

Soil

- Soil is a naturally occurring substance that is valuable in sustaining life on earth.
- **Humus** – It is a component of soil that is formed from the dead and decayed organic matter.
- **Weathering** – It is the process of formation of soil by breaking down of rocks. It occurs by the action of wind, water, and climate.
- **Soil profile** – It is a vertical section through various layers of soil. These various layers are known as horizons.
- There are four types of horizons.
 - **A-horizon or topsoil**– It is the top most soil, which is dark in colour and rich in humus. It is soft, porous, and has the ability to retain water.
 - **B-horizon** – It is the middle next layer of the soil profile. It has lesser humus and more minerals. The layer is harder and more compact.
 - **C-horizon** – It is the third layer made up of small lumps of rocks with cracks and crevices.
 - **Bedrock** – It is the lowermost hard layer and difficult to dig with a spade.
- **Soil Types**
 - Soil is a mixture of rock particles and humus.
 - Soil → Rock particle + Humus
 - Living organisms such as microbes, earthworm, and plant roots are found in soil.
- **Classification of soil**
 - **Sandy soil**
 - Sand particles are large that cannot fit together.
 - Larger spaces are present between particles.
 - It is light, well aerated, and dry.
 - **Clayey soil**
 - Clay particles are smaller and tightly packed together.
 - It has little space for air and can hold water between particles.
 - **Loamy soil**
 - It is the best top soil for the growth of plants.
 - It is the mixture of sand, clay, and silt.
 - It contains humus and has the right water holding capacity.
 - Toys, pots, and statues are made up of clayey soil.

- **Structure of a soil**

- Granular- Highly permeable
- Block- moderately permeable
- Columnar- moderately permeable
- Platy- less permeable

- **Uses of soil**

- For plant and water conservation.
- For construction and pottery.

- **Useful soils:** China clay, shadu soil, terracotta soil and multani soil.

- **Soil testing** enables us to find out the characteristics and composition of the soil. Soil testing helps in determining the need for additional fertilizers or lime.

- **Causes of diminished soil fertility:**

Soil erosion and loss of water are the major causes of loss of fertility.

Chemical factors like use of excessive pesticides and insecticides also degrade soil.

Decreasing organic matter content in the soil also results in a less fertile soil.

Imbalance in the pH of soil also causes diminished soil fertility.

- **Properties of Soil**

- Percolation rate of water varies in different soil types.
- Percolation rate of water is highest in sandy soil and least in clayey soil.
- The soil moisture and water absorption capacity of soil also varies among different soil types.
- Loamy soil has the maximum accurate water holding capacity while sandy soil has the least.
- Climatic factors such as wind, rainfall, temperature, light, and humidity affect the soil.

Soil and crops:

| S. No. | Crops Grown | Soil Types |
|--------|--|--------------------------|
| 1. | Wheat and gram | Clayey and loamy |
| 2. | Paddy | Clayey soil |
| 3. | Lentils (<i>masoor</i>) and other pulses | Loamy soil |
| 4. | Cotton | Sandy-loam or loamy soil |

The soil capacity to hold water is important for the cultivation of various crops.

Crop

- When same kinds of plants are cultivated on a large scale, it is called a crop.
 - It is of two types.
1. **Kharif crops** – Crops that are sown in rainy season (June to September)
Examples – soyabean, paddy, maize
 2. **Rabi crops** – Crops that are grown during winter season (October to March) Examples – wheat, gram, pea

Basic crop production practices

- Preparation of soil

- Sowing
- Adding manure and fertilizers
- Irrigation
- Protection from weeds (weeding)
- Harvesting
- Storage
- **Preparation of soil**
- Loosening and upturning of the soil (tilling or ploughing)
- **Plough**

It is made up of wood and contains two parts. Ploughshare (strong triangular strip of iron) and Plough shaft (main wooden axis of plough). It is driven by the help of animals and helps in growth of microbes and earthworms by bringing nutrient rich soil to the top. It also helps in aeration of the soil.

- **Hoe** - It consists of long rod of wood or iron and contains strong, broad, and bent plate of iron at one of its ends. It is driven with the help of animals
- **Cultivation** – It is the modern method of ploughing which is carried out with the help of a tractor
- **Sowing**
- Placing of seeds of a crop in the soil is called sowing.
- Seeds of good quality and health must be used in order to produce healthy crop plants.
- Tools used in sowing

Traditional tool

1. Funnel-shaped
2. Seeds are placed in soil with the help of a long pipe with sharp ends
3. This tool is driven by a plough

Seed drill

1. Contains funnel-shaped receptacle with a set of uniformly arranged tubes
2. Seeds are uniformly placed in soil at a proper depth.
3. Driven with the help of a tractor

Addition of manure and fertilizers

- Supplies plants with essential nutrients for growth and development
- **Manures**
- 1. Prepared from decomposed animals and plant waste.
- 2. Provides organic matter and humus to the soil but is less rich in plant nutrients
- 3. Enhances the water holding capacity and texture of the soil

Fertilizers

1. Commercially available inorganic salts rich in plant nutrients
2. Rich in plant nutrients and do not provide humus to the soil
3. Make soil less fertile in the long run

Irrigation

- Supplying of water to plants at various intervals is called irrigation.
- Sources of irrigation – Wells, Tubewells, Ponds, Lakes, Canals, Rivers, Dams
- **Methods of irrigation**
- 1. **Sprinkler system** – Useful for uneven land. Uses system of perpendicular pipes with rotating nozzle on top, which sprinkles water on crops. Provides efficient coverage of water for large area
- 2. **Drip system** – Water falls drop by drop at the roots of plants. Provides efficient irrigation and prevents water wastage. Used commonly for water fruit plants, gardens, and trees.

Protection from weeds (weeding)

- Weeds are the undesirable plants in the field that are present along with crop plants
- Compete with crop plants for water, nutrients, space, and light

Mechanical methods of weeding

1. Removal by hand
2. Removal using *khurpi*
3. Using seed drill or plough

- **Chemical methods of weeding** – Spraying of weedicides (For example, 2, 4-D)

Harvesting

- The process of cutting of mature crops from the field is called harvesting.
- The process of removing grains from chaff is called threshing.
- The process of separating grains from the husk in the mixture of threshed chaff is called winnowing.

Instruments used for harvesting

1. Sickle
2. Combine (contains harvester and thresher)

Storage

- The process of keeping seeds safe from spoilage due to moisture, insects, rats, and microorganisms for a long time is called storage.

Small scale storage of grains

1. Jute bags
2. Metallic bins

Large scale storage of grains

1. Silos
2. Granaries

Improvement in crop yields

- The crops grown in rainy season are known as *kharif* crops. These are grown from the month of June to October.
- The time when *kharif* crops are grown is also called *kharif* season. Soya bean, paddy, maize, cotton, pigeon pea, green gram, and black gram are *kharif* crops.
- The crops grown in winter are known as *rabi* crops. The *rabi* season is from November to April.
- Wheat, gram, mustard, linseed, and pea are *rabi* crops.
- The variety of the crop can be improved by plant breeding and genetic engineering.

- The net crop yield can also be increased by adopting better cropping pattern(s) such as inter-cropping, mixed cropping, and crop rotation.

Plants and their Products

- Plants act as Source of food
Food items and their nutritional importance

| Food items | Nutrients |
|--|-----------------------|
| Pulses such as gram (<i>chana</i>), black gram, green gram (<i>moong</i>) peas, pigeon pea (<i>arhar</i>) lentil (<i>masoor</i>), etc. | Proteins |
| Soya bean, ground nuts, sesame, castor, mustard, sunflower, etc. | Fats or lipids |
| Vegetables, spices, fruits - | Vitamins and minerals |

- Rivers carry the soil during their course. When moving rapidly over the surface of the land, the rivers wash away the topsoil. This washing away of the valuable topsoil is called **erosion**.
- Erosion occurs not only because of water but also by the action of wind and ice.
- The cutting of trees and deforestation increases the rate of erosion

Afforestation (planting of trees) and prevention of the cutting of trees are two important measures to help control soil erosion.