Infiltration and evapotranspiration

1. Infiltration: It is a process in which the water enters into the soil surface. It is different from the term percolation because percolation means movement of water in the soil mass. From the definition it follows that the process of infiltration will stop unless percolation removes infiltrated water. The infiltration capacity is the maximum rate at which water can be absorbed by a given soil per unit area under given conditions.

During the rain infiltration loss occurs quickly almost exclusively from the water that has reached the ground surface. The water infiltrating into the soil moves downward through larger soil pores under the force of gravity. The smaller surface pores take in water by capillarity. The downward moving water is also sucked in by capillary pores.

The gravitational water moves towards the ground water following the path of least resistance. When the capillary pores at the surface are filled and intake capacity reduced infiltration rate decreases. As a trend the rate of infiltration is high in the beginning. It decreases rapidly in the initial stages and then slowly till it approaches a nearly constant rate in about 30 to 90 minutes depending upon the type of soil.

2. Factors Affecting Infiltration: The main factors that influence the infiltration are:

a) **Porosity of the rocks**- Pore space helps capillary force and absorption.
b) **Permeability and impermeability of rocks**- Permeable rocks increase infiltration rate but the non permeable rocks decreases the infiltration rate.
c) **Soil-Moisture Content**- When the soil is fairly dry the rate of infiltration into the soil is quite high. The infiltration rate diminishes as the soil-moisture storage capacity is exhausted. After this infiltration rate equals transmission rate. The rate of infiltration in early phases of a rainfall will be less if the soil pores are still filled from previous rain storm.
d) **Amount and duration of precipitation**- If the amount and duration of rainfall increase, the infiltration rate is also increase.
e) **Slope of the land**- Steep slope permeates runoff but interrupts the infiltration process. The gentle slope decreases infiltration rate.

f) **Type of Vegetative Cover-** Vegetative cover affects surface entry of water significantly. The vegetation or mulches protect the soil surface from impact of rain drops. The lengthy and extensive root system penetrates the soil and increases its porosity. Organic matter from crops promotes a crumbly by structure and improves soil permeability. Forest canopy protects soil surface whereas row crops provide less protection to soil.

g) **Human Activities on Soil Surface-** If the soil surface gets compacted due to construction of roads, operation of tractors and other farm implements and machinery the porosity of the soil is decreased. As a result bigger pores are almost eliminated making soil impermeable. It reduces the infiltration rates appreciably.

3. Evapotranspiration: Evapotranspiration is an important process in the water cycle because it is responsible for 15% of the atmosphere's water vapor. Without that input of water vapor, clouds couldn't form and precipitation would never fall. Evapotranspiration is the combined name for the processes of evaporation and transpiration. When water vapor is released into the atmosphere both processes are involved, so they have been combined into one word to cover all bases.

The evaporation in evapotranspiration refers to water evaporated from over land. This includes evaporation from soil, wetlands, and standing water from places like roofs and puddles. It can also refer to direct evaporation of liquid water from the leaf surface of the plant.

Transpiration happens when plants release water vapor from tiny holes, called stomata, in their leaves. This is caused in part by the chemical and biological changes that occur as the plant undergoes photosynthesis and converts carbon dioxide into oxygen. Transpiration performs the same function as a human sweating because plants do it to cool down their leaves.

4. Factors that effected evapotranspiration:

a) **Temperature** – As temperature increases, the rate of evapotranspiration increases. Evaporation increases because there is a higher amount of energy available to convert the liquid water to water vapor. Transpiration increases because at warmer temperatures plants open up their stomata and release more water vapor.

b) **Humidity** – If the air around the plant is too humid, the transpiration and evaporation rates drop. It's the same reason sweat does not evaporate from our skin when it's too humid.

c) **Wind speed** – If the air is moving, the rate of evaporation will increase. The wind will also clear the air of any humidity produced by the plant's transpiration, so the plant will increase its rate of transpiration.

d) **Water availability –** If the soil is dry and there is no standing water, there will be no evaporation. If plants can't get enough water, they will conserve it instead of transpiring by closing their stoma.

e) **Soil type** – Soil type determines how much water the soil can hold and how easy it is for the water to be drawn out of it, either by a plant or by evaporation. For areas where the ground is covered by vegetation, the rate of transpiration is considerably higher than the rate of evaporation from the soil.

f) **Plant type** – Some plants, like cacti and other succulents, naturally hold onto their water and don't transpire as much. Trees and crops are on the other end of the spectrum and can release copious amounts of water vapor in a day. For example, an acre of corn can release 4,000 gallons of water vapor a day and a single large oak tree can transpire 40,000 gallons of water vapor in a year.