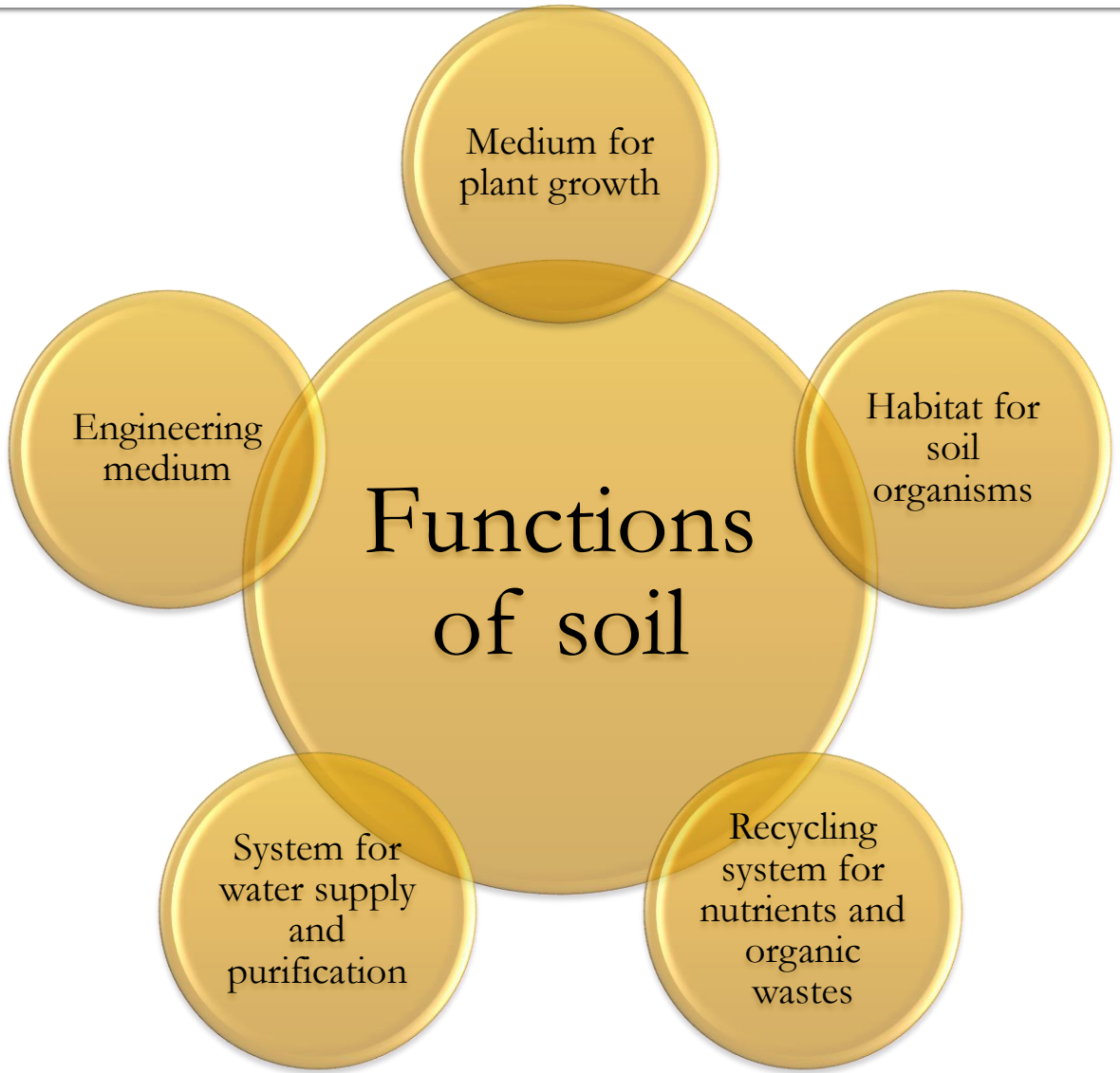
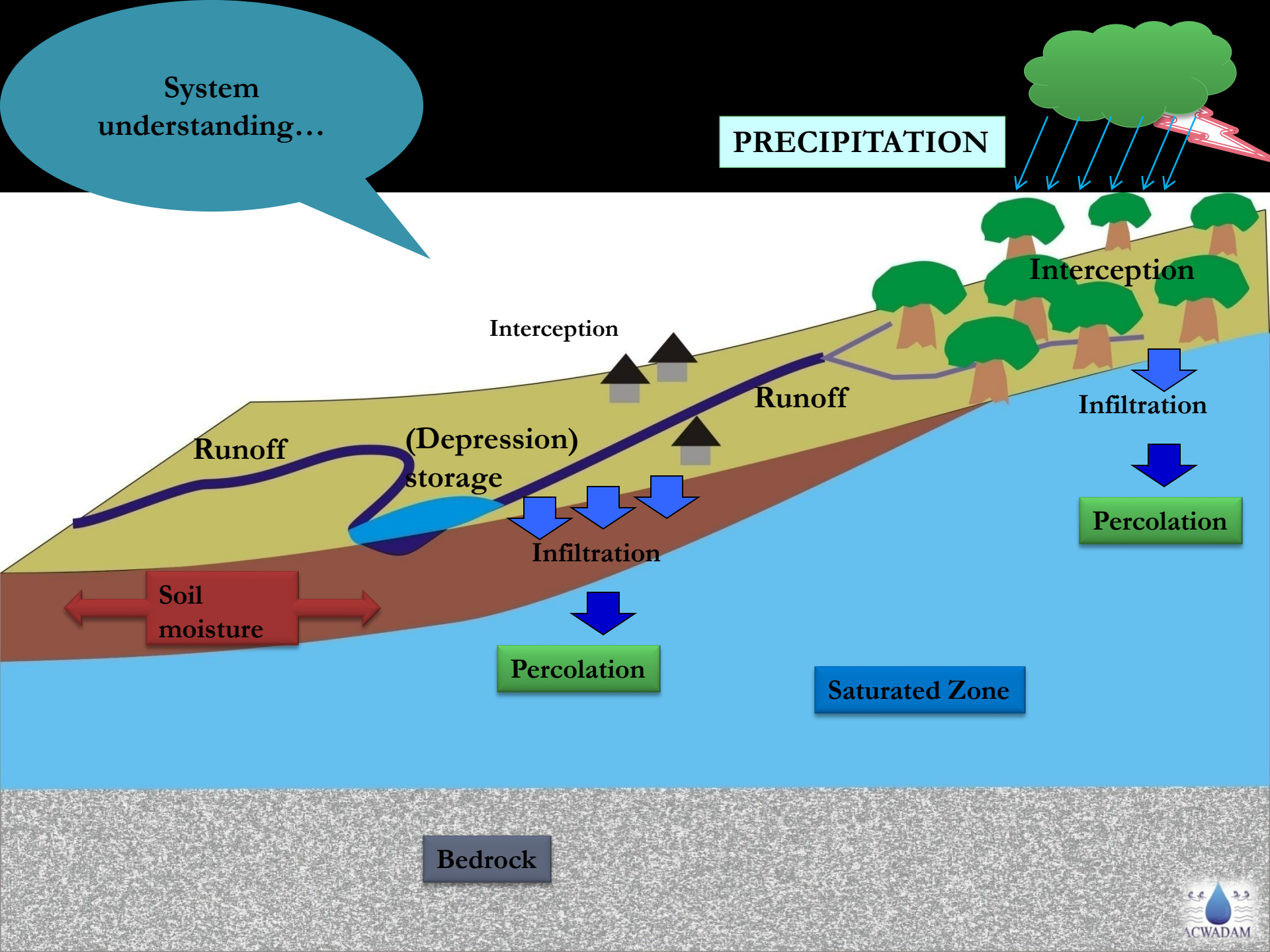
Introduction To Soils

Why Study Soils

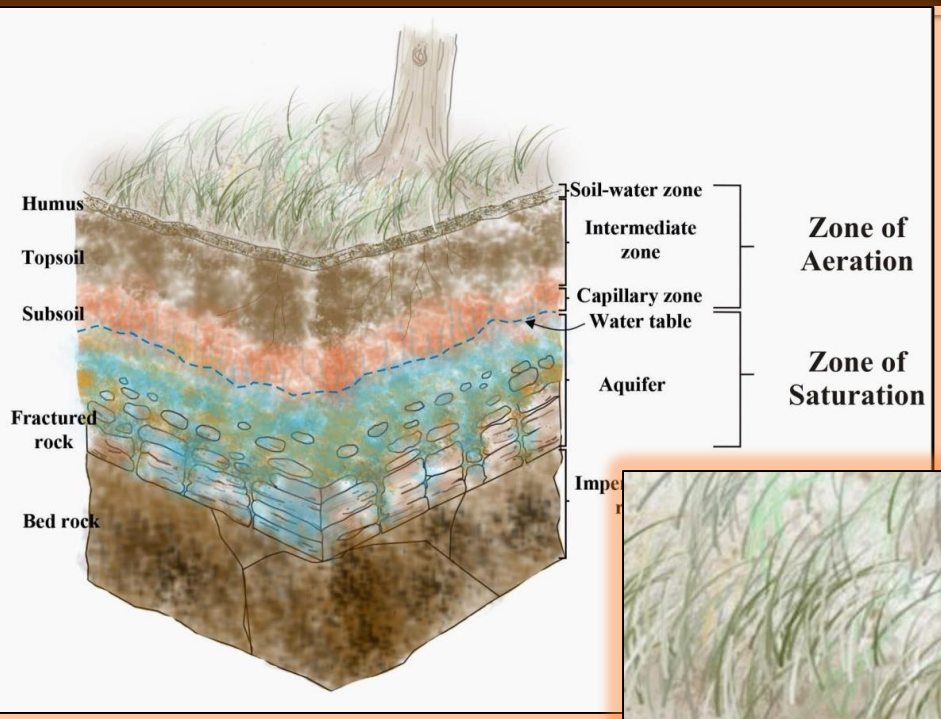


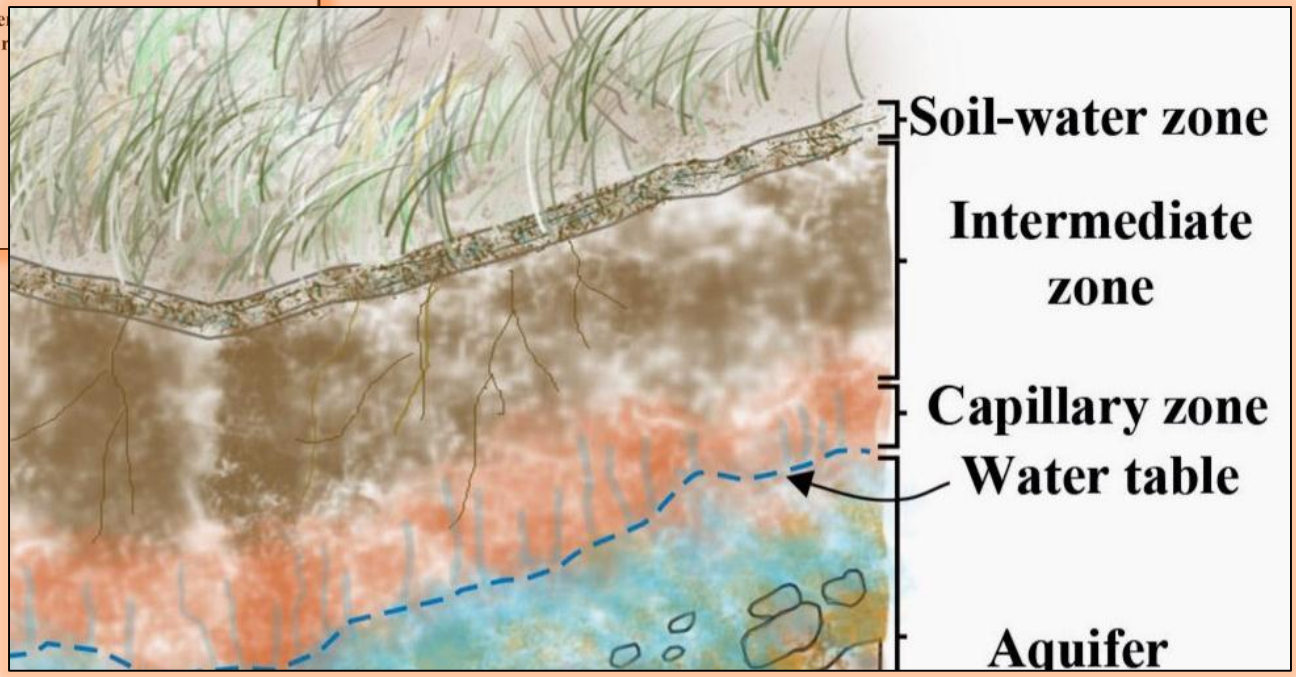
The System


ATMOSPHERE
Transpiration
LITHOSPHERE
BIOSPHERE
Precipitation
Evaporation
PEDOSPHERE
Infiltration
Base flows
HYDROSPHERE
Percolation


System understanding…
PRECIPITATION
Interception
Interception
Runoff
Infiltration
Runoff
(Depression) storage
Percolation
Infiltration
Soil moisture
Percolation
Saturated Zone
Bedrock
ACWADAM

Where Does Soil Moisture Occur In The Vertical Distribution Of Groundwater??

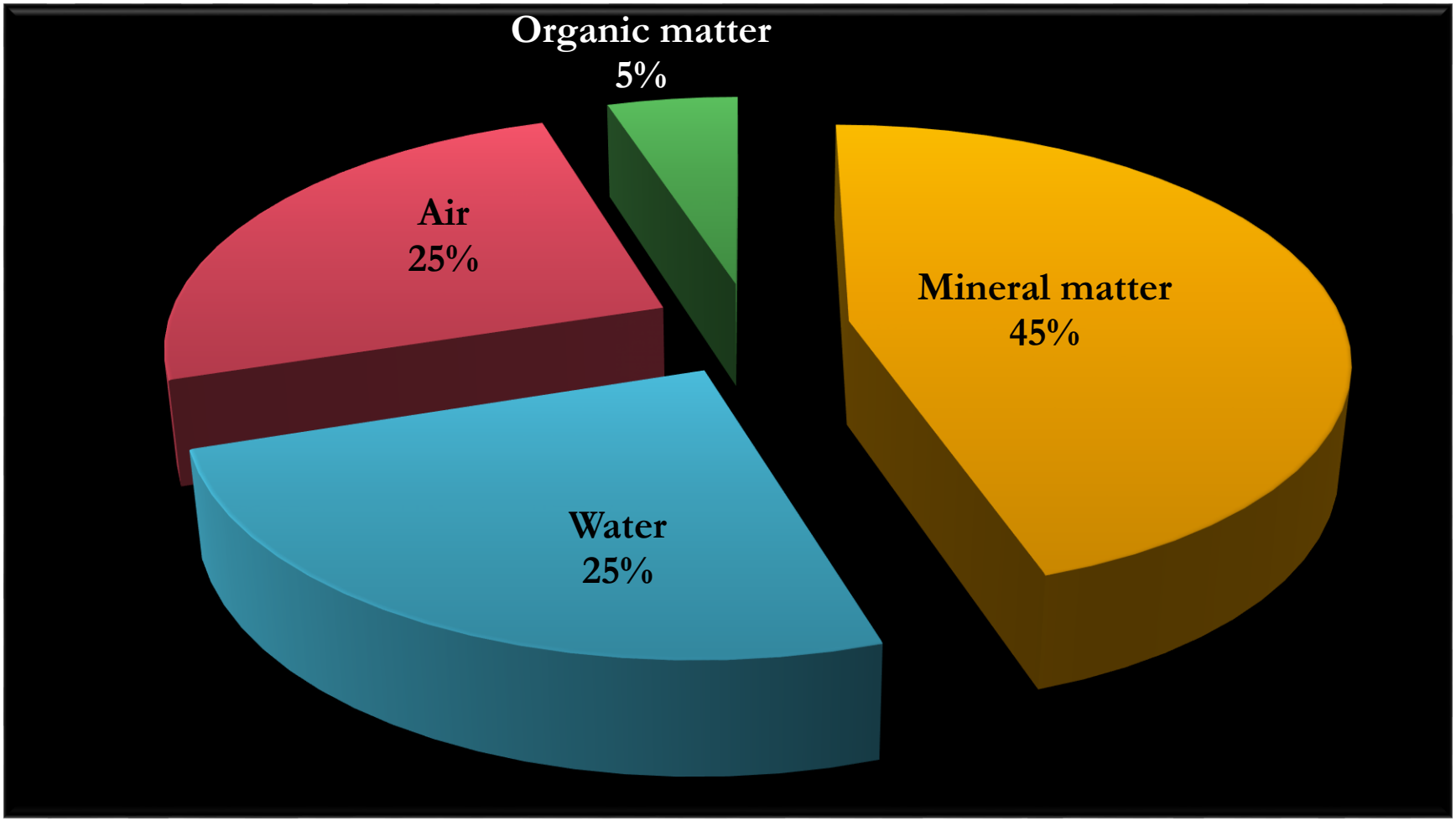




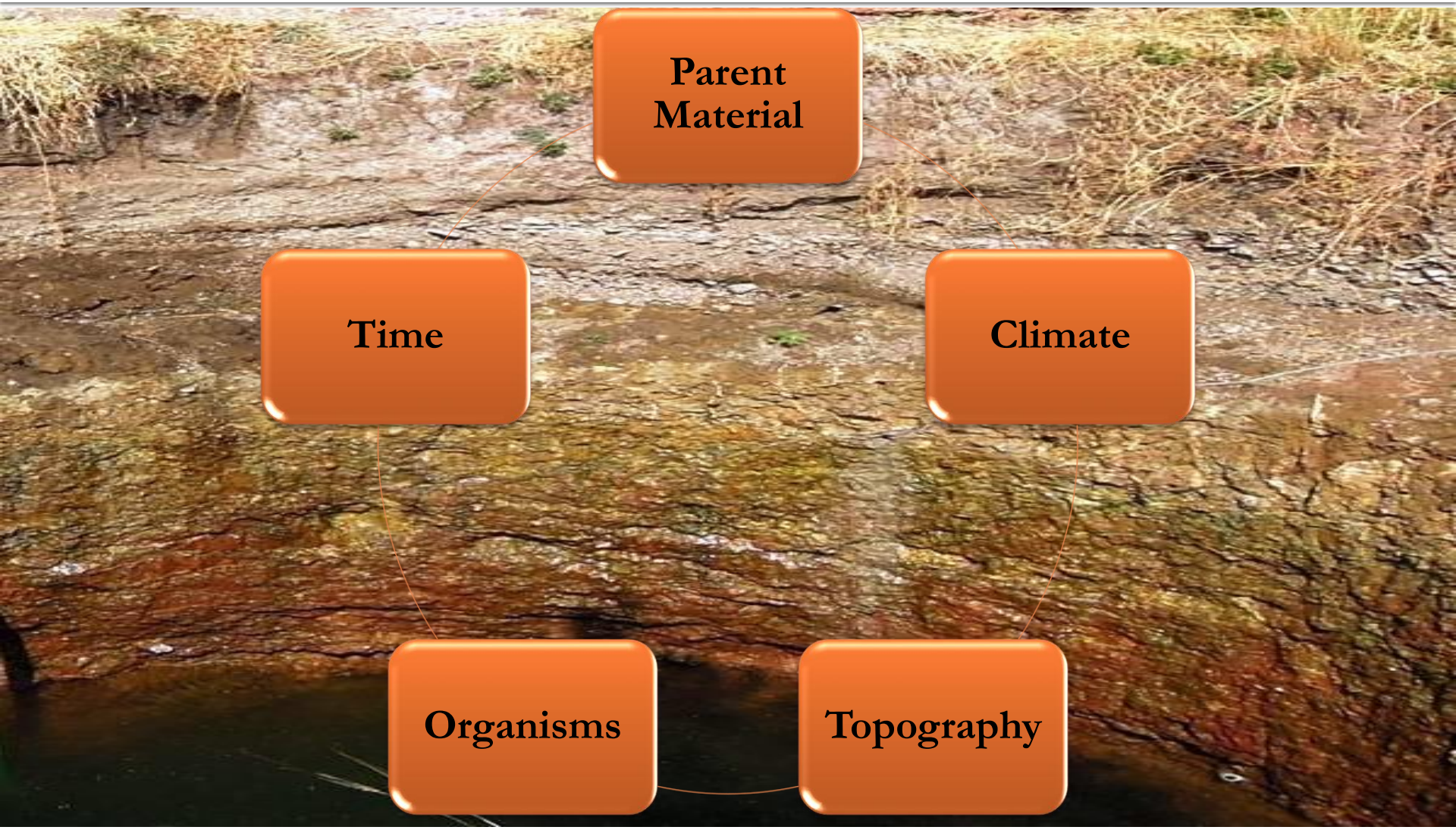
Is there a difference between a *soil* and a *sediment*?

1. It should be formed in-situ
2. It should contain organic matter

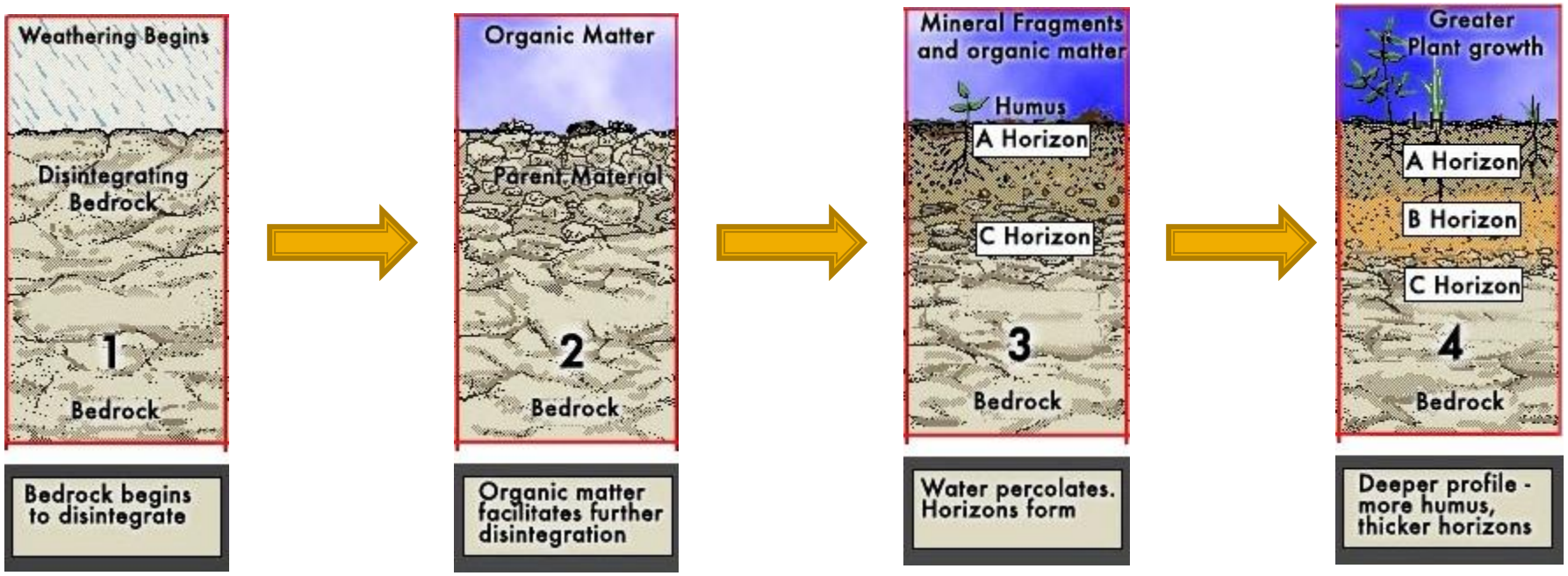
Components Of Soil



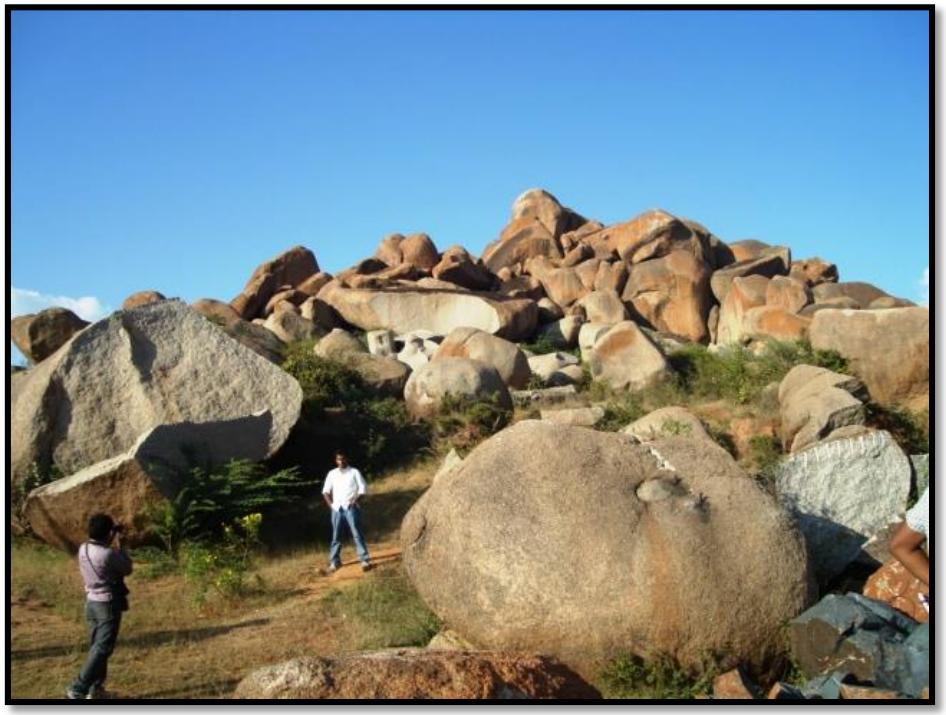
Factors That Control Soil Formation



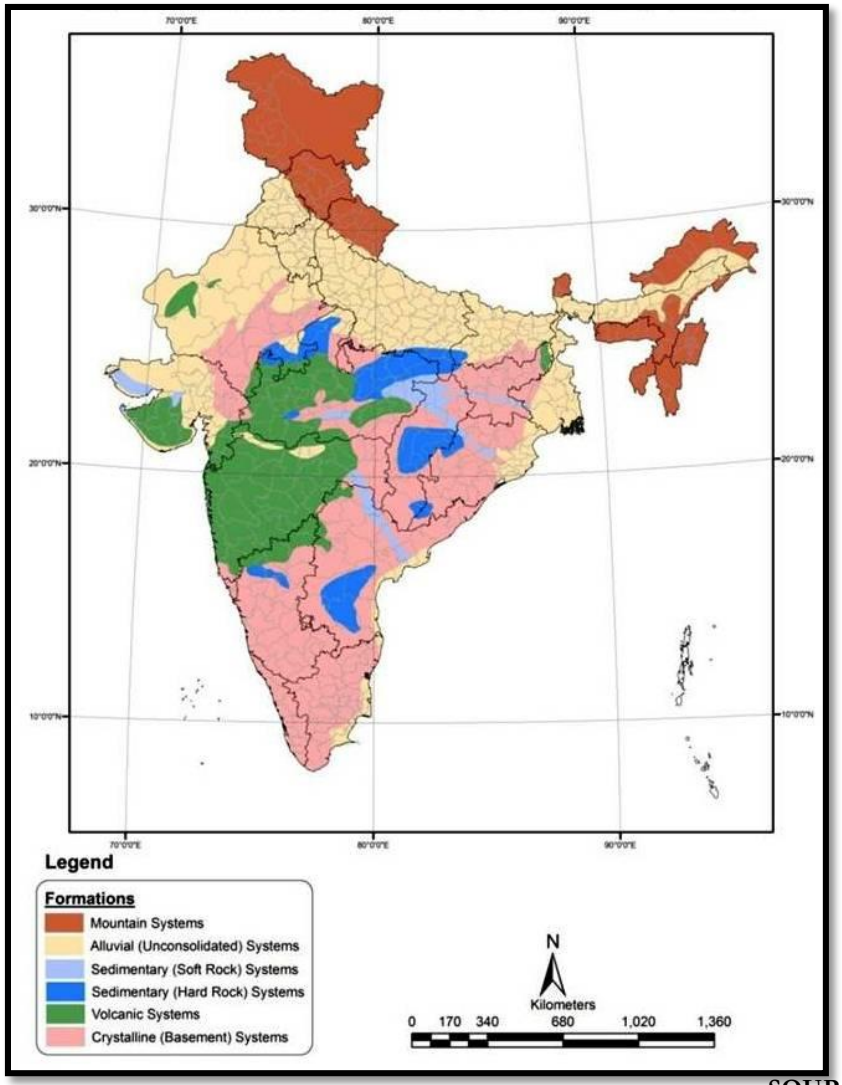
Parent Material, Climate, Organism And Time

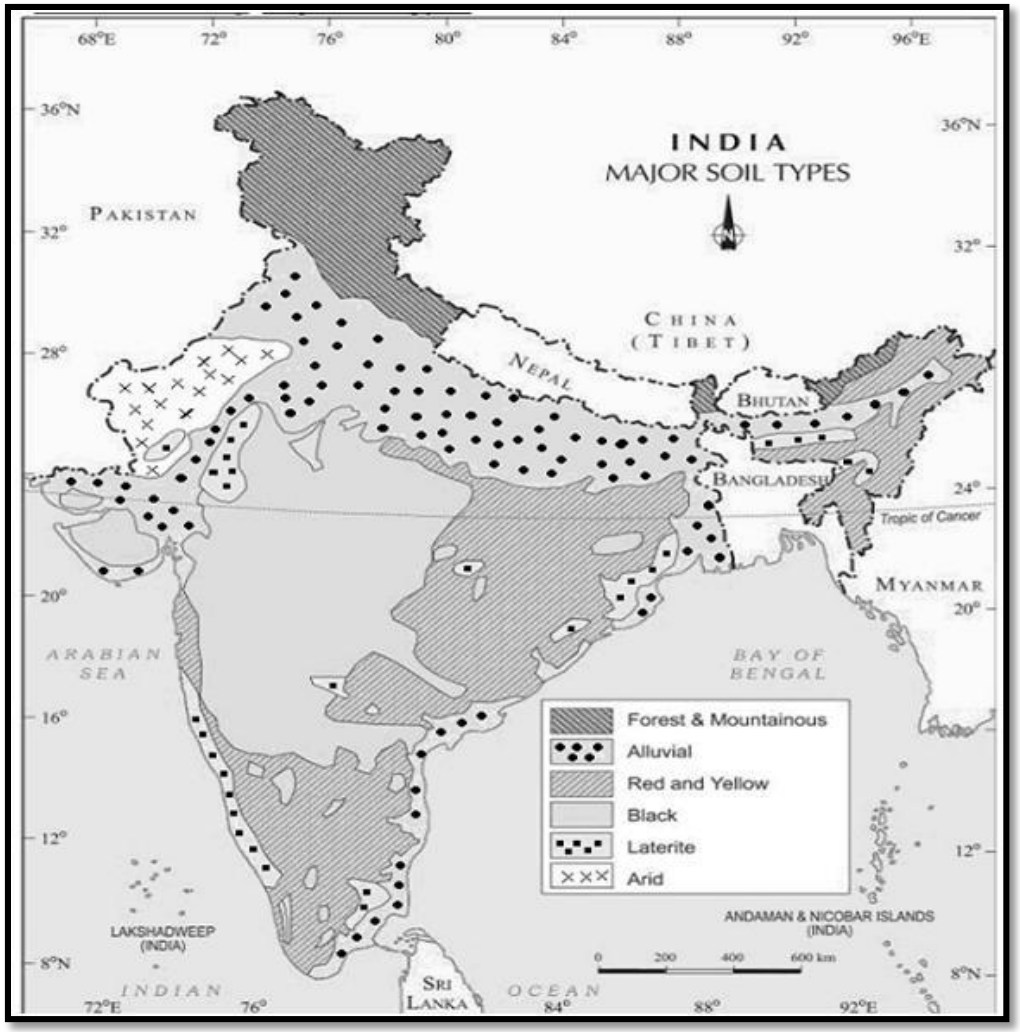


SOURCE: www.pinterst .com/pin/189362359305861720/



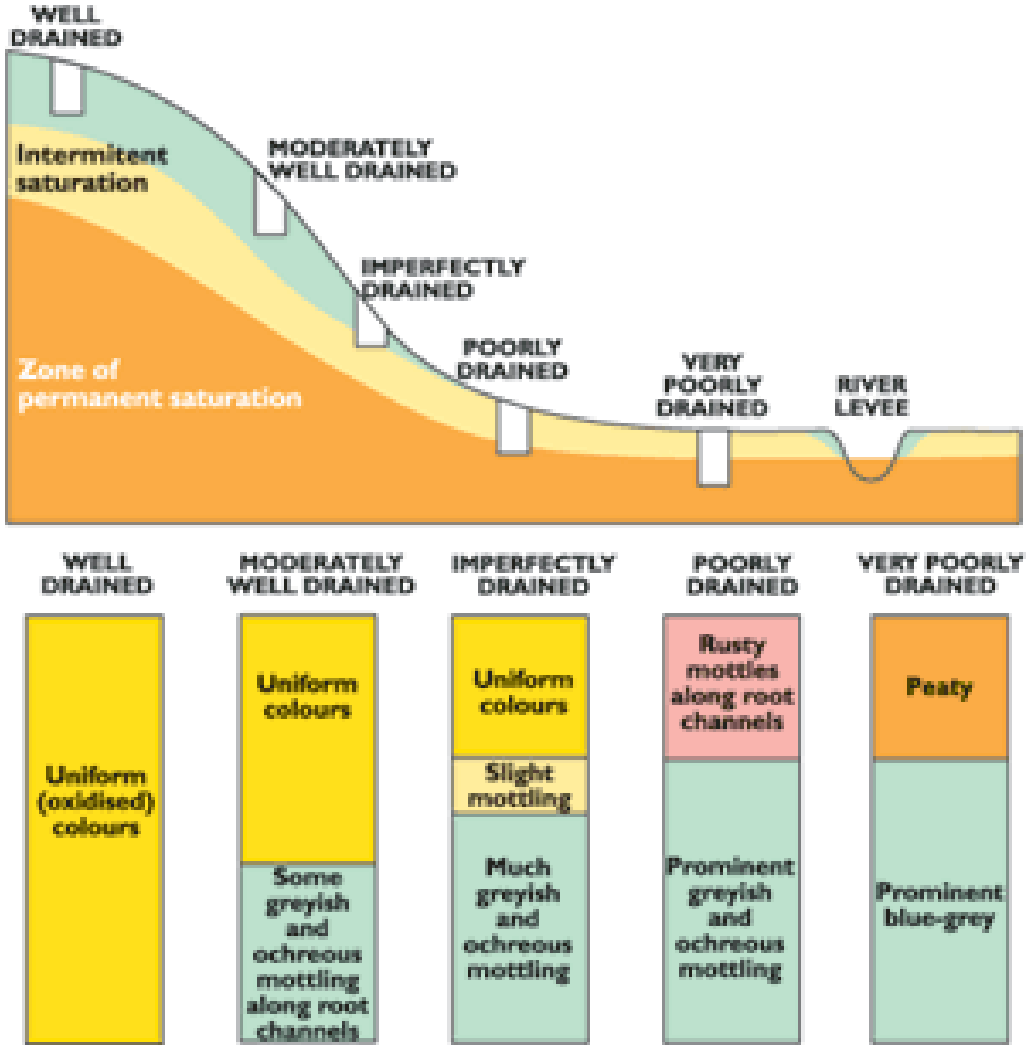
Good Correlation Between Geology And Soil Type



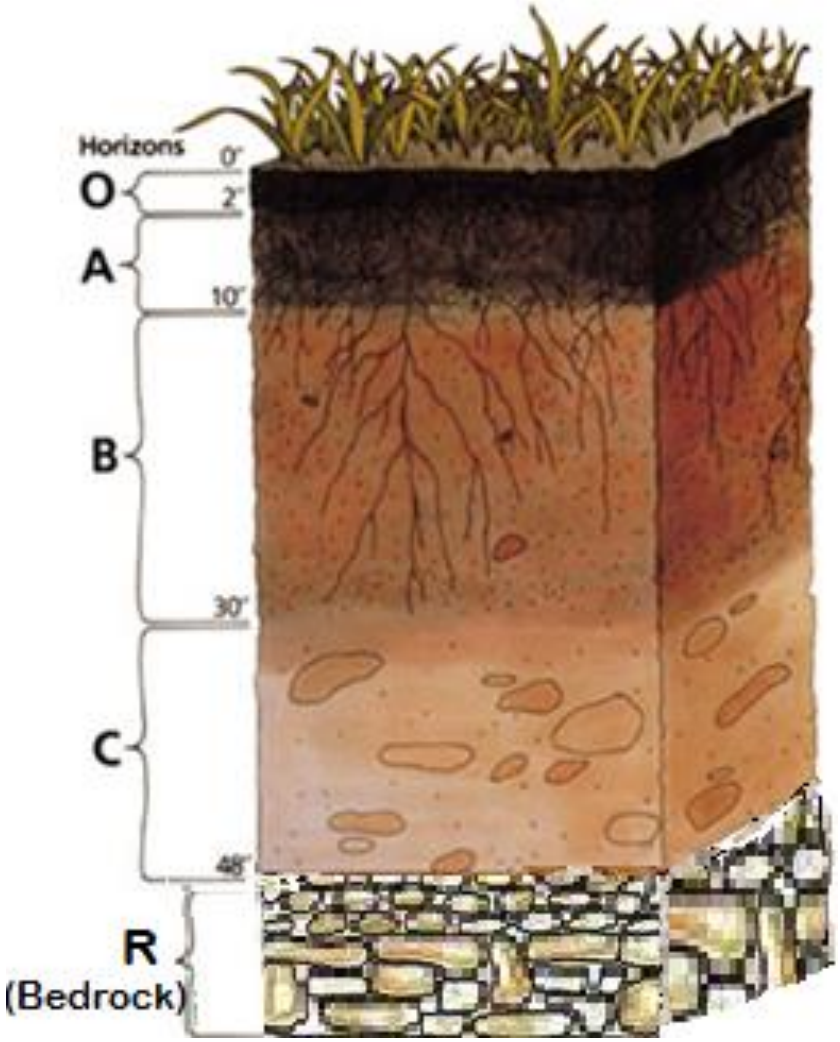


SOURCE: http://www.yourarticlelibrary.com/soil-groups-8-major-soil-groups-available-in-india

Topography


WELL DRAINED
Intermitent saturation
MODERATELY WELL DRAINED
IMPERFECTLY DRAINED
POORLY DRAINED
VERY POORLY DRAINED
RIVER LEVEE
Zone of permanent saturation
WELL DRAINED
Uniform (oxidised) colours
MODERATELY WELL DRAINED
Uniform colours
Some greyish and ochreous mottling along root channels
IMPERFECTLY DRAINED
Uniform colours
Slight mottling
Much greyish and ochreous mottling
POORLY DRAINED
Rusty mottles along root channels
Prominent greyish and ochreous mottling
VERY POORLY DRAINED
Peaty
Prominent blue-grey

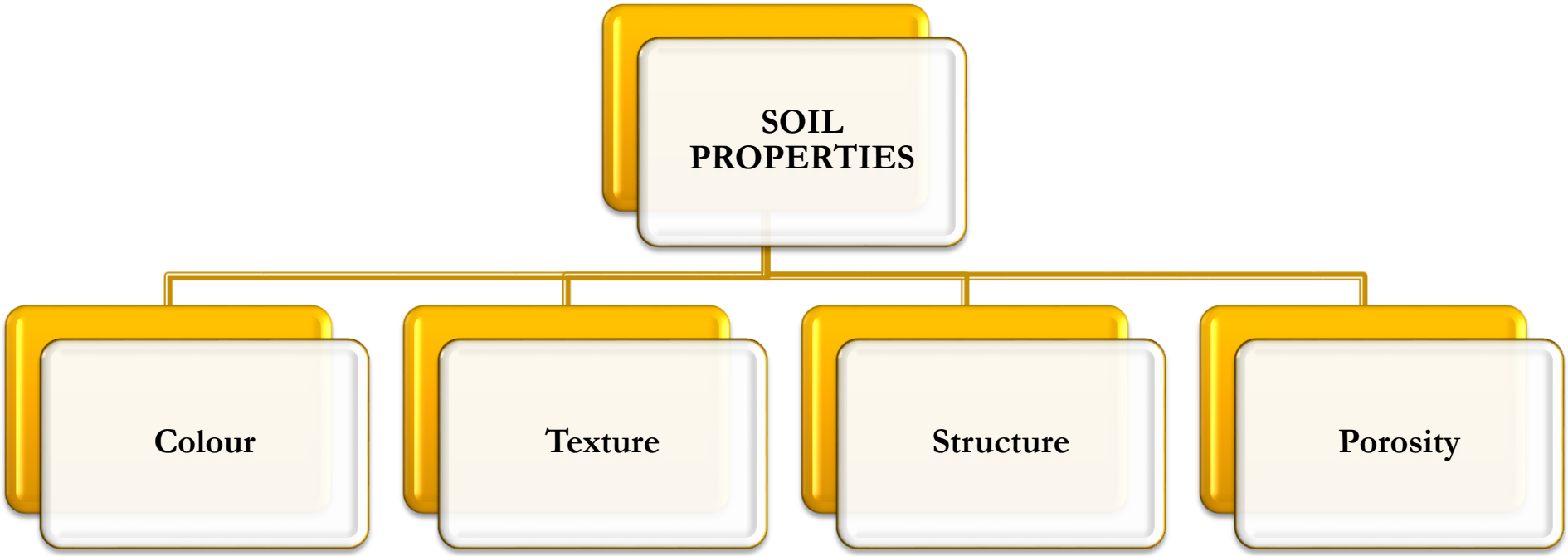
Soil Profile



- ***O Horizon*** – dominated by organic matter; little mineral content.
- ***A Horizon*** – mineral matter and less organic matter as compared to the O horizon; granular to crumbly structure.
- ***B Horizon*** – deposition of materials leached from the horizons above; granular/ blocky/prismatic structure
- ***C Horizon*** – very little alteration and lacking the properties of the above horizons
- ***R Horizon*** – the main unaltered hard rock from which the above layers are formed

SOURCE: en.wikipedia.org

Soil Properties

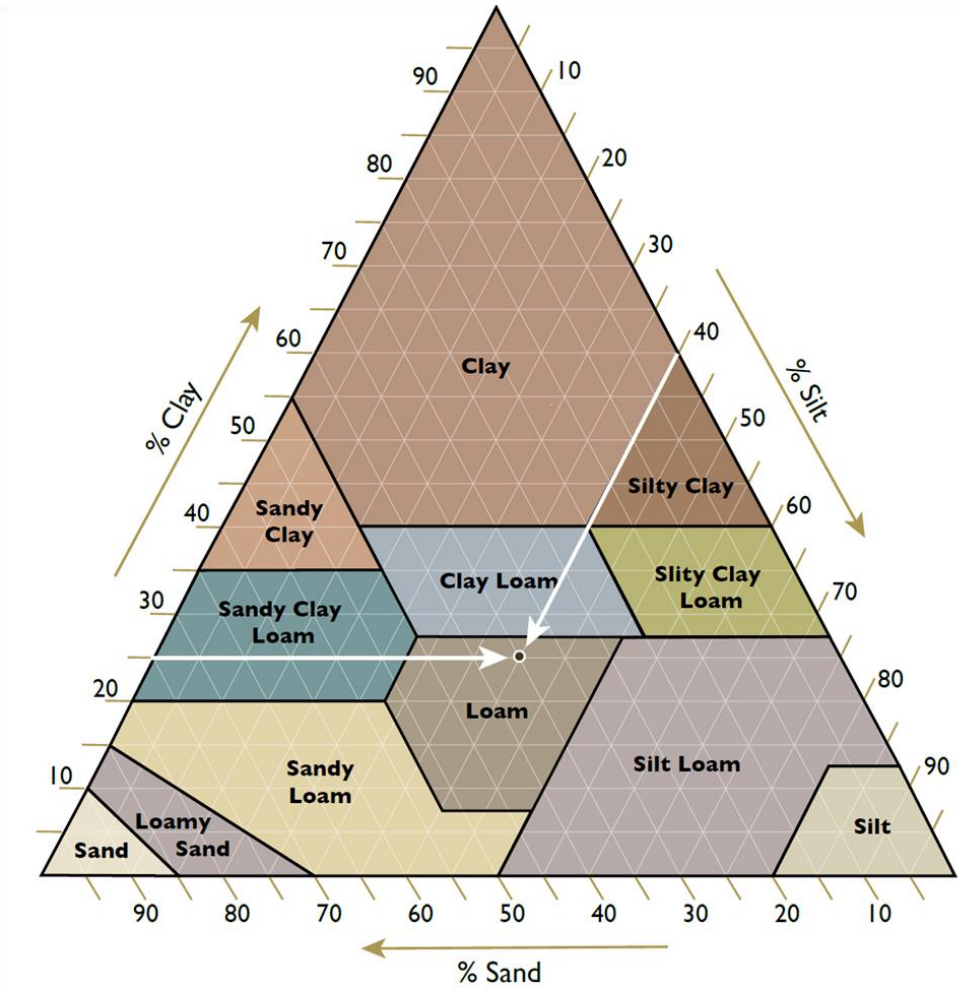


Soil Colour

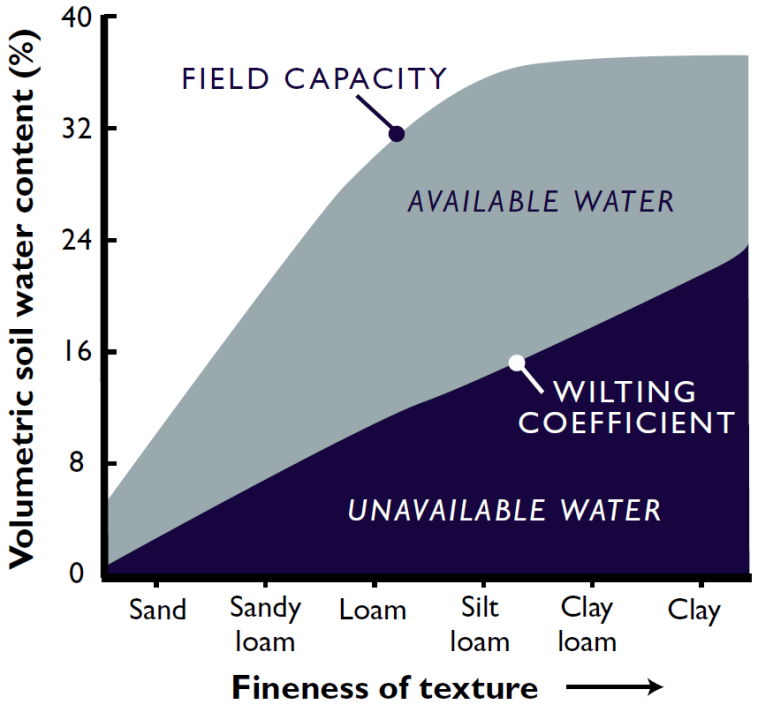
Soil Texture

Properties influenced by Soil Texture

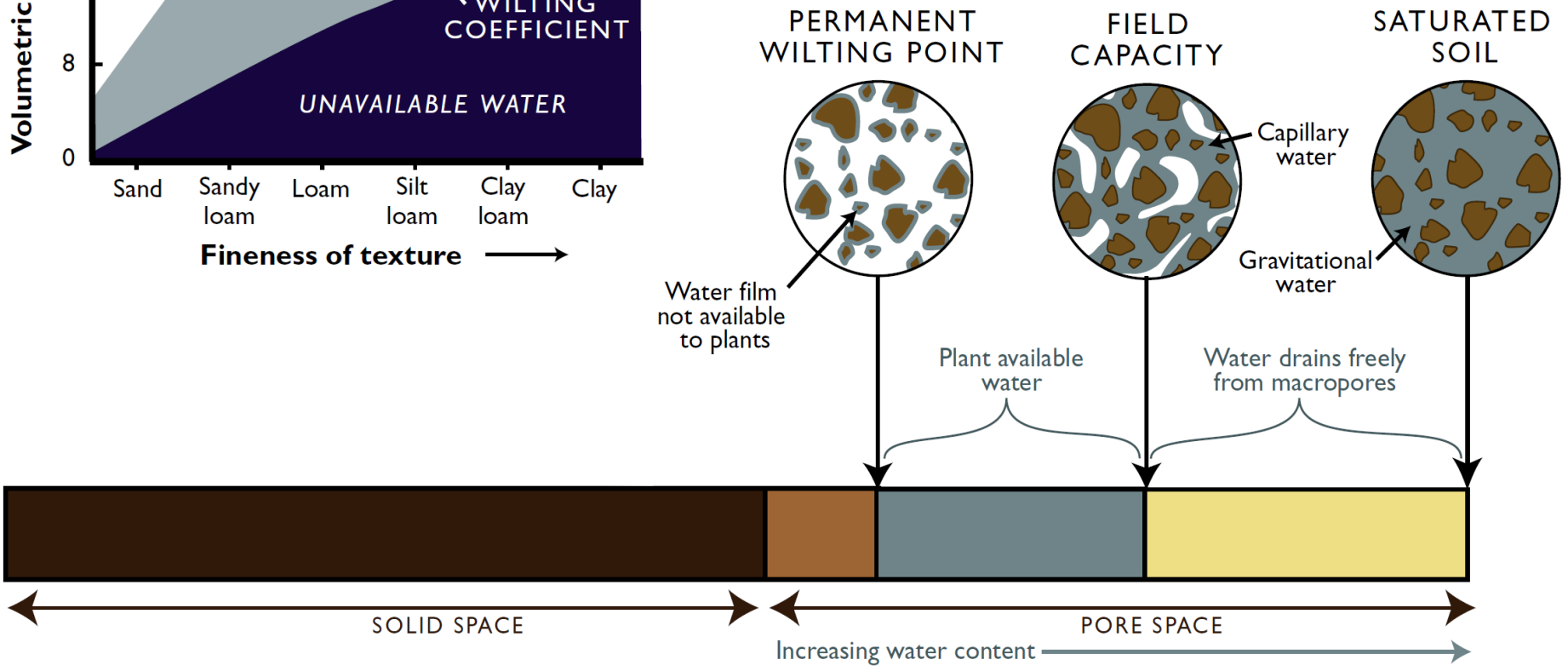
1. Porosity
2. Permeability
3. Infiltration
4. Shrink-Swell rate
5. Water holding Capacity
6. Susceptibility to erosion



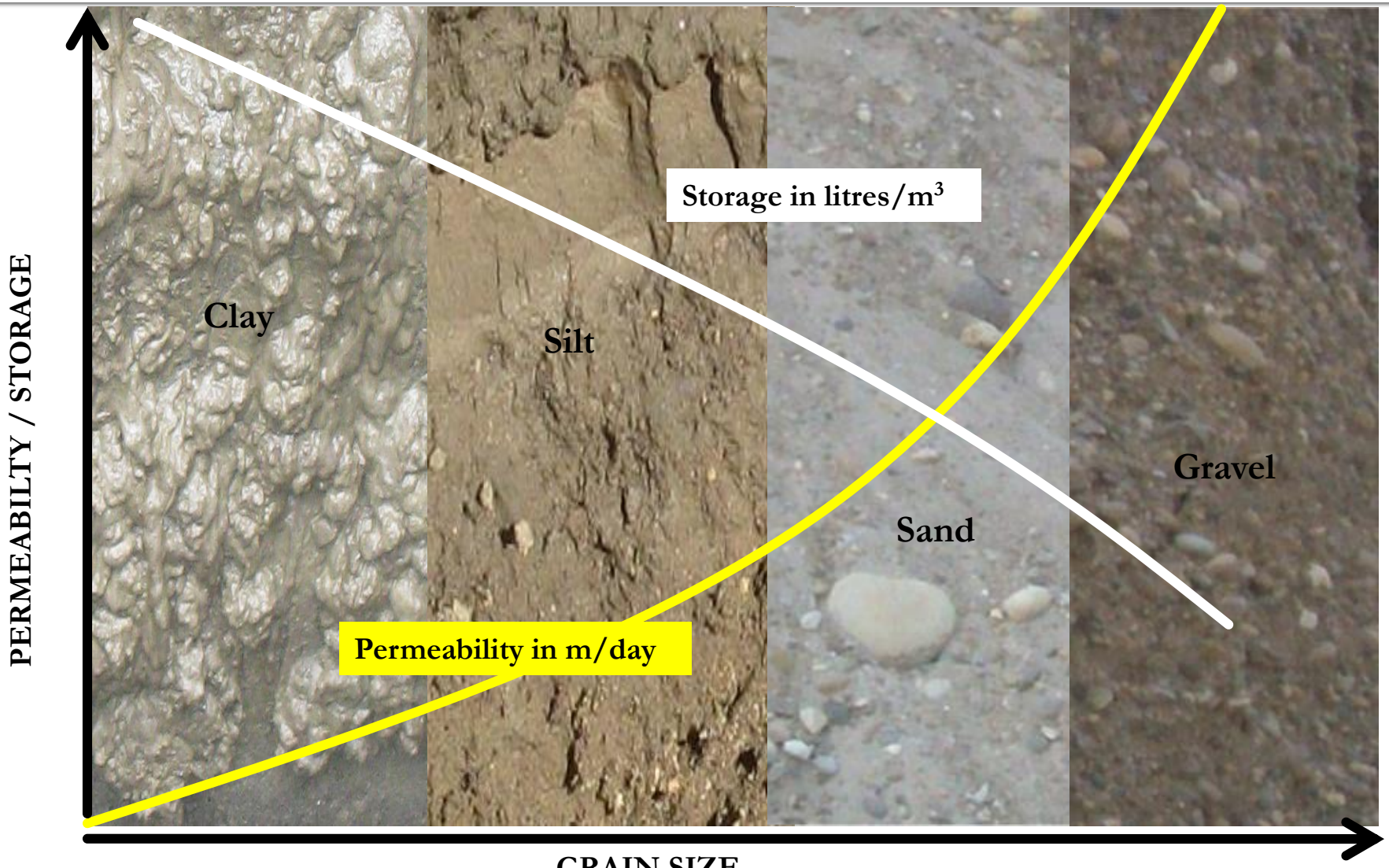
Soil Moisture



Gurevitch et al., 2002

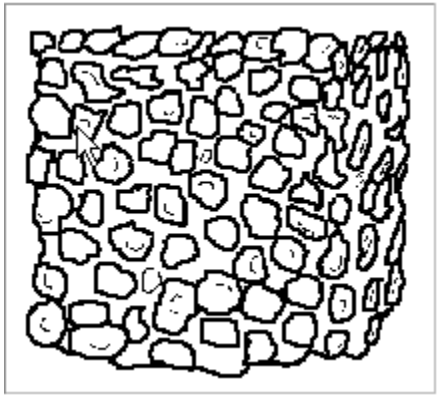


Soil Porosity

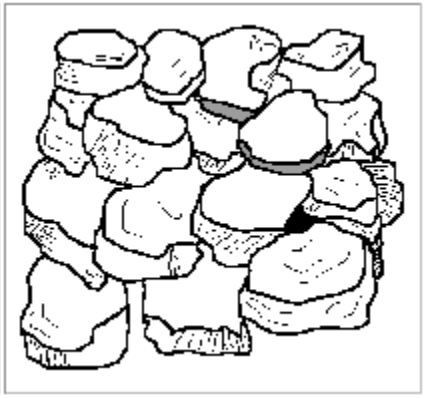


Soil Structure

How will the rate of water movement vary in each case??

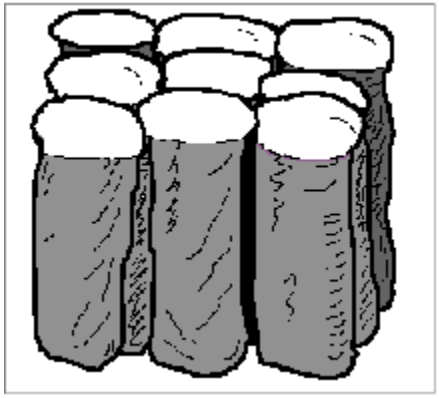


GRANULAR

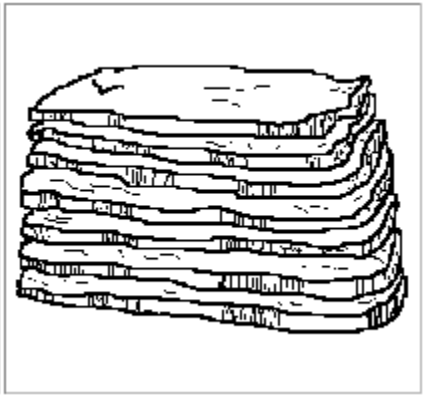


BLOCKY

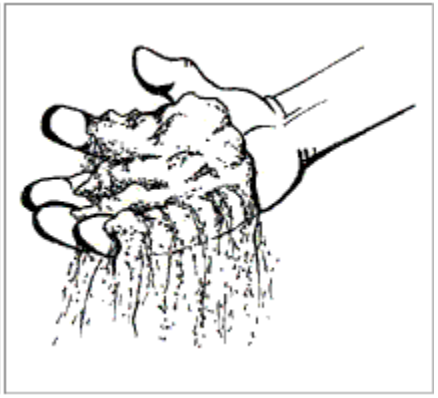
PRISMATIC



COLUMNER



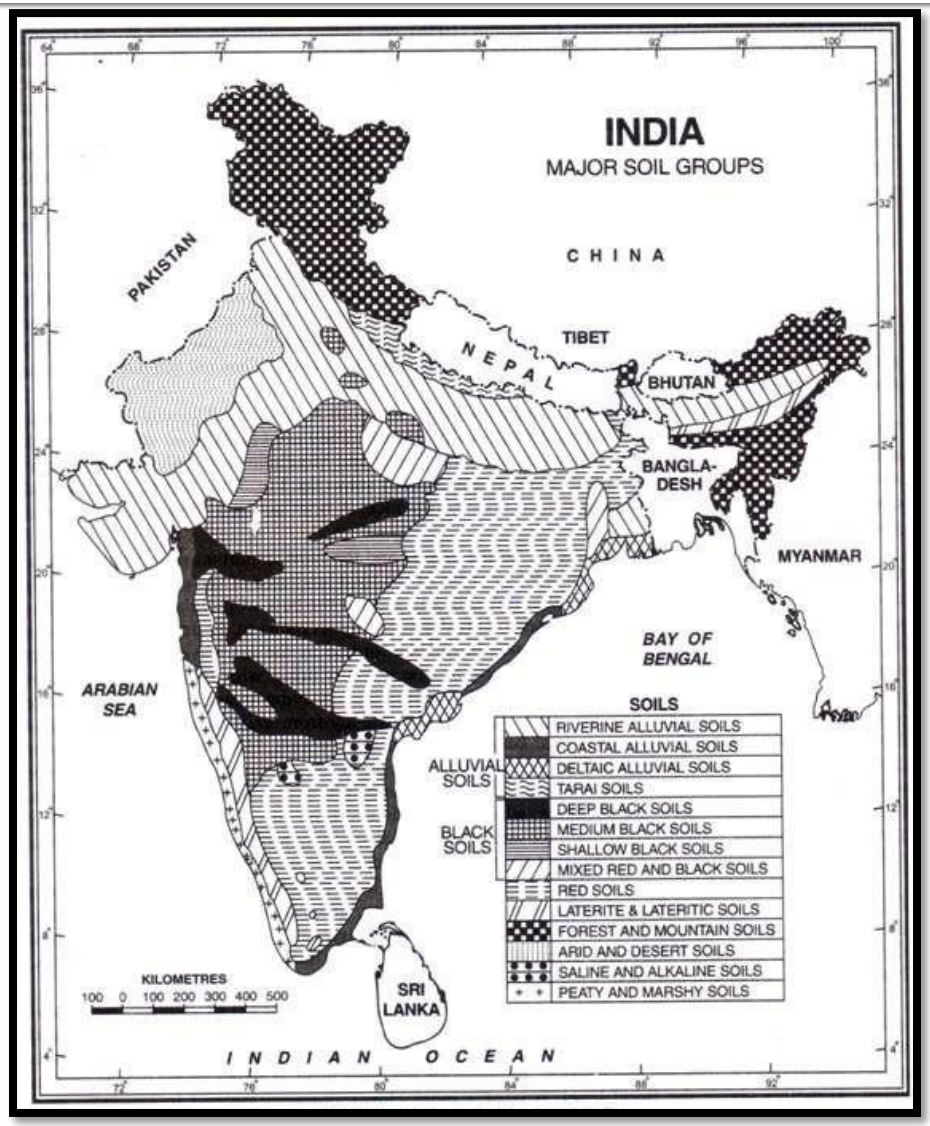
PLATY



SINGLE GRAINED

SOURCE: http://www.ctahr.hawaii.edu/mauisoil

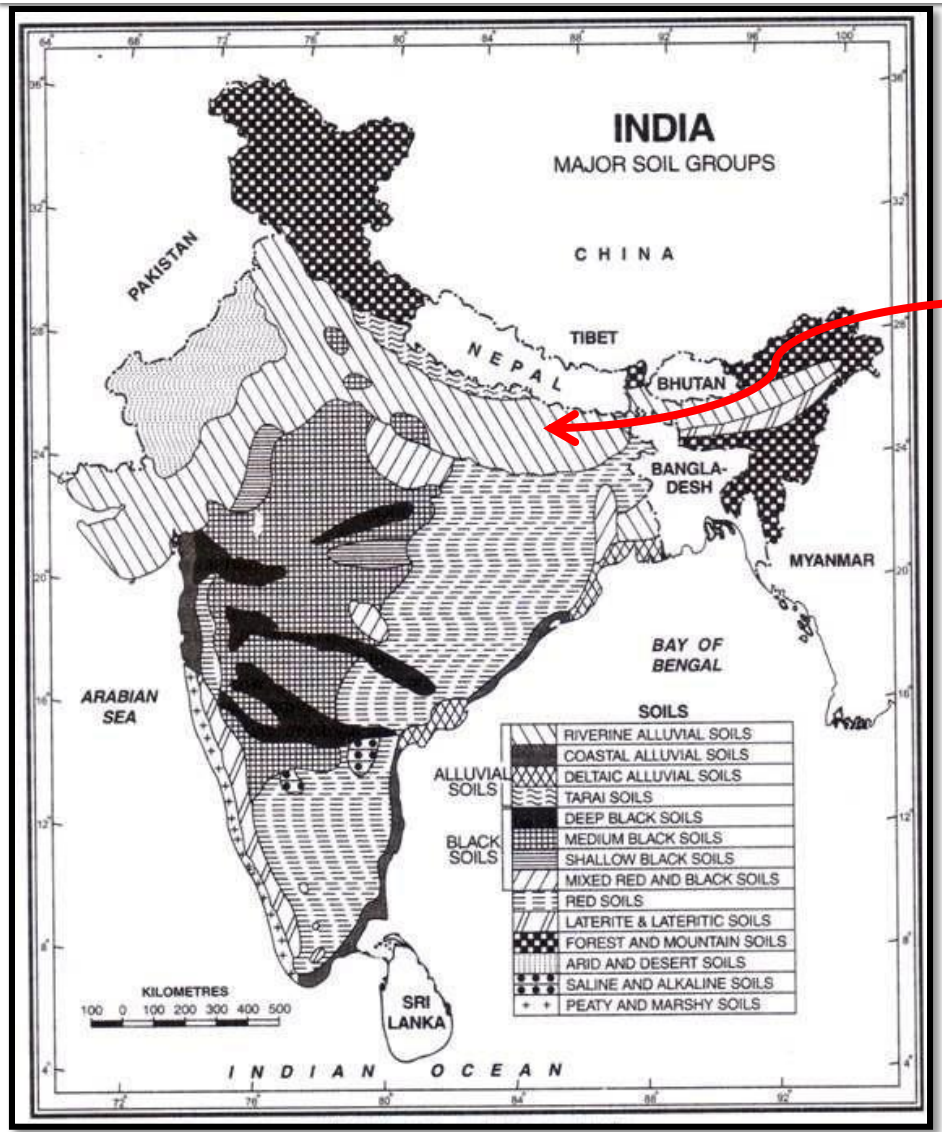
Soils In India



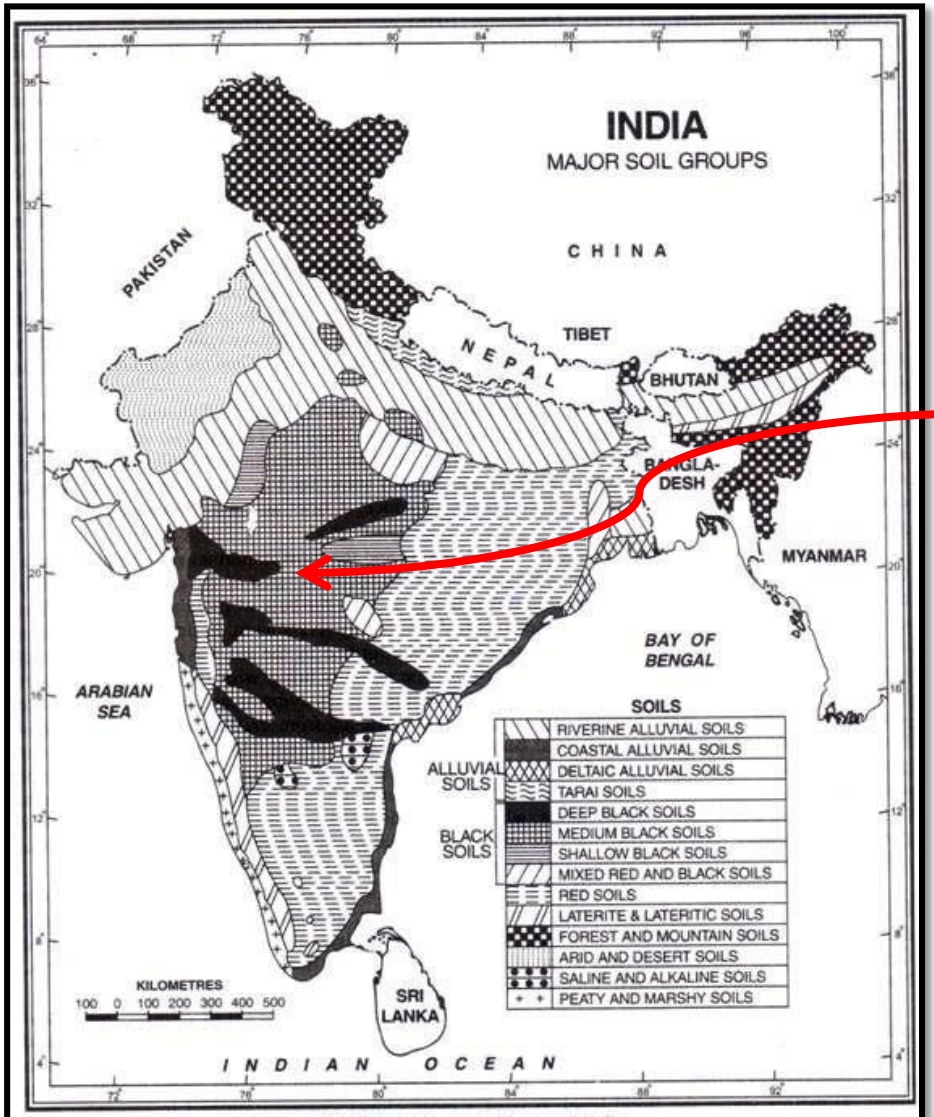
1. Alluvial Soils
2. Black Soils
3. Red Soils
4. Laterite and Lateritic Soils
5. Forest and Mountain Soils
6. Arid and Desert Soils
7. Saline and Alkaline Soils
8. Peaty and Marshy Soils

SOURCE: www.yourarticlelibrary.com/8 major soil groups available in india

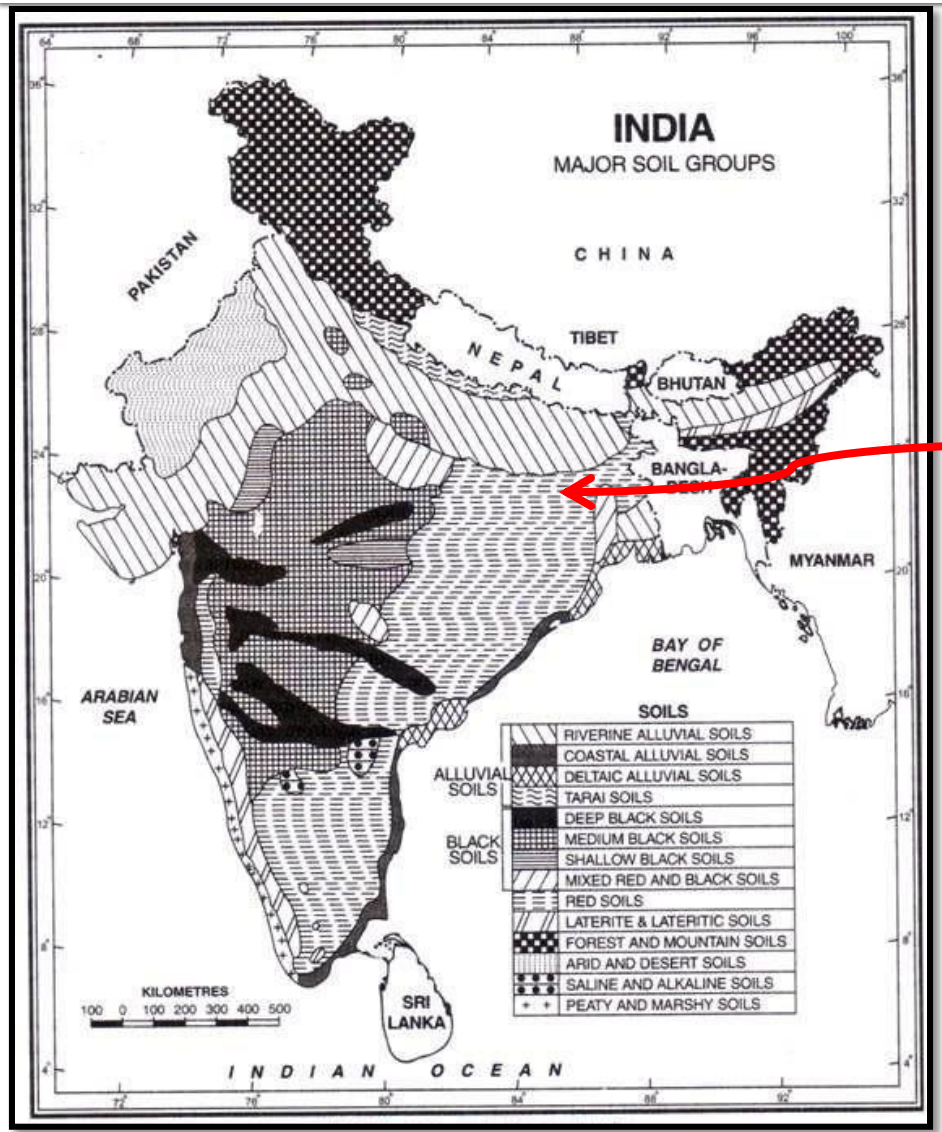
Soil Type: Alluvial



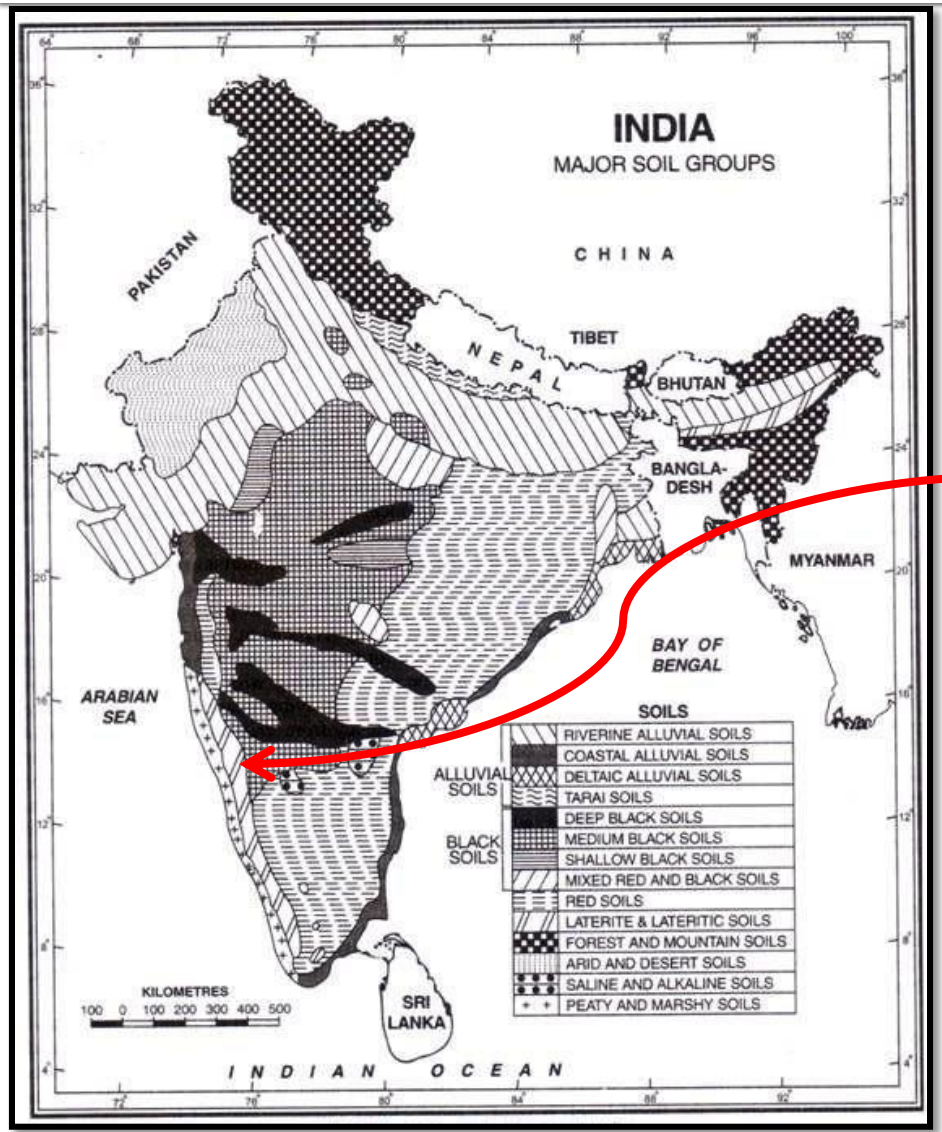
Soil Type: Black



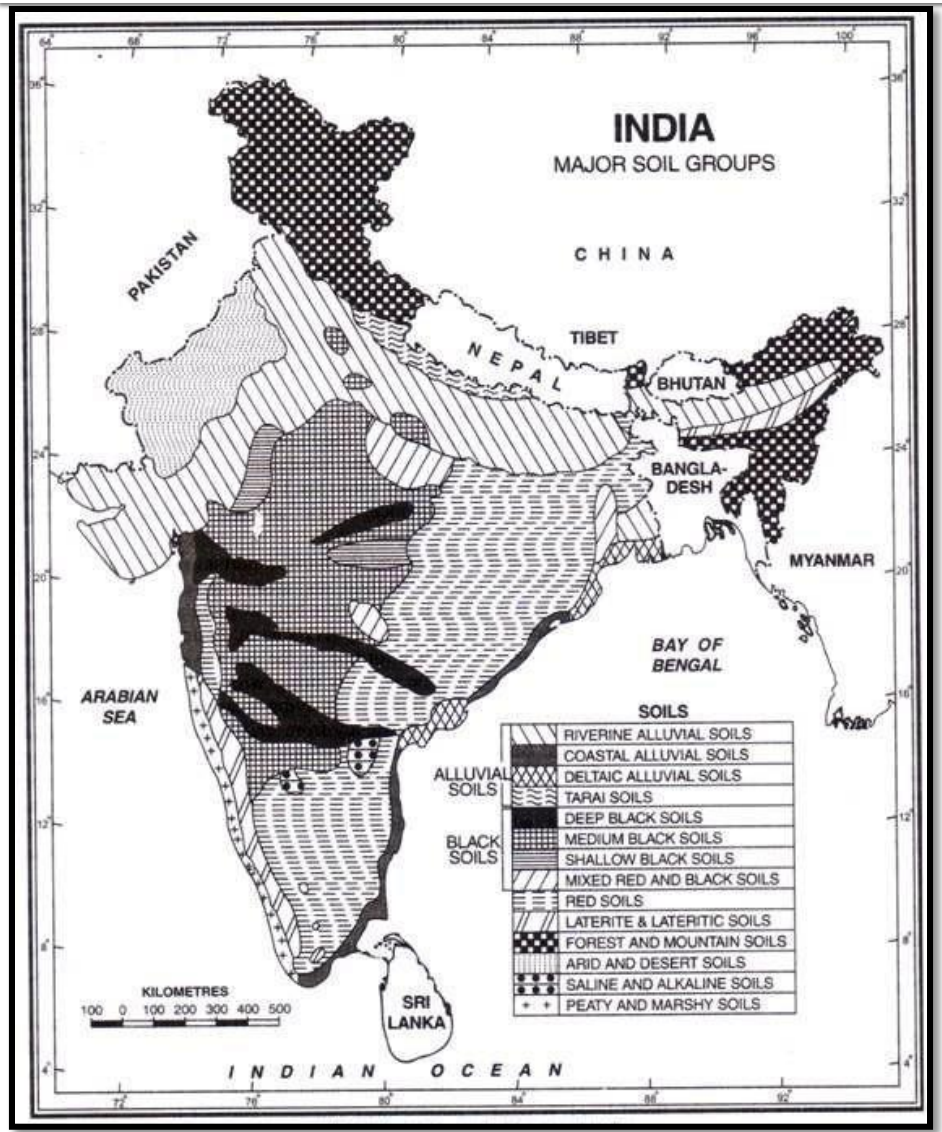
Soil Type: Red



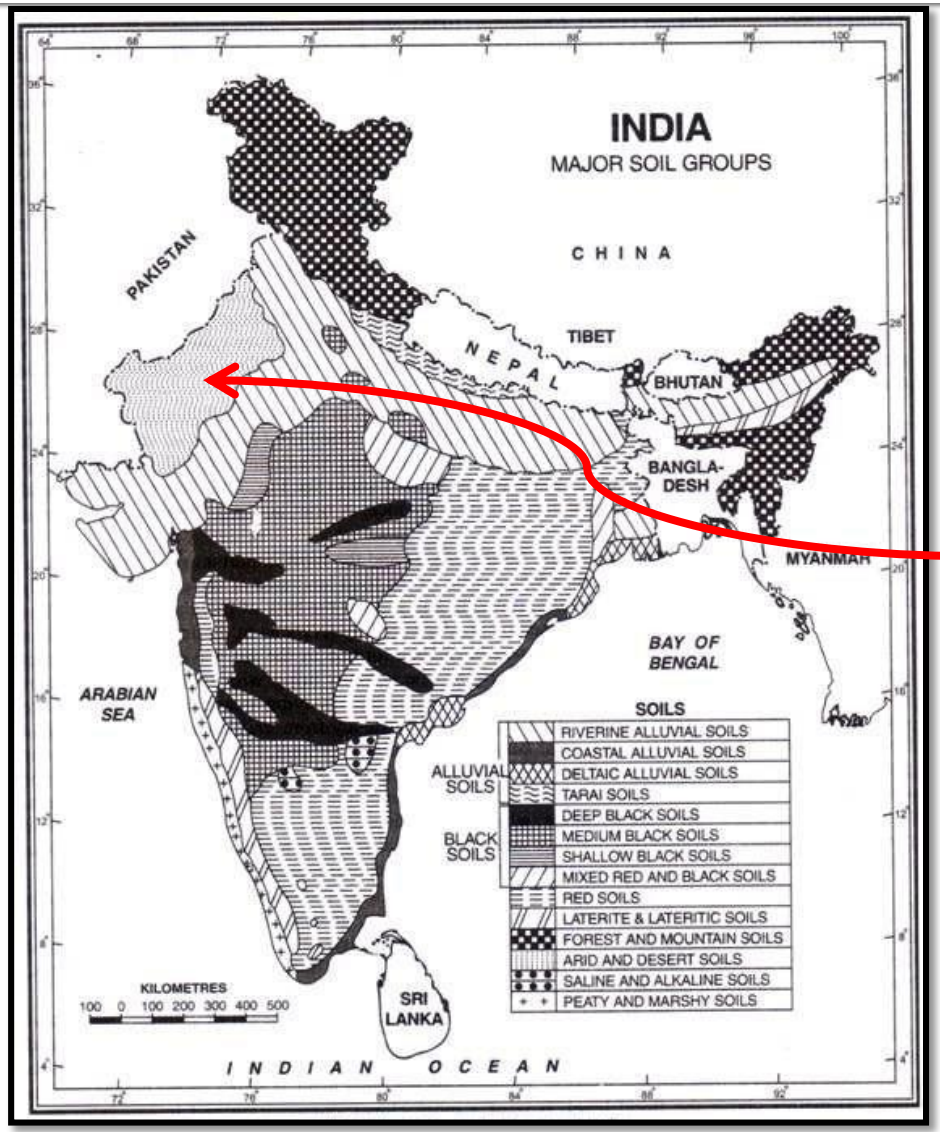
Soil Type: Laterite



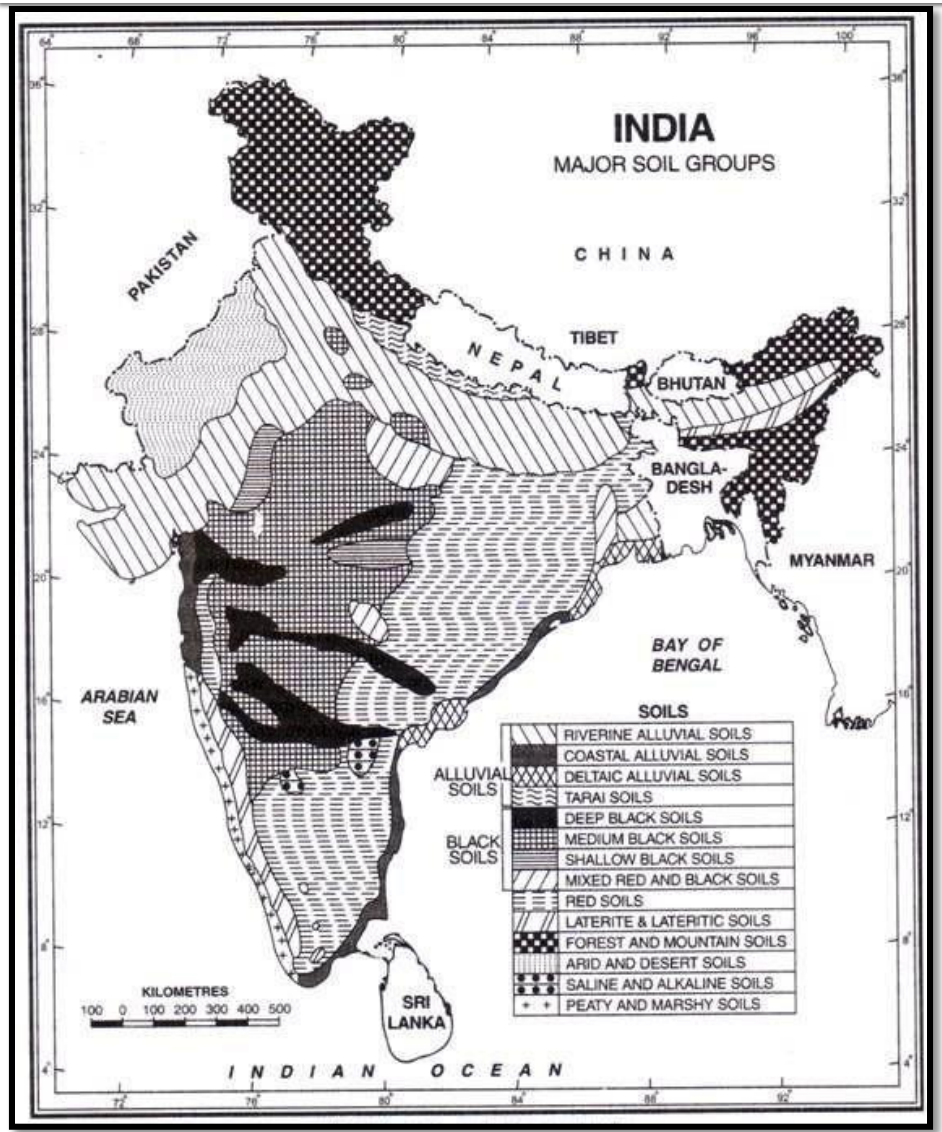
SOIL TYPE: FOREST AND MOUNTAIN



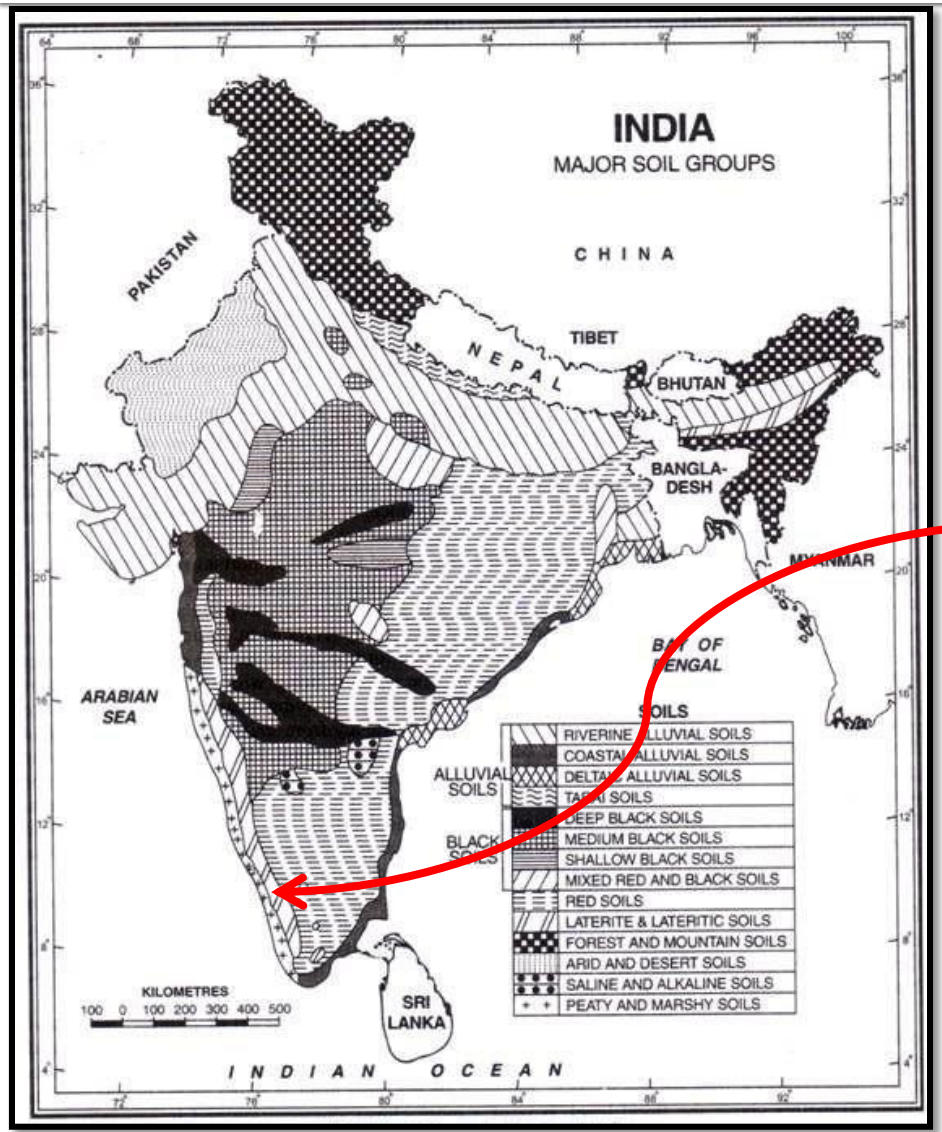
SOIL TYPE: ARID AND DESERT



SOIL TYPE: SALINE AND ALKALINE

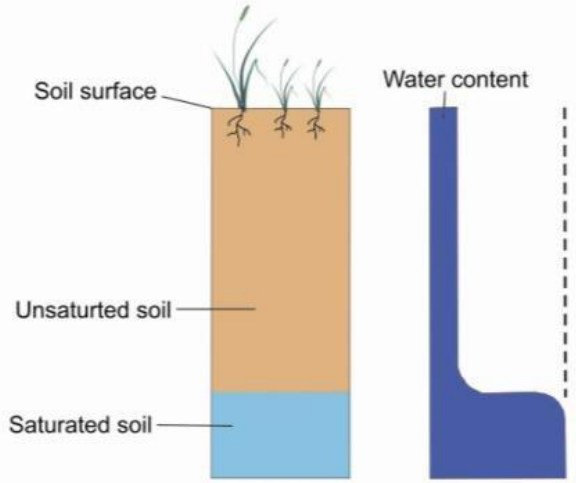


SOIL TYPE: PEATY AND MARSHY

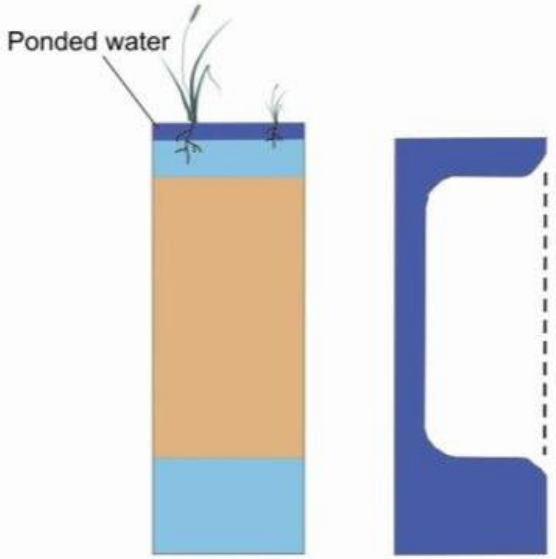


SOURCE: www.nature.com

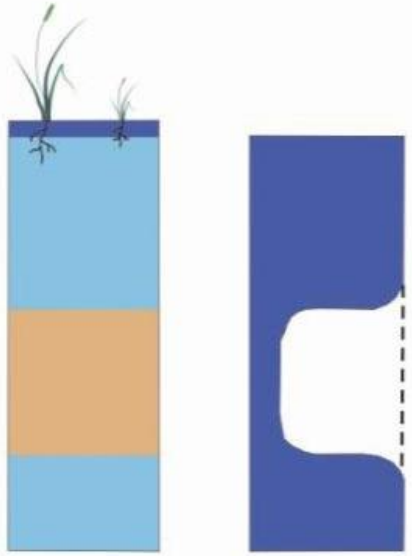
Soil Moisture: Spatial Variability



Dry surface

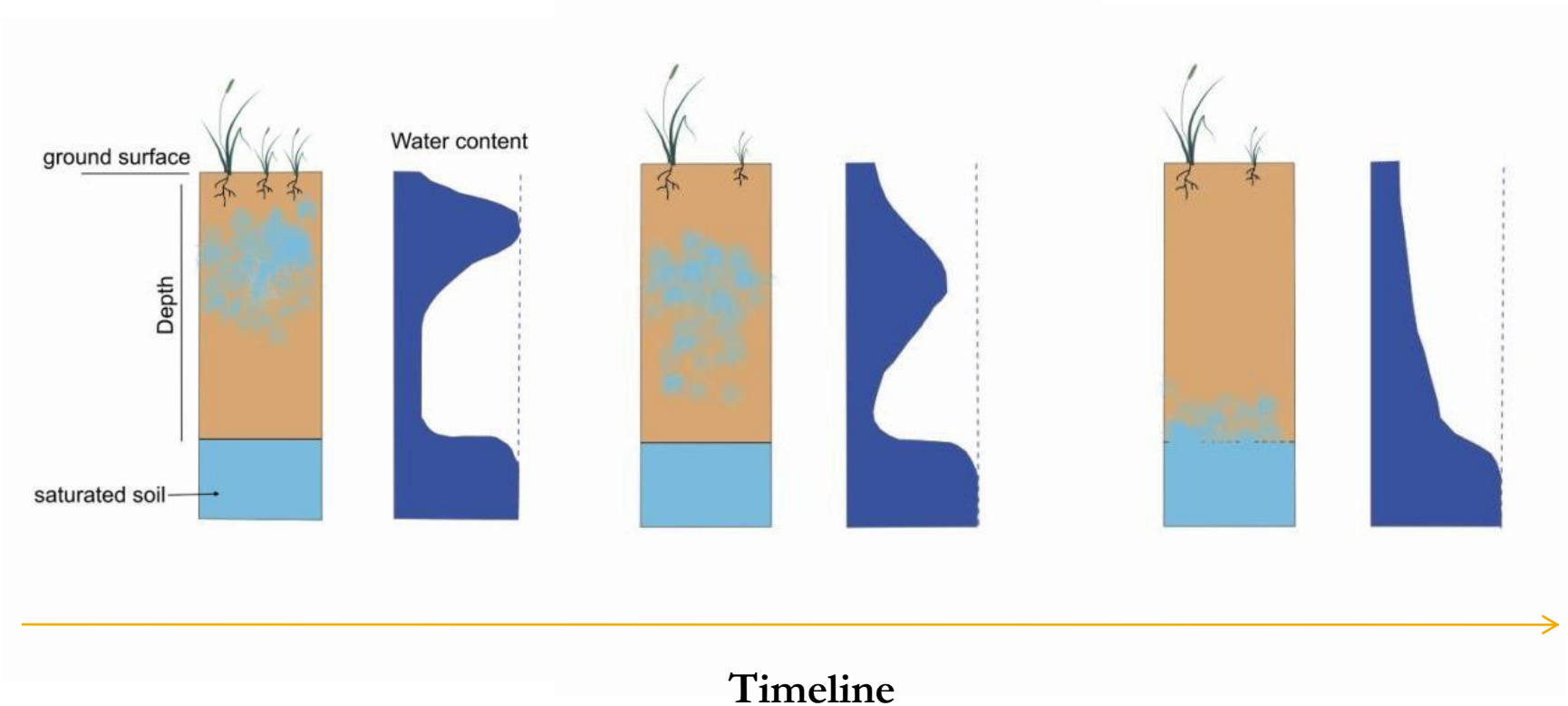


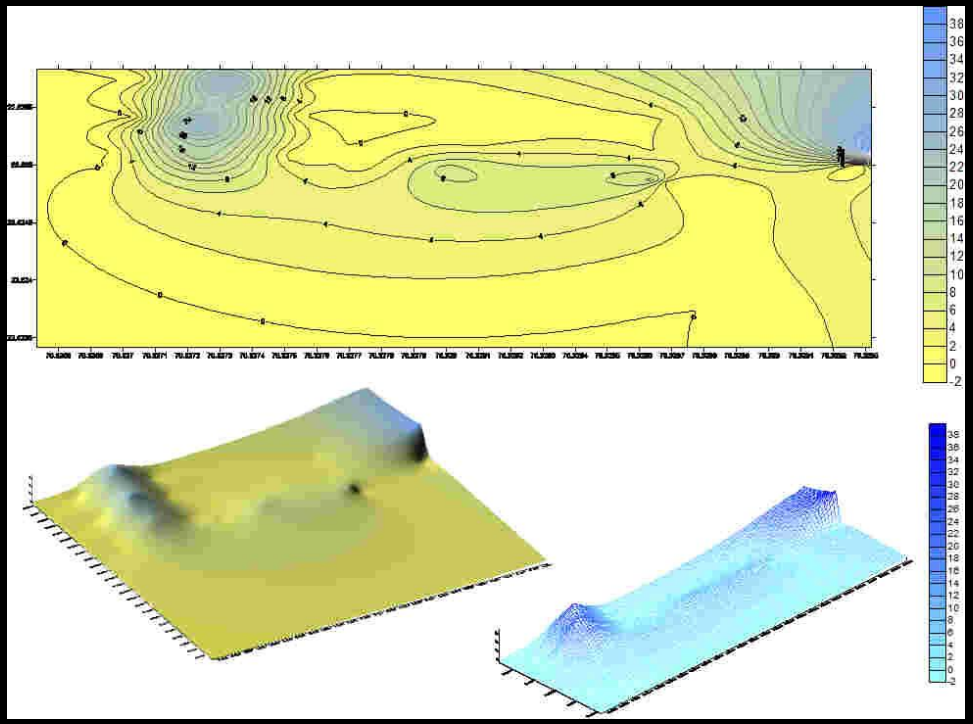
Shallow ponding

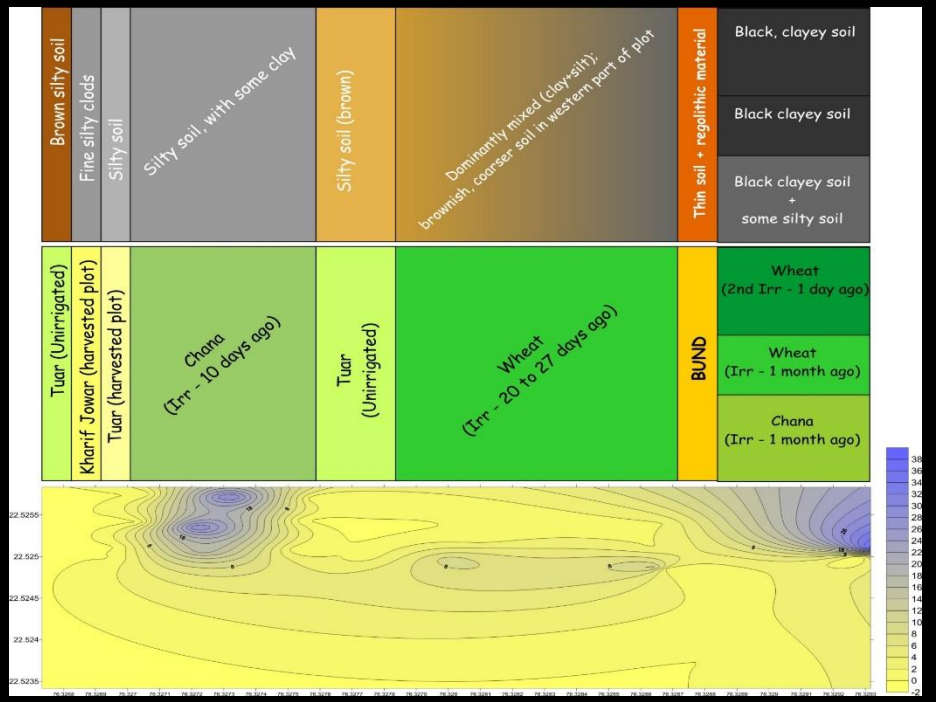


Deep ponding

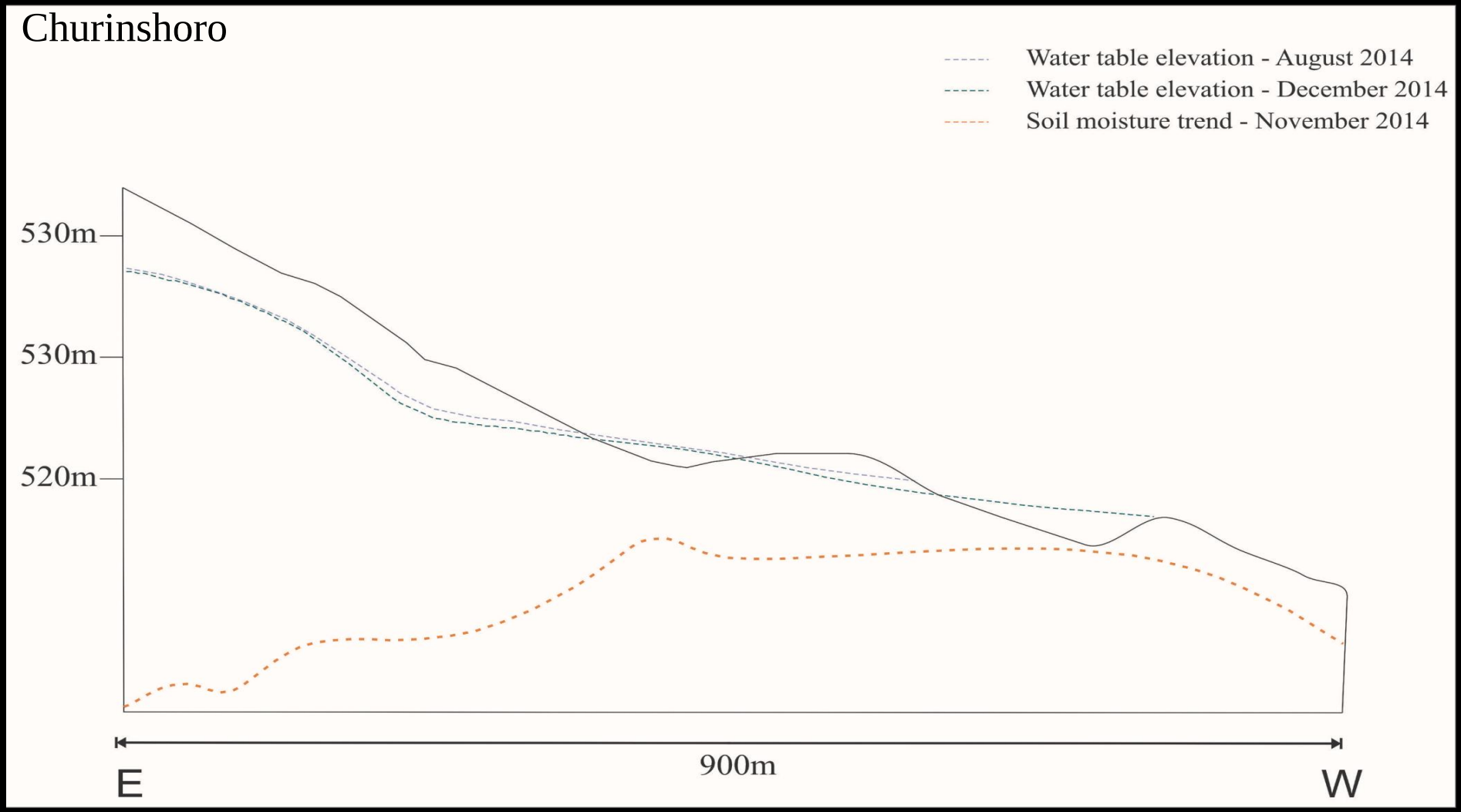
Soil Moisture: Temporal Variability



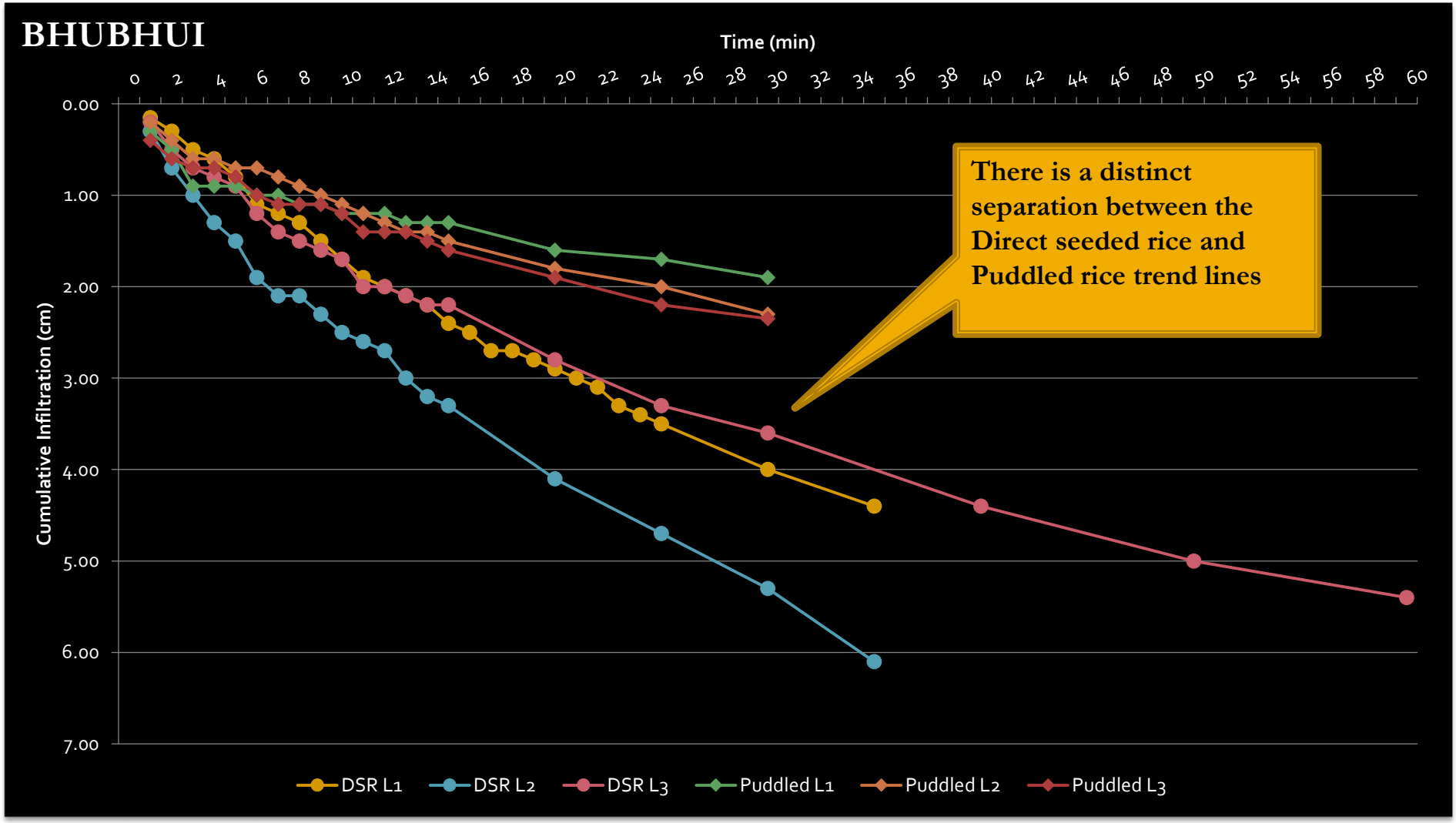

38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2

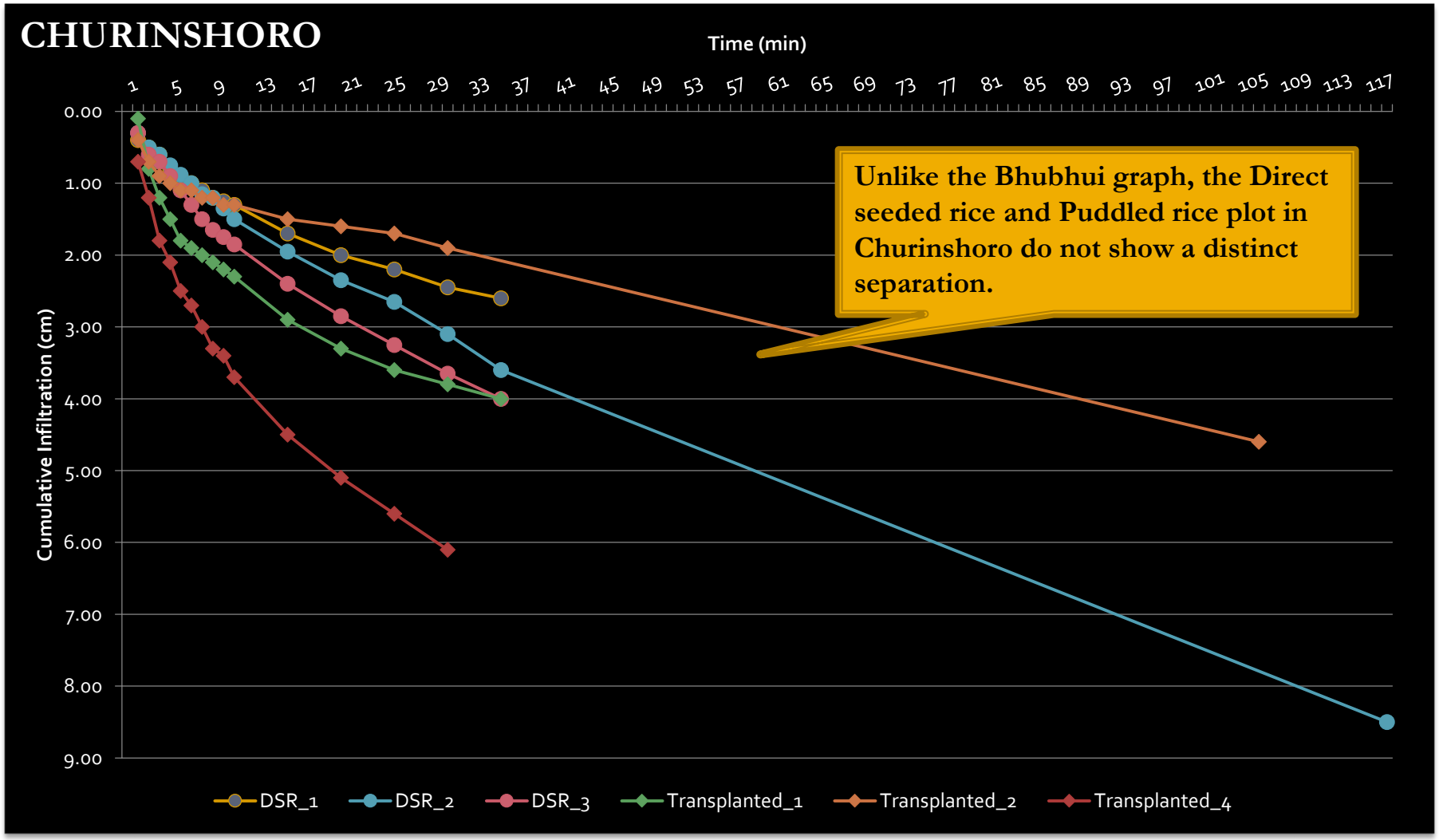

Brown silty soil
Fine silty clods
Silty soil
Silty soil, with some clay
Silty soil (brown)
Dominantly mixed (clay+silt); brownish, coarser soil in western part of plot
Thin soil + regolithic material
Black, clayey soil
Black clayey soil
Black clayey soil + some silty soil
Tuar (Unirrigated)
Kharif Jowar (harvested plot)
Tuar (harvested plot)
Chana (Irr - 10 days ago)
Tuar (Unirrigated)
Wheat (Irr - 20 to 27 days ago)
BUND
Wheat (2nd Irr - 1 day ago)
Wheat (Irr - 1 month ago)
Chana (Irr - 1 month ago)
22.5255
22.525
22.5245
22.524
22.5235
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2

Relation Between Soil Moisture And Water Table



Infiltration Rates




CHURINSHORO
Time (min)
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97 101 105 109 113 117
0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00
Cumulative Infiltration (cm)
Unlike the Bhubhui graph, the Direct seeded rice and Puddled rice plot in Churinshoro do not show a distinct separation.
DSR_1
DSR_2
DSR_3
Transplanted_1
Transplanted_2
Transplanted_4