

Soils

Introduction

Soil is the natural, unconsolidated body covering the earth's surface. It is a medium on which plants grow; by providing anchorage, nutrients and moisture.

Soil Formation

Soil is formed by the weathering process. Agents of weathering:

(a) *Physical agents*

These include water, wind and moving ice (glaciers).

(b) *Chemical agents*

Rain water dissolves carbon dioxide to form carbonic acid. This acid reacts with calcium carbonate causing decomposition of the rock material.

(c) *Biological agents*

- (i) Micro-organisms such as bacteria and fungi decompose dead organic remains.
- (ii) Termites and earthworms feed on dead organic remains and add humus to the soil.
- (iii) Roots of growing plants force their way into the rock causing cracks.
- (iv) Animals break the rock by their movement and burrowing.
- (v) Man's activities e.g cultivation, mining and road construction.

Soil Forming Factors

These are the factors which influence the rate of weathering and type of soil formed.

- (i) *Climate* - Rainfall, temperature and wind.
- (ii) *Biotic factors* - Living organisms.
- (iii) *Parent materials* - Nature and properties of the original rock from which the soil is formed.
- (iv) *Time* - Length of time during which soil is formed.
- (v) *Topography* - Influences the rate of soil formation.

Soil Profile

This is the vertical section of the earth's crust formed in layers. These layers are organic matter region, topsoil, subsoil, parent material and bedrock.

Influence on plant growth:

- (i) Availability of plant nutrients.
- (ii) Anchorage of the plant.
- (iii) Root penetration into the soil.

Soil Constituents

Soil is made up of:

- (i) *Organic matter* - Dead and decaying plant and animal residues.
- (ii) *Living organisms* - Micro-organisms, plant roots, earthworms and termites.
- (iii) *Water* - It is in form of soil moisture. It supports plant growth by:
- dissolving mineral salts.

- maintaining turgidity in plant cells.
 - translocating nutrients in the plants.
 - being used in photosynthesis.
 - regulating temperature.
- (iv) *Air* - Shares the pore space with water. Used in respiration by plant roots, micro-organisms and other living organisms.
- (v) *Inorganic or mineral matter* - Formed from the parent rock. Supply plant nutrients in the soil.

Properties of Soil

(a) Soil Texture

This is the proportion of particle sizes in the soil. These particle sizes are gravel, sand, silt and clay.

- (i) *Sandy Soil*
- Made up largely of particles.
 - Have large pore spaces hence poor in water retention.
 - Easy to till (light soils).
 - Freely drains.
 - Low fertility due to leaching of minerals.
 - Easily erodible.
- (ii) *Clayey Soil*
- Made up largely of clayey particles.
 - Have small pore spaces hence good in moisture retention.
 - Difficult to till (heavy soils).
 - Poorly drained.
 - Expand when wet, crack when dry.
 - High capillarity.
 - Rich in plant nutrients.
- (iii) *Loam Soil*
- About equal amounts of sand and clay.
 - Moderately good in both moisture and air retention.
 - Fertile soils.

(b) Soil Structure

This is the way in which soil particles are arranged. Examples of soil structure in-

clude platy, blocky, granular and prismatic.

Importance of good soil structure:

- (i) Ensures proper balance between water and air content in the soil.
- (ii) Free draining:
 - No waterlogging.
 - No build-up of carbon dioxide.
- (iii) Reduces liability to soil erosion.
- (iv) Proper anchorage of plant roots.

(c) Soil pH

This is a measure of acidity or alkalinity in soil solution in terms of hydrogen ion concentration. Soil pH influences distribution and performance of crops.

WORK TO DO

1. (a) Define the term "soil"
(b) State three major roles of soil in sustaining plant life.
2. (a) Name agents of the weathering process.
(b) Name five soil forming factors giving the role of each in soil formation.
3. (a) Name the constituents of soil.
(b) Briefly explain the role of each constituent in supporting plant growth.
4. What is the importance of good soil structure?
5. (a) How would you define the term "soil profile"?
(b) How does soil profile influence plant growth?
6. What term is used to describe the percentage proportions of various soil aggregates in the soil?
7. Name three types of soils and describe the characteristics of each.
8. What is soil pH? How does it influence plant growth?
9. Describe with the help of an experiment, how you can determine capillarity in clayey and sandy soils.
10. Describe steps undertaken to determine physical properties of clayey and sandy soils by the feel method.