SOIL EROSION

Erosion is the removal of soil particles by the motion of wind or water. It may be defined as the detachment and transfer of soil from one place to another by various natural agencies that are wind and water. Removal of top or surface soil by wind or water is also called as erosion.

Effects of Soil Erosion:

1. By erosion top soil is removed by water or wind and subsoil is exposed which is low in nutrients, poor in physical properties that results low yield per acre. In this way, area under cultivation becomes less.
2. As surface soil is removed and sub soil is exposed, so farming of sub soil is expensive and non profitable.
3. Tillage operations are difficult in sub soil due to its hardness.
4. Removal of top soil disturbs the level of the soil and hence, fields can not be irrigated evenly.
5. Soil carried by wind or water is deposited in another field where crops may be growing that is buried.
6. Sometimes a layer of infertile subsoil is deposited over highly productive soil, thus greatly reducing crop producing power of soil.
7. Soil removed through erosion may be deposited in streams, canals and other water reservoirs. Thus, beds of rivers or canals rise up and may cause floods.
8. When water reservoirs are silted up, their capacity to store water is reduced.

Socioeconomic effect of erosion:

1. Eroded soils are usually less fertile and hence, there will be less production that means less income.
2. When there is much erosion, majority of the people will leave that place and they will move towards places where there is less erosion or they will come towards towns or cities.
3. If there will be less production, there will be less recovery of taxes from that area. Its ultimate effect will be more taxes on the population living in other areas of the country.

Comparison of Normal and Eroded soil:

Sr. No.	Normal Soil	Eroded Soil
1	High biological activity	Low biological activity
2	Soil will be rich in nutrients	Soil will be poor in nutrients
3	Good Soil Texture	Poor Soil Texture
4	Good Soil Structure	Poor Soil Structure
5	More organic matter	Low organic matter
6	Easy tillage operations	Difficult tillage operations
7	High crop yields	Low crop yields

Types of Soil Erosion:

There are two types of soil erosion which are as under:

a. Water Erosion:

There are 4 stages of soil erosion by water which are as under:

i. **Raindrop or splash erosion:** It is the first stage of water erosion. Raindrops strike soil surface with great force. Aggregates and clods are broken into smaller particles which are splashed into the air and the surface layer of the soil is compacted and puddle.

ii. **Sheet erosion:** It is the removal of a thin layer of soil by water acting over the whole surface. Sheet erosion has damaged very fertile lands located on slopes, some of which have been eroded to a depth of about 15 cm. This causes great economic loss because it results in the loss of the most fertile soil layer and diminished soil productivity.

iii. **Rill erosion:** Appearance of small rivulets (depressions/water channels) on the soil surface is called rill erosion. This is transitional phase between sheet erosion and gullying. These small channels can be smoothed out with suitable tillage practices and proper management. Rill erosion is visible on uneven and neglected lands in Pothwar and western hilly areas.

iv. **Gully erosion:** It is the last stage of water erosion and is the result of constant neglection of land. Gullies are active as long as their sides are bare. They become inactive when they have been stabilized by vegetation. It causes much more soil loss than any other form of erosion.

b. Wind Erosion:

There are 3 distinct types of soil movement which depend upon the size of soil particles. Soil can move in any of these ways.

i. **Suspension:** It is the movement of very fine particles which are less than 0.1 mm in diameter. Soil particles are so small that once they are lifted into the air stream, they remain suspended in the air for long time.

Creep: It is the movement of soil particles at other extreme of the size range, greater than 0.5 mm. These particles are not lifted in the wind stream but are rolled along the surface of the ground.

iii. **Saltation:** It is the most important of all the three types of movement. Particles of 0.05-0.5 mm diameter move mainly by saltation. The particles are lifted in the wind stream and again fall down, moving by short leaps and bounces.

Causes of Soil Erosion:

The following are the factors on which soil erosion depends.

I. **Rainfall:** If rainfall is well distributed, falls with enough intervals and in less quantity, erosion will be less as compared to heavy and frequent rainfall.

II. **Slope of the land:** If slope of the land is more, the velocity of water will be high and erosion will also be more. Also more water is likely to runoff.

III. **Nature of soil:** If soil is hard and compact in nature, it will resist more to erosion as compared to the soil which is loose and porous. Though hard soil has more runoff, yet erosion is less due to the compactness of soil particles. Also the compact soil is not blown by the wind.

IV. **Vegetation on the land:** If the land is covered with vegetation, erosion will be less. On the other hand, soil particles will be more easily eroded if land is bare and naked.

V. **Cultivation method:** If land is kept under crops at intensive scale, the soil will remain covered with crops for most of the time and thus the chances of erosion will be minimized.

Control of Soil Erosion:

Following steps may be taken to control soil erosion.

I. **More vegetation on hilly areas:** If soil surface remains covered with trees, grasses etc., it will not allow soil particles to be washed away and thus, erosion is checked. Generally a cover of dense vegetation is effective in retaining soil and rainfall. Another advantage of vegetation cover is that it reduces the beating action of rain drops that dislodges and removes soil.

II. **Bunds Making;** If strong bunds are made around the fields, rain water instead of flowing away will accumulate in the fields and as such erosion will be controlled.
III. **Avoid grazing** of the animals on the sloppy lands.
IV. **Soil leveling:** If soil is well leveled, runoff of water will be stopped and as a result erosion will be checked.
V. **Soil ploughing across the slope:** If soil is not well leveled and is sloppy, then ploughing of soil across the slope will decrease the velocity of flowing water and erosion will be checked.
VI. **Building of small dams** in the gullies will check the flow of water.
VII. **Wind breaks:** Planting of trees around the area will reduce the wind velocity and will protect the flat land from wind erosion especially in areas where winds blow with great force.

Soil Conservation:

Soil conservation is a system of husbandry which aims at getting maximum production from the soil on sustained basis. In other words, the conservation of the soil is a matter of using the land as it should be used. i.e., some soils are too steep to be farmed, some are too erodible to be cultivated and some are climatically unsuited to intensive cultivation. Keeping in view the above things, soil conservation may be defined as the use of land within limits of economic practicability according to its capabilities and its needs in order to keep it permanently productive.

Principles of Soil Conservation:

Following are some basic principles of soil conservation.

a. **Land use according to its capability:** This is the most important factor for the success of soil conservation efforts. For this purpose, get your soil survey for its capability and use it according to the type of the soil.
b. **Retain rainwater:** Rainwater should be retained as close as possible to where it falls, so as to make the best use of precipitation and minimize potential runoff effects. Rainwater can be retained in the soil in the following ways.
    - Soil surface can be kept covered by cultivated crops or vegetation, particularly during rainy season.

- Fields should be kept loose to allow maximum infiltration of rainwater when fields are fallow.
- Flow of surface water down a slope can be regulated by constructing field embankments and terraces or by reducing size of the fields.
- A proper system needs to be provided for the safe disposal of runoff water to reduce immediate damage by heavy rains.

c. Minimize runoff: Practices adopted on both arable and non arable lands should be such as to minimize runoff and maximize retention of rainwater.

d. Store surplus water: Surplus water should be stored in dams or other reservoirs. This water can then be used for supplemental irrigation, livestock, or other purposes.

e. Maintain soil fertility: Soil fertility should be maintained at a level which can support crop production.

f. Use non-arable lands effectively: Non cultivable lands, or those damaged by erosion should preferably be brought under forest.

Soil Conservation Practices: Specific applications of land and water management knowledge with the goal of protecting soil resources from exploitation, destruction, or neglect are called **soil conservation practices.** Soil conservation measures are highly site specific and depend upon land use pattern, soil characteristics, topographic conditions, rainfall pattern and potential erosion hazards. In order to determine proper land use and appropriate soil practices, a land capability/erosion survey should be carried out.

Soil conservation practices can be classified into soil management, crop management, engineering, range management and forestry operations.

- Land management refers to the proper use of land
- Crop management pertains to selection of crops, tillage practices and cultural operations.