



FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

Rainfed Agriculture and Watershed Management

Lecture -4

SOIL AND CLIMATIC CONDITIONS IN RAINFED AGRICULTURE

Soils:

- ❖ Rainfed soils are generally of poor quality (low fertility, high erodibility, fragile, shallow and susceptible to loss of physical integrity).
- ❖ These have very weak buffering and resilience capacity.
- ❖ The soils suffer from excess of salts (saline-alkali soils) in arid and semi-arid areas and acids (acid soils) in sub-humid and humid areas.
- ❖ Micronutrients and ameliorants (mainly lime) are deficient and need supplementation periodically.

The soils are mostly coarse textured, highly degraded with low water retentive capacity, multiple nutrient deficiencies, and thus are not conducive for intensive cropping.

Characteristics of Dryland soils:

- ❖ Dryland soils are generally low in organic matter and alkaline to slightly acidic in reaction in the surface have calcium carbonate (CaCO_3) accumulation in the upper 150 cm of soil layer, weak to moderate profile development, coarse to medium texture and having low biological activity.
- ❖ Nearly two-thirds of India's land mass has more than 3% slope and is highly undulating.
- ❖ The top soil shows many textural groups like loamy sand, sandy loam, loam, silt loam to clay loam.
- ❖ The soils are predominantly coarse textured and hence retain less water and nutrients. Crops grown on them are prone to drought and nutrient deficiencies.
- ❖ The low organic matter content is due to sparse vegetation producing little residues. The top soil when eroded, is devoid of organic matter, thus resulting in deficiencies of several nutrients.
- ❖ Removal of vegetation, intensive agriculture, uncontrolled and excessive grazing, and large unprotected fields devoid of protective vegetation are known to cause wind erosion.
- ❖ The inherent properties of dryland soils lead to degradative processes in rainfed semi-arid tropics, impose the following constraints for successful crop production
 1. Much reduced permeability.
 2. Poor or restricted root development
 3. Tillage and seeding problems
 4. Poor seedling establishment
 5. Uneven soil wetting

6. Salinity and shallow water table and
7. Poor soil fertility.

TROPICAL DRYLANDS

- Warm winters (20-30° C);
- Warm (20-30° C) to very warm (>30° C) summers;
- Aridity regime ranging from arid to semi-arid to sub-humid;
- Summer precipitation regimes are the norm, although they can be shifted to autumn; bimodal rainfall in the Horn of Africa;
- In view of the generally warm winters the growing season is not limited by temperature, and cold is not a constraint for crops or plants. However, the water requirements are higher in view of higher evaporative demand of the atmosphere.
- Production systems are dominated by tropical crops (millet, sorghum, rice). C4-crops have a productivity advantage.

TRUE DESERTS

- Areas with hyper-arid moisture regimes
- Almost no perennial vegetation; agriculture and grazing are generally impossible.