Introduction to Soils

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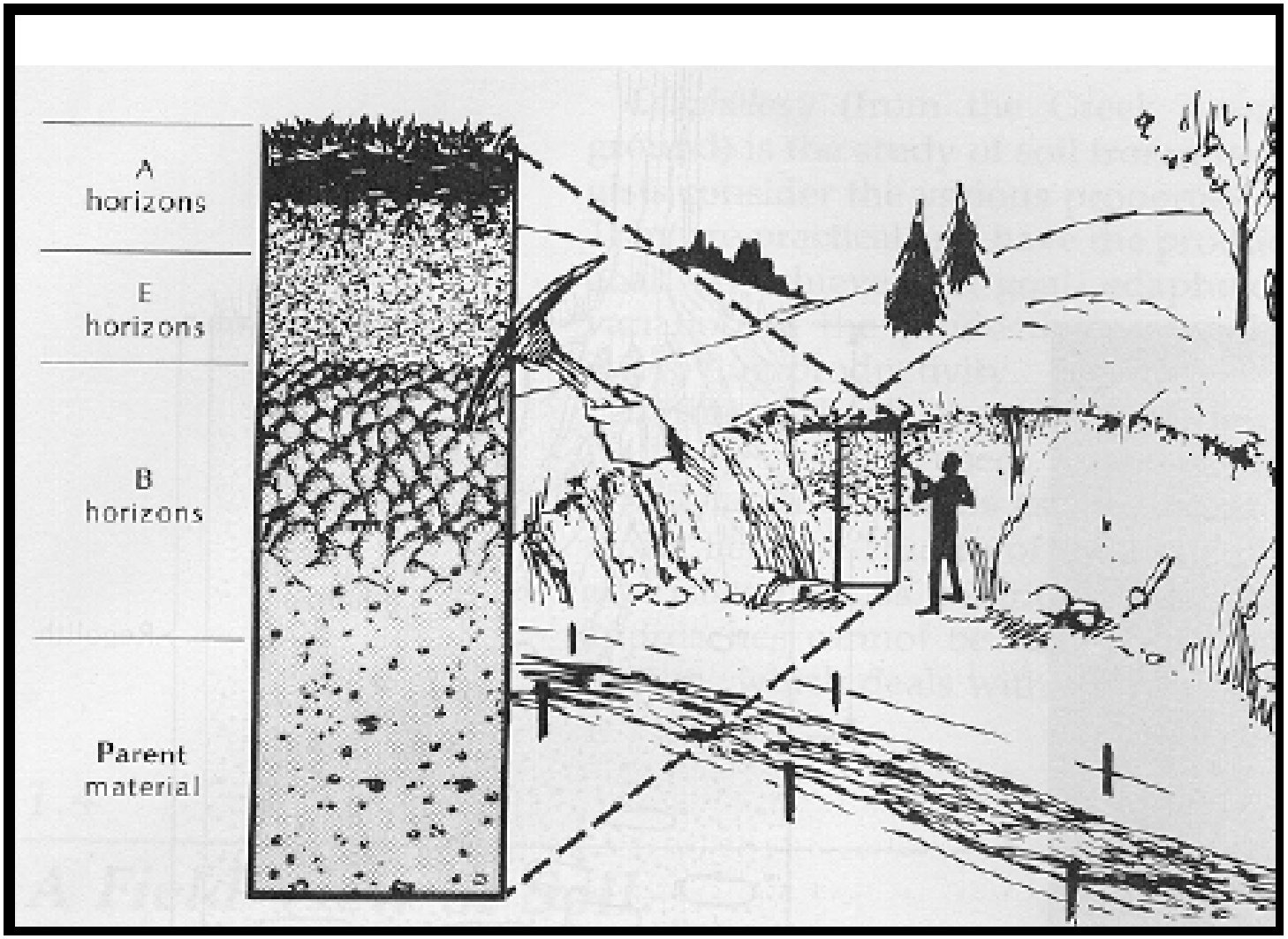
What is soil?

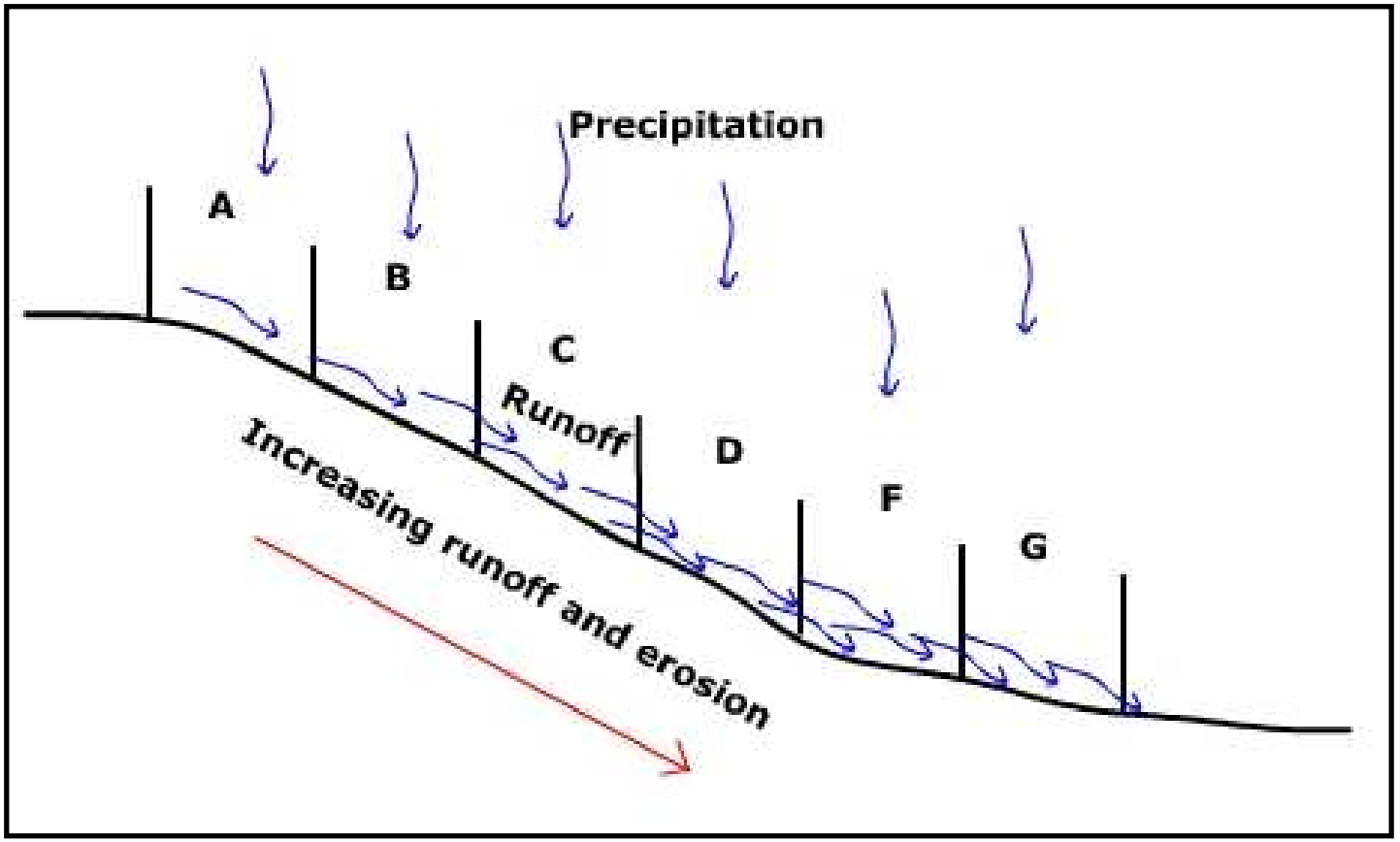
Soil is a natural body on the surface of the earth consisting of inorganic and organic material whose characteristics depend on the five soil forming factors: *parent material, topography, climate, vegetation, and time.*

Parent Material



Topography

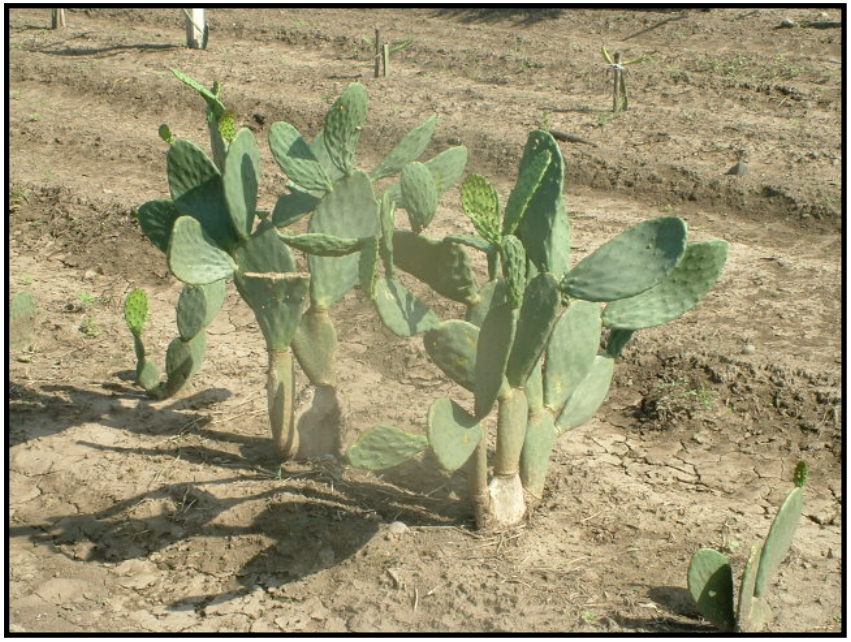
Effect on soil erosion



Climate and Vegetation

Climate and Vegetation

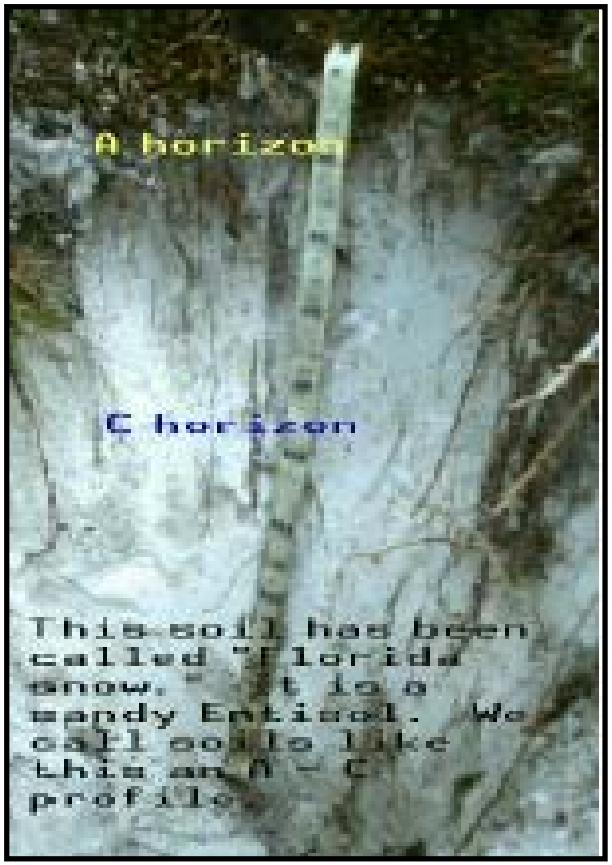
Hot and dry desert



Warm and wet rainforest

Time

Young Soil



Old Soil

Why information on soils is important?

- Bioenergy Crop Production

Corn

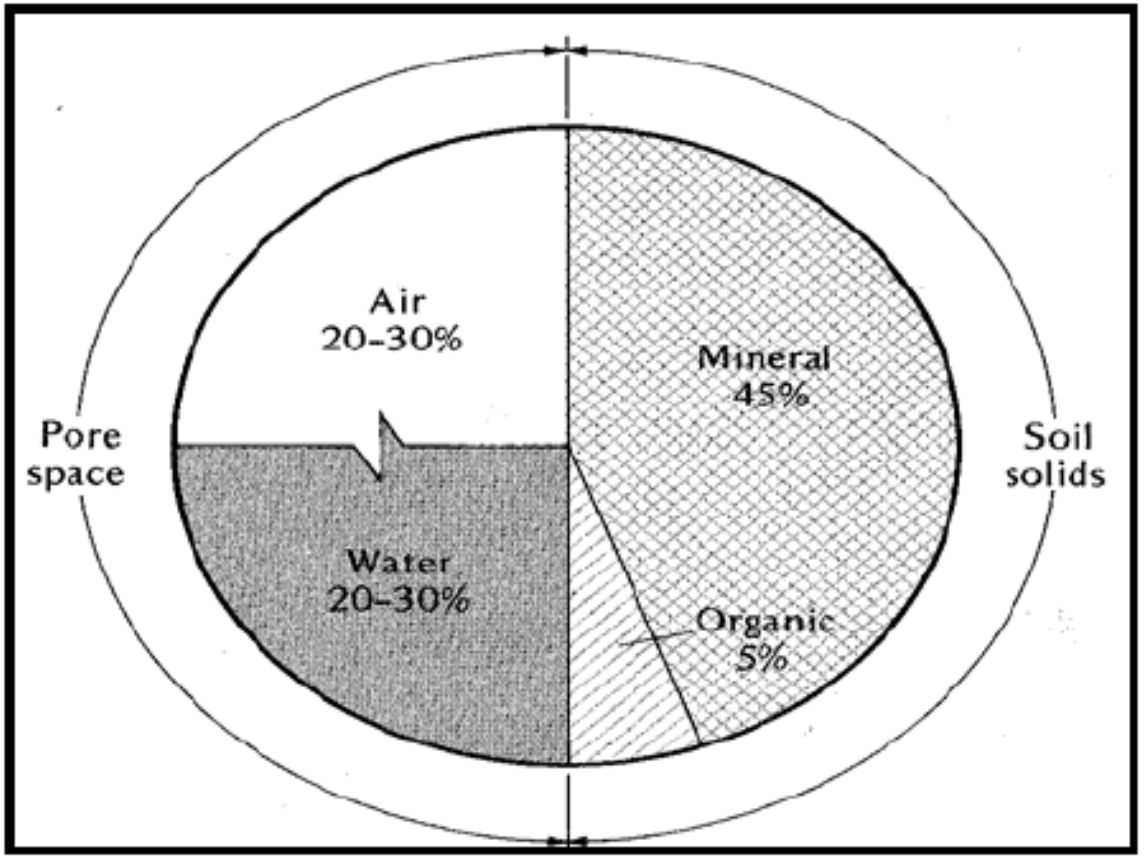
Sugar Cane

Waste Management

Oxidation Pond

Wastewater land application

Soil Components



Inorganic component

- Various sizes of minerals.

- Three basic particle-size designations to characterize a soil:

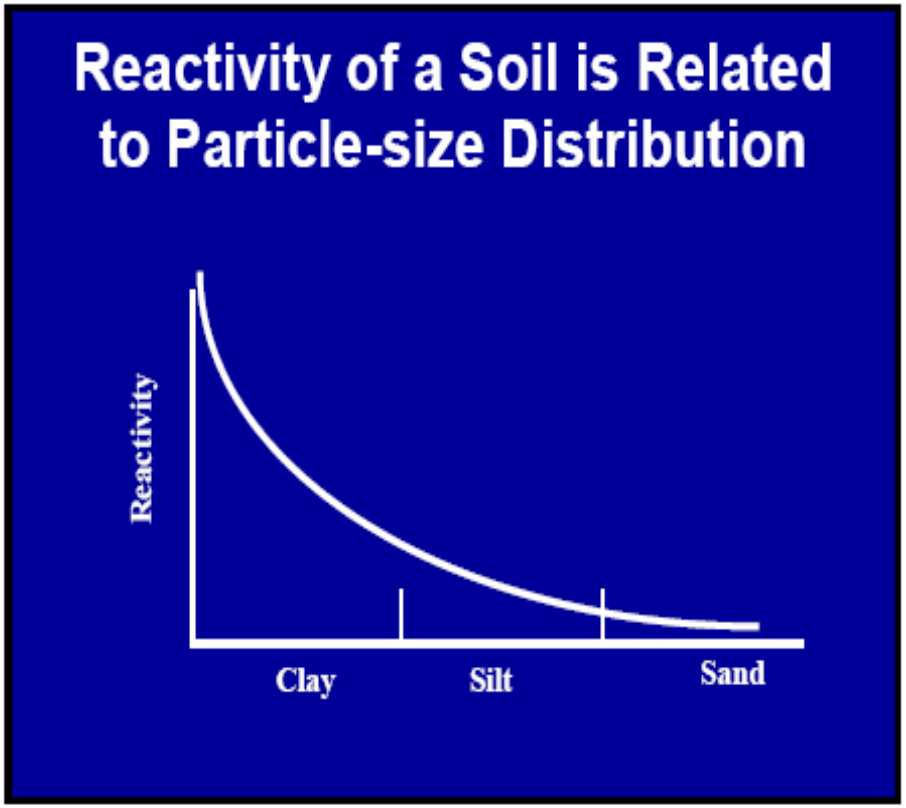
Sand ------- 2.0-0.05mm (coarse)

Silt---------- 0.05-0.002mm (medium)

Clay--------- <0.002mm (fine)

Soil texture

- The proportion of sand, silt and clay particles in the soil determine the soil texture.
- Soil texture has a major influence on the behavior of chemicals and water in the soil.



Effect of particle size on soil reactivity

Particle-size Designation	Surface Area cm^2/gram	CEC* cmol/kg
Sand	23	1
Silt	450	5-10
Clay	8,000,000	100+

*CEC = Cation-Exchange Capacity

Soil Organic Matter (SOM)

- Can be living or dead material.
- Main role of soil microorganisms (MO): decomposition of crop residue or organic matter added to the soil.
- When MO decompose SOM, they produce a complex, dark brown, colloidal organic material called HUMUS.

Characteristics of Humus

- Humus has important implications to soil quality:
  - Increases soil's surface area and CEC.
  - Increases the soil's water holding capacity.
  - Improves soil's tilth.

Water Retention in Soil

- Water-holding capacity is defined as the amount of water held by a soil after drainage.
- The water-holding capacity of a soil is determined by its texture and humus content.

Stages of Water Holding in Soils