EDAPHIC FACTORS (soil)

Plants grown in land completely depend on soil on which they grow. The soil factors that affect crop growth are

1. Soil moisture
2. Soil air
3. Soil temperature
4. Soil mineral matter
5. Soil organic matter
6. Soil organisms
7. Soil reactions
Soil moisture

- Water is a principal constituent of growing plant which it extracts from soil
- Water is essential for photosynthesis
- The moisture range between field capacity and permanent wilting point is available to plants.
- Available moisture will be more in clay soil than sandy soil
- Soil water helps in chemical and biological activities of soil including mineralization
- It influences the soil environment Eg. it moderates the soil temperature from extremes.
- Nutrient availability and mobility increases with increase in soil moisture content.
Soil air

- Aeration of soil is absolutely essential for the absorption of water by roots
- Germination is inhibited in the absence of oxygen
- O2 is required for respiration of roots and microorganisms
- Soil air is essential for nutrient availability of the soil by breaking down insoluble mineral to soluble salts
- For proper decomposition of organic matter
- Potato, tobacco, cotton linseed, tea and legumes need higher O2 in soil air
- Rice requires low level of O2 and can tolerate water logged (absence of O2) condition.
Soil temperature

- It affects the physical and chemical processes going on in the soil.
- It influences the rate of absorption of water and solutes (nutrients).
- It affects the germination of seeds and growth rate of underground portions of the crops like tapioca, sweet potato.
- Soil temperature controls the microbial activity and processes involved in the nutrient Availability.
- Cold soils are not conducive for rapid growth of most of agricultural crops.
Soil mineral matter

- The mineral content of soil is derived from the weathering of rocks and minerals as particles of different sizes.
- These are the sources of plant nutrients eg: Ca, Mg, S, Mn, Fe, K etc
Soil Organic matter

• It supplies all the major, minor and micro nutrients to crops
• It improves the texture of the soil
• It increases the water holding capacity of the soil,
• It is a source of food for most microorganisms
• Organic acids released during decomposition of organic matter enables mineralisation process thus releasing unavailable plant nutrients.
Soil organisms

- The raw organic matter in the soil is decomposed by different microorganisms which in turn releases the plant nutrients.
- Atmospheric nitrogen is fixed by microbes in the soil and is available to crop plants through symbiotic (Rhizobium) or non-symbiotic (Azospirillum) association.
Soil reaction (pH)

- Soil reaction is the pH (hydrogen ion concentration) of the soil.
- Soil pH affects crop growth and neutral soils with pH 7.0 are best for growth of most of the crops.
- Soils may be acidic (<7.0), neutral (=7.0), saline and alkaline (>7.0).
- Soils with low pH is injurious to plants due high toxicity of Fe and Al.
- Low pH also interferes with availability of other plant nutrients.
BIOTIC FACTORS

Beneficial and harmful effects caused by other biological organism (plants and animals) on the crop plants.

Plants

• Competitive and complimentary nature among field crops when grown together
• Competition between plants occurs when there is demand for nutrients, moisture and sunlight particularly when they are in short supply or when plants are closely spaced.
• When different crops of cereals and legumes are grown together, mutual benefit results in higher yield (synergistic effect)
• Competition between weed and crop plants as parasites eg: Striga parasite weed on sugarcane crop
Animals

• Soil fauna like protozoa, nematode, snails, and insects help in organic matter decomposition, while using organic matter for their living

• Insects and nematodes cause damage to crop yield and considered as harmful organisms.

• Honey bees and wasps help in cross pollination and increases yield and considered as beneficial organisms.

• Burrowing earthworm facilitates aeration and drainage of the soil as ingestion of organic and mineral matter by earthworm results in constant mixing of these materials in the soils.

• Large animals cause damage to crop plants by grazing (cattle, goats etc)
Physiographic factors

• Topography is the nature of surface earth (leveled or sloppy) is known as topography.
• Topographic factors affect the crop growth indirectly.
• Altitude – increase in altitude cause a decrease in temperature and increase in precipitation and wind velocity (hills and plains)
• Steepness of slope: it results in run off of rain water and loss of nutrient rich top soil
• Exposure to light and wind: a mountain slope exposed to low intensity of light and strong dry winds may results in poor crop yields (coastal areas and interior pockets)
Socio-economic factors

- Society inclination to farming and members available for cultivation
- Appropriate choice of crops by human beings to satisfy the food and fodder requirement of farm household.
- Breeding varieties by human invention for increased yield or pest & disease resistance
- The economic condition of the farmers greatly decides the input/ resource mobilizing ability (marginal, small, medium and large farmers)