College of Agriculture Engineering Sciences

Soil and Water Dept. (Principle of Irrigation)

3rd stage Lecture (1)

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Introduction

Irrigation can be defined as the artificial application of water to the crop root zone to meet consumptive use which cannot be provided by rainfall.

When plants need irrigation

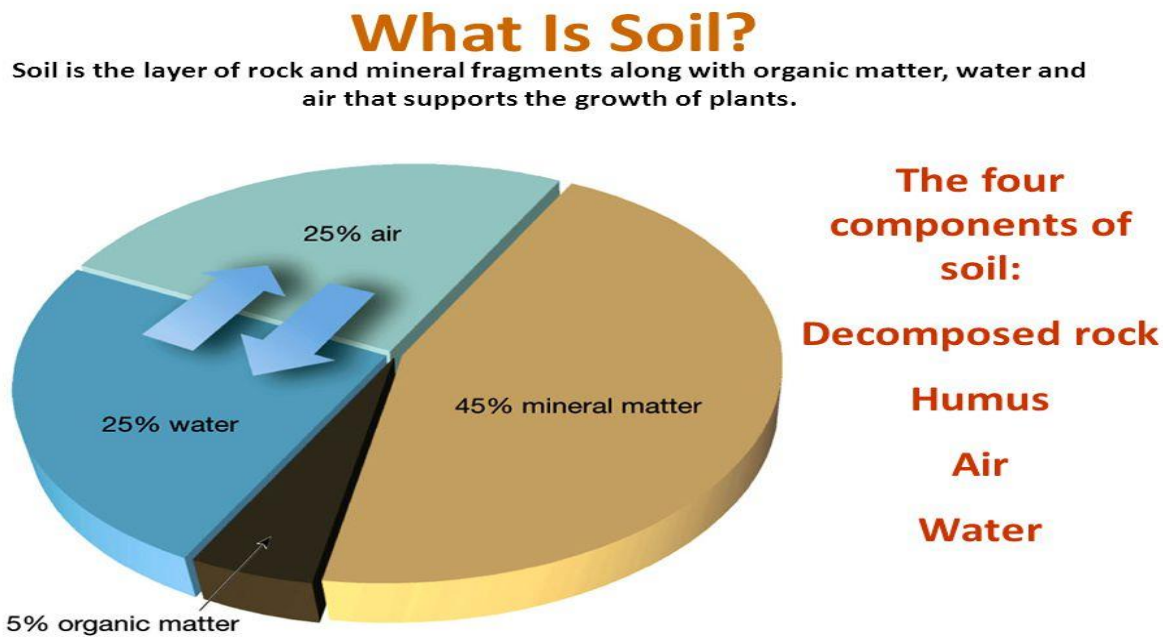
1. Where rainfall is not sufficient to supply crop water needs.
2. Where rainfall is not uniformly distributed to supplement the crop requirement.
3. If there is a variable crop water requirement.

Function of irrigation

1. Irrigation supplies moisture to the soil essential for, the germination of seeds and growth processes of crops.
2. Cools the soil.
3. Washes the soil from the salt present.
4. Softens the clods and thus helps in tillage operation.
5. Increasing the availability of fertilizers for plants.

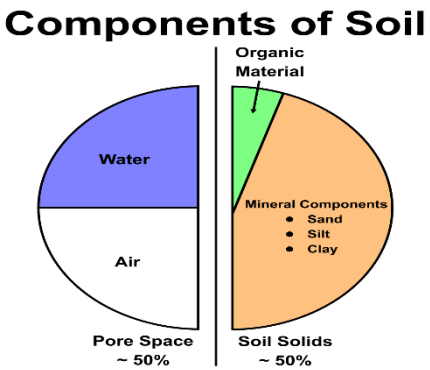
Advantages of irrigation systems

1. Increased water use efficiency
2. Improved crop yield and quality
3. Improved crop establishment, improved weed control, improved crop yields, and quality
4. Reduced runoff, deep percolation, and decreased surface evaporation.
5. Improved fertilizer and other chemical applications.



Soil can be regarded as a porous medium, consisting of:

1. Solid phase 50%
2. Liquid phase 25%
3. Gases phase 25%



Solid phase component of:

- Mineral material.
- Organic matter (OM).
- Living microorganisms decompose various residues into beneficial Humus.

#Organic matter content in mineral soil is usually between 1 to 4 % by dry weight.

Soil texture

one of the important factors for irrigation.

What is Soil Texture?

soil texture is described by classification which is determined by the particle size, and distribution percentage of sand, silt, and clay within the soil.

Soil texture

The classes are distinguished in the field by the 'textural feel' which can be further clarified by separating the relative proportions of **sand, silt,** and **clay** using grading sieves in the laboratory.

- **USDA classifications**

Sand: 0.05 – 2.0 mm

Silt: 0.002 - 0.05 mm

Clay: <0.002 mm

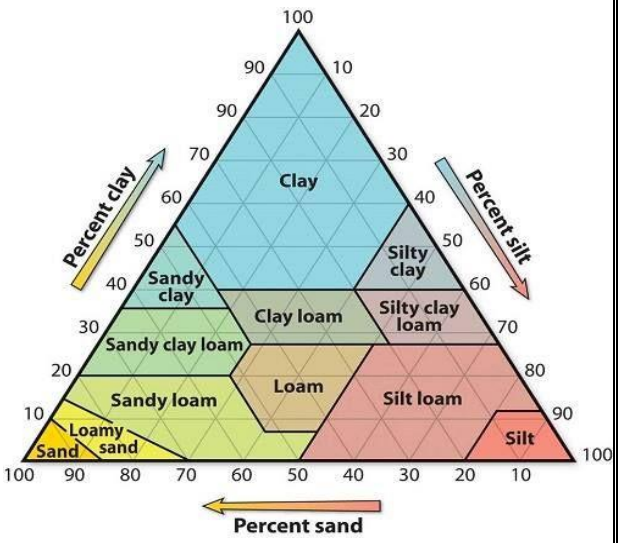
Methods of soil texture determination

1-Field method

- Feel method

2- Laboratory methods

- Sieve method
- Pipette method
- Hydrometer method

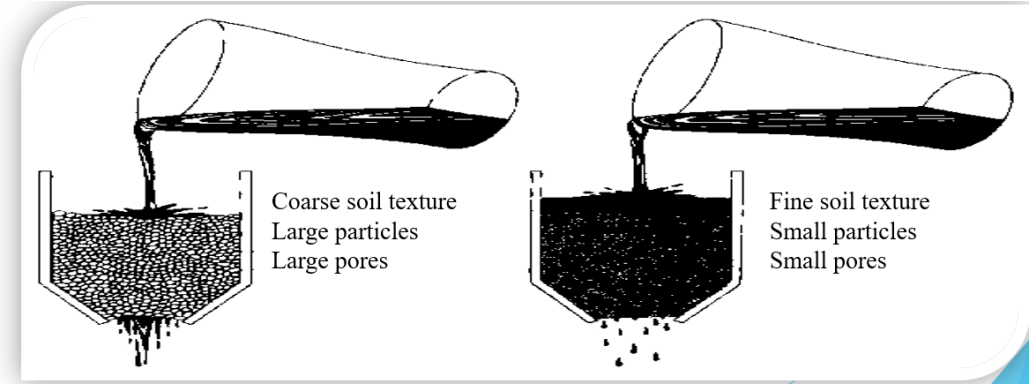


Soil texture triangle

Sand = 15% , Silt = 50% and **Clay = 35**

⦿ What are the effects of Soil texture on water movement and storage

Fine-textured soils generally hold more water than coarse-textured soils. Medium-textured soils actually have more available water for plant use than clay soils. Water in clay soils can be held at a greater tension that reduces its availability to plants.



In irrigation terms, the texture will determine the rate at which water should be applied, and how much should be applied. For example, clay soils only infiltrate water slowly, so applying large volumes quickly will lead to run-off. However, they can store large amounts of water and will therefore require less frequent irrigation.