

# PROPERTIES OF SOIL

MODULE 2/2

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# SOIL PROPERTIES

- ⊙ The various properties of soil include-
  1. Color
  2. Texture
  3. Humus
  4. Soil structures

# SOIL COLOR



Appling Series, Granville Co, NC

- ❖ Useful tool for providing information about other soil properties
  - ❖ Organic matter content
  - ❖ Soil minerals
  - ❖ Seasonal high water tables

# Texture



Seabrook Series, Hyde Co, NC

- ❖ Soils containing large amounts of **sand** exhibit little plasticity and cannot retain large amounts of water or nutrients. They have large voids between the particles and can readily transport water and air.

## **TEXTURAL CLASSES OF SOIL:**

<b>Textural class</b>	<b>Sand (%)</b>	<b>Silt (%)</b>	<b>Clay(%)</b>
<b>Sand</b>	<b>85-100</b>	<b>0-15</b>	<b>0-10</b>
<b>Loamy sand</b>	<b>70-90</b>	<b>0-30</b>	<b>0-15</b>
<b>Sandy loam</b>	<b>43-80</b>	<b>0-50</b>	<b>0-20</b>
<b>Loam</b>	<b>23-52</b>	<b>28-50</b>	<b>7-27</b>
<b>Silt loam</b>	<b>0-50</b>	<b>50-88</b>	<b>0-27</b>
<b>Silt</b>	<b>0-20</b>	<b>88-100</b>	<b>0-12</b>
<b>Sandy clay loam</b>	<b>45-80</b>	<b>0-28</b>	<b>20-55</b>
<b>Clay loam</b>	<b>20-45</b>	<b>15-53</b>	<b>27-40</b>
<b>Silty clay loam</b>	<b>0-20</b>	<b>40-73</b>	<b>27-40</b>
<b>Sandy clay</b>	<b>40-65</b>	<b>0-20</b>	<b>35-45</b>
<b>Silty clay</b>	<b>0-20</b>	<b>40-60</b>	<b>40-60</b>
<b>Clay</b>	<b>0-40</b>	<b>0-40</b>	<b>40-60</b>

### **Example**

**If the soil contains more than 80% of silt fraction, the soil is designated as silty soil and soil with more than 85% of sand is called sandy soil and so on.**

# Infiltration



- ❖ *Infiltration* is the downward entry of water into the immediate surface of the soil and is influenced by texture, structure, bulk density, and the type and connectivity of macropores.
- ❖ Soils with a high infiltration rate are resistant to erosion because there is little runoff.

# Properties of Soil

- Percolation rate of water in soil.

Formulae of rate percolation is

Percolation rate (ml/min)

= Amount of water (ml)/Percolation time (min)

- Moisture in soil

Soil moisture is difficult to define because it means different things in different disciplines. For example, a farmer's concept of soil moisture is different from that of a water resource manager or a weather forecaster. Generally, however, soil moisture is the water that is held in the spaces between soil particles

## 6) Properties of SOIL :-

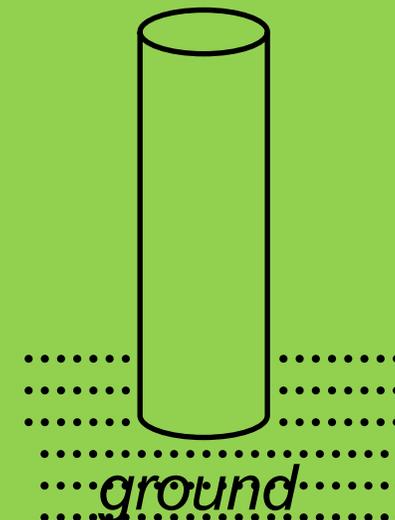
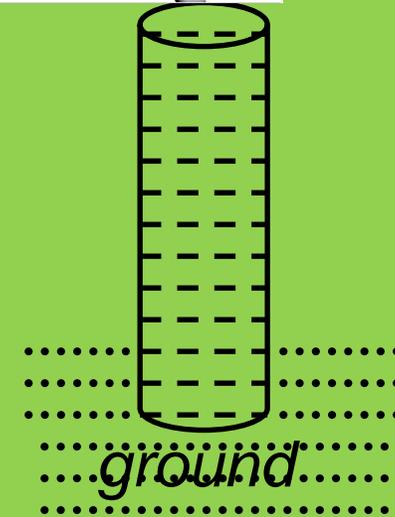
i) Percolation rate of water :- (How fast water passes through the soil)

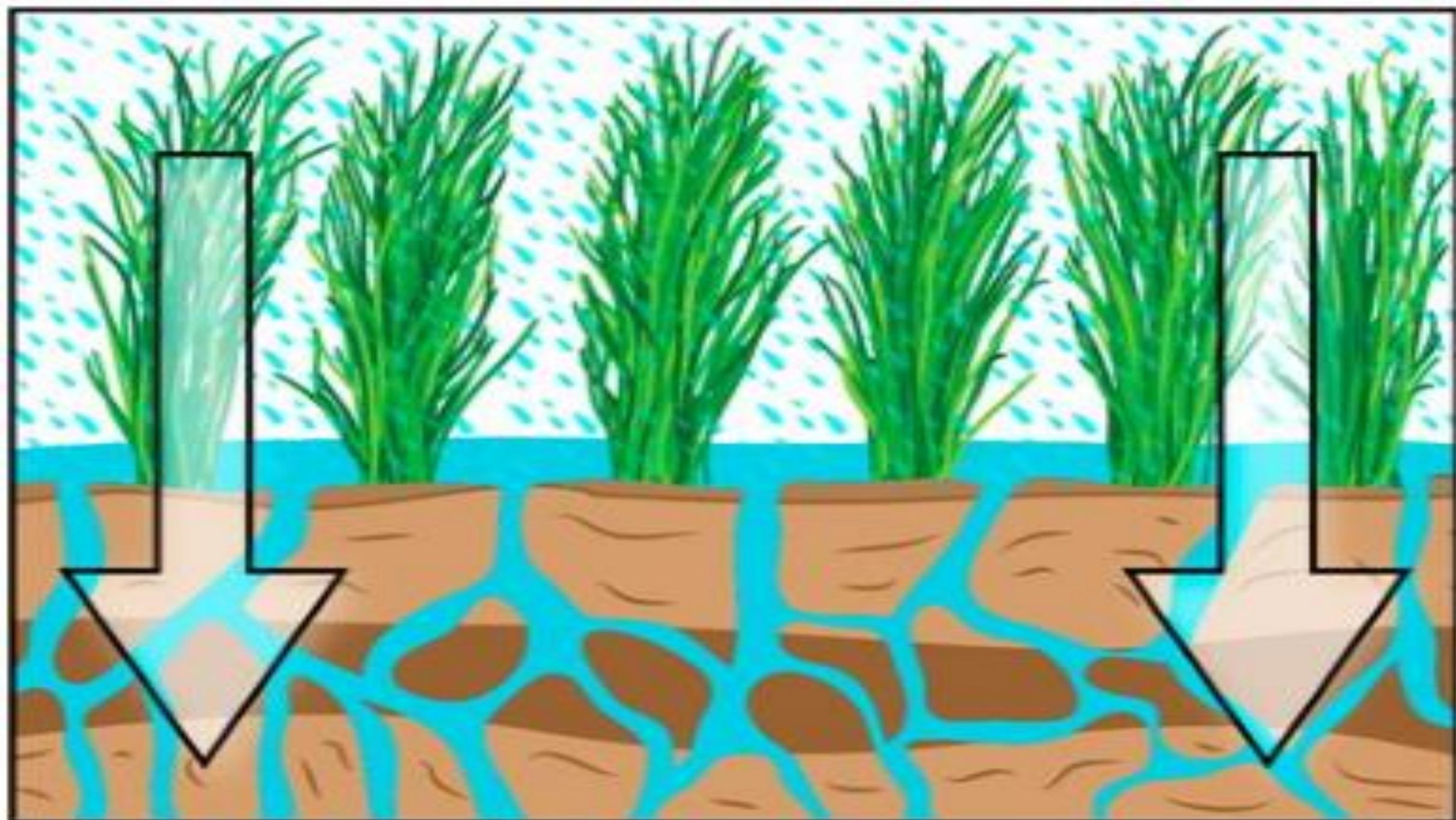
Water percolates faster through sandy soil and slower through clayey soil.

Activity :-

Take a PVC pipe about 20 cm long and 5 cm diameter. Place it about 2 cm in the ground. Pour 200 ml water slowly into it and note the time taken for the water to percolate. The rate of percolation of water can be calculated by using the formula

$$\text{Rate of percolation} = \frac{\text{Amount of water (mL)}}{\text{Percolation time (min)}}$$





# Moisture

Moisture is the amount of water that is present in the soil. Even a dry soil has some amount of moisture in the air. However, the clayey soil has the highest content of moisture.

Why air above farmland appears shimmering during the daytime?

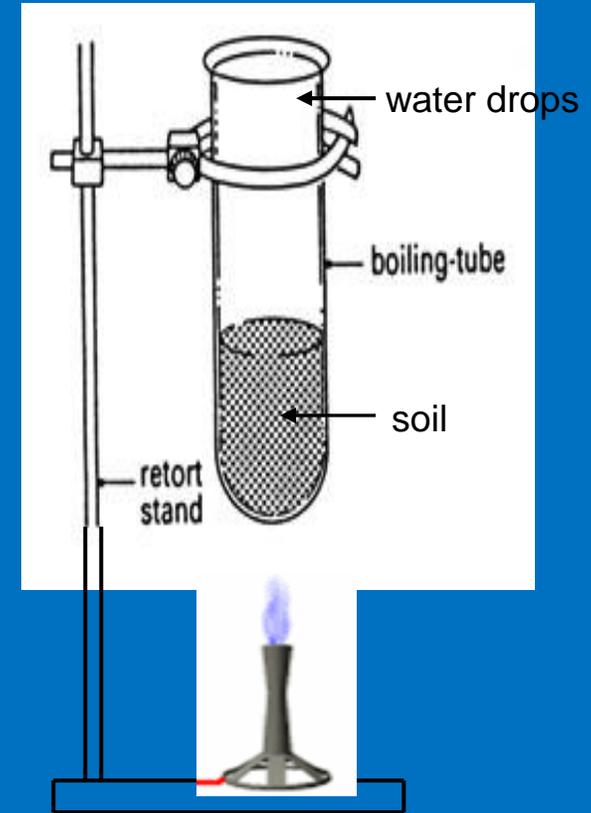
We know that soil contains water. Due to sunlight, the water from the soil begins to evaporate and turns into water vapour. This water vapour when reflects the sunlight appears as if it is shining and hence the air above the soil makes the land look shimmery.

## ii) Moisture in the soil :-

Soil contains moisture. The amount of moisture is different in different types of soils. Clayey soil contains most moisture And sandy soil contains least moisture.

### Activity :-

Take some soil in a boiling tube and fix it to a stand. Heat the soil with a burner. Drops of water are formed in the boiling tube. The water from the soil evaporates and condenses in the inner walls of the boiling tube. This shows that soil contains moisture.



### iii) Absorption of water by the soil :-

Soil absorbs water. Clayey soil absorbs most water and sandy soil absorbs least water.

#### Activity :-

Take a funnel. Fold a filter paper and keep it in the funnel. Weigh 50g dry soil and pour it in the funnel. Measure a certain amount of water in a measuring cylinder. Pour it drop by drop all over the soil till it starts dripping. Subtract the amount of water left in the measuring cylinder from the original amount. This is the amount of water absorbed by the soil. Calculate the percentage of water absorbed by the soil.

Weight of soil = 50 g

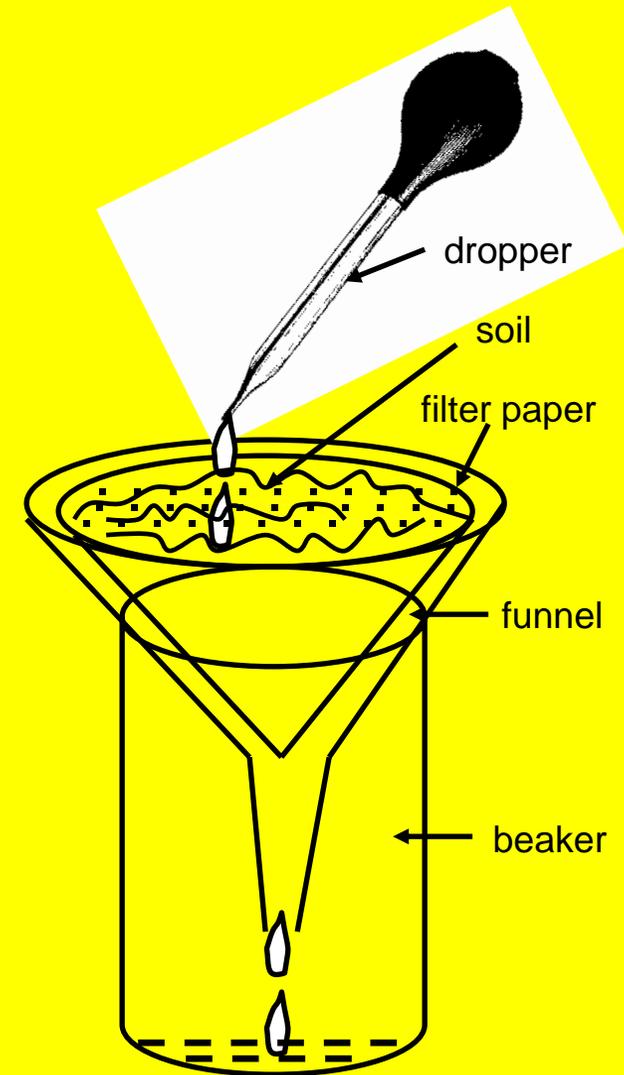
Initial volume of water = U mL

Final volume of water = V mL

Volume of water absorbed by the soil = (U - V) mL

$$\text{Percentage of water absorbed} = \frac{(U - V)}{50} \times 100$$

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# SOIL PROPERTIES

Properties	Sand	Silt	Clay
Water holding Capacity	Low	Medium to High	High
Drainage Rate	High	Low to Medium	Very Low
Cohesion Between Particles	Very Low	Medium to High	Very High
Organic material Content	Low	Medium to High	Medium to High
Shrink & Swell Potential	Low	Medium to High	High

## pH of Soil

Soils can have different pH depending upon their acidic, basic or neutral nature. Based upon the pH different types of crops grow in the soil.

## Air Content

Since soil is made up of particles of different sizes these particles can be loosely bound or tightly bound. The air often occupies the space in between these particles. This allows life to sustain in the soil such as microorganisms.

# Soil and Crops

- Different types of soils are found in different parts of India. In some parts there is clayey soil, in some parts there is loamy soil while in some other parts there is sandy soil. Soil is affected by wind, rainfall, temperature, light and humidity. These are some important climatic factors which affect the soil profile and bring changes in the soil structure. The climatic factors, as well as the components of soil, determine the various types of vegetation and crops that might grow in any region.

## 7) Soil and crops :-

Different types of crops are grown in different types of soils.

Clayey and loamy soils are suitable for growing wheat and pulses.

Clayey soil containing organic matter is suitable for growing paddy.

Sandy and loamy soils are suitable for growing cotton.

Wheat



Peas



Paddy



Cotton



# Soil Erosion

- Erosion is the process by which soil and rock are removed from the Earth's surface by exogenetic processes such as wind or water flow, and then transported and deposited in other locations.
- While erosion is a natural process, human activities have increased by 10-40 times the rate at which erosion is occurring globally. Excessive erosion causes problems such as desertification, decreases in agricultural productivity due to land degradation, sedimentation of waterways, and ecological collapse due to loss of the nutrient rich upper soil layers. Water and wind erosion are now the two primary causes of land degradation; combined, they are responsible for 84% of degraded acreage, making excessive erosion one of the most significant global environmental problems.

A man in a blue shirt and shorts is working in a field, possibly planting or tending to young trees. The field is surrounded by dense green vegetation, and the ground appears to be a mix of soil and rocks, illustrating the context of soil erosion prevention.

# How can we prevent Soil Erosion

- Plant grass and ground cover in huge expansive gardens and on sports fields
- Never leave embankments or sloped gardens bare and exposed.
- Ensure that homes and other buildings have adequate draining and water collection systems.
- Adopt a small piece of land outside your property as your own.
- Create a dislike for bare and open spaces around your home, schools, universities etc.



*Thank you*