

## Effect of Soil erosion in Agriculture

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### **Abstract**

Soil is the thin top layer of the land which supports life. But this precious gift of nature is becoming degraded day by day. Soil erosion is foremost cause of degrading the soil. Soil erosion is defined as the removal of top layer of earth by the effects of water or wind. It is a gradual process. In this process the upper layer of soil (topsoil) is transported from one place to another by different agents – particularly water, wind, and mass movement – causing deterioration of soil in the long term. Fertile layer of soil is lost by soil erosion and a large amount of fertile soil gets deposited into water bodies.

**Keywords:** Soil erosion, method to control soil erosion, deterioration, fertility.

### **Introduction**

Soil is one of the most important natural resources of man but it is getting degraded day by day. Denudation of soil is naturally occurring process that affects all landforms. Soil erosion occurs when natural process of soil formation is slower than the rate of soil formation. It is caused by ecological destruction and distribution. The quality of soil decreases. Nutrient status and organic matter content also decreases and electrolytes and toxic chemicals also concentrate in the soil. Soil erosion incorporates several environmental problems. Soil quality and productivity decreases due to soil erosion. Due to settled agriculture, this problem has increased manifold. Soil erosion, is associated with increased incidence of flooding, siltation of rivers lakes and reservoirs and deposition of material in low-lying areas. It is a gradual continuous process. Initially it was a natural process but human activities have accelerated this process. It causes removal of vegetation. It has led to a drastic increase in pollution and sedimentation in rivers that clogs the water bodies resulting in a decline in the population of aquatic organisms. After soil erosion, soil becomes incapable to store water and nutrients for plants. The process of the soil erosion is detachment, movement, and deposition. If soil erosion continues with this rate, then farmers have to bear higher production costs and less productive cropping lands.

### Causes of soil erosion

- **Strong winds:** - When winds of high-speed blow over a dry soil, then the soil flows from one place to another. This is normally occurred when land is overgrazed.
- **Rainfall and flooding:** - Heavy rainfall causes soil erosion. The soil erodes with the rainwater and gets settled in lower areas or water bodies. Four types of erosions are caused by water namely, Rill erosion, Gully erosion, Sheet erosion, Splash erosion. Regions with heavy rainfall face a heavy soil loss due to this.
- **Agriculture practices:** - Farming practices practiced by farmers also causes soil erosion. Trees are cleared to plough the land due to which the soil particles become loose and erode fastly.
- **Overgrazing:** - Due to overgrazing, grass is pull out from the soil due to which soil particles becomes loose. When soil particles become loose soil erosion is caused.
- **Rivers, streams, running water:** - The flowing rivers and streams carry away the soil particles leading to soil erosion.
- **Construction:** - for the purpose of constructing buildings and to develop infrastructure, lot of trees are cut down. Due to this the soil particle become loose and erodes.
- **Logging:** - Many trees are cut down to carry out the logging process. Trees hold the soil firmly. But when trees are cut down lot of soil gets eroded because soil particles become loose.
- **Mining:** - Mining activities disturb the land and leave the soil more prone to erosion.

### Factors affecting soil erosion

- **Climate:** - The amount and intensity of precipitation is the main climatic factor governing soil erosion by water. The relationship is particularly strong if heavy rainfall occurs at times when, or in locations where, the soil's surface is not well protected by vegetation
- **Soil structure and composition:** - The composition, moisture, and compaction of soil are all major factors in determining the erosivity of rainfall. Sediments containing more clay tend to be more resistant to erosion than those with sand or silt, because the clay helps bind soil particles together. Soil containing high levels of organic materials

are often more resistant to erosion, because the organic materials coagulate soil colloids and create a stronger, more stable soil structure.

- **Vegetation cover:** - Vegetation acts as an interface between the atmosphere and the soil. It increases the permeability of the soil to rainwater, thus decreasing runoff. It shelters the soil from winds, which results in decreased wind erosion, as well as advantageous changes in microclimate. The roots of the plants bind the soil together, and interweave with other roots, forming a more solid mass that is less susceptible to both water and wind erosion. The removal of vegetation increases the rate of surface erosion.

### Types of soil erosion

- **Water erosion:** - when soil erodes due to effect of water that is known as water erosion. Intensity of water, flow of water, slope height, slope steepness, altitude affects the magnitude of soil that is to be eroded. Due to water erosion the soil is transported from one place to by the effect of fast flowing water.
- **Sheet erosion:** - Sheet erosion occurs when a thin layer of topsoil is removed over a whole hillside paddock. It occurs when rainfall intensity is greater than infiltration or soaking capacity of soil (sometimes due to crusting). When soaking capacity of soil decreases, rainwater will not get absorbed in the land and it will erode the land. This causes a lot volume loss of soil.
- **Rill erosion:** - Rill erosion occurs when runoff water forms small channels as it concentrates down a slope.
- **Gully erosion:** - Gully erosion happens when runoff concentrates and flows strongly enough to detach and move soil particles.
- **Tunnel erosion:** - Tunnel erosion is the removal of subsoil.
- **Mass erosion:** - Mass movement occurs on cleared slopes in coastal areas. Gravity moves earth, rock and soil material down slope both slowly (millimetres per year) and suddenly (e.g. rock falls).
- **Wind erosion:** - When strong winds blow over light-textured soils that have been heavily grazed during drought periods. Wind erosion can be caused by a light wind as well as with strong winds.

- **Increased flooding:** - Land is often transformed from a forest or other natural landscape, such as floodplains and wetlands, into a crop field or pasture. The land that is eroded soaks less water due to which floods become common.

### Impacts of soil erosion

- **Loss of fertile land:** - Soil erosion removes the top fertile layer of the soil. Due to this, low productivity is caused which results in low production. Soil erosion makes the soil less fertile due to which it becomes difficult to grow crops.
- **Air pollution:** - Due to soil erosion, dust particles merged with air which causes air pollution. The dust plumes from the arid and semi-arid regions cause widespread pollution when the winds move.
- **Desertification:** - soil erosion transforms habitat land into deserts. This also leads to loss of biodiversity, degradation of the soil, and alteration in the ecosystem. It usually involves the removal of nutrient-rich topsoil, leaving coarse, sandy particles with poor water-retaining ability. As a result, for those lands where are not suitable for plants to grow will finally turn into a desert.
- **Degrade the quality of soil:** -Soil erosion reduced ability of the soil to store water and nutrients. Physical and chemical components of the soil changes. Topsoil lost due to soil erosion.
- **Water pollution:** When soil sediments deposits in the water bodies, water becomes impure and polluted. Soil eroded from the land, along with pesticides and fertilizers applied to fields, washes into streams and waterways. This sedimentation and pollution can damage freshwater and marine habitats and the local communities that depend on them.
- **Climate change:** - The warmer atmospheric temperatures observed over the past decades are expected to lead to a more vigorous hydrological cycle, including more extreme rainfall events. The rise in sea levels that has occurred as a result of climate change has also greatly increased coastal erosion rates.

### Methods to control soil erosion

- **Plant more trees:** - plants holds the soil particles with the help of their roots. So planting trees help to control soil erosion because roots fasten the soil particles. When planted

along waterways as riparian buffers, they reduce run-off of nutrients and soil sediment in stream.

- **Mulching:** - Adding mulch and rocks to prevent the plants and grass underneath to prevent soil erosion is known as mulching. Mulch matting can be used to reduce erosion on slopes.
- **Proper drainage:** - Every household should have a proper drainage system so that water flows down into proper water collecting systems.
- **Terrace farming:** - Terraces break the slope, splitting one big slope into several smaller ones, making it less steep, and the force of water due to gravitation is less destructive. Terraces reduce both the amount and velocity of water moving across the soil surface.

#### **Government projects to prevent soil erosion**

- ✚ **Watershed Development Component- Pradhan Mantri Krishi Sinchayee Yojna (WDC-PMKSY):** This scheme was launched in 2009-2010 for optimum use of resources, sustainable outcomes, and integrated planning. The programme is implemented as per Common Guidelines for Watershed Development Projects 2008. The main objectives of this project are to restore the ecological balance by harnessing, conserving, and developing degraded natural resources such as soil, vegetative cover, and water.
- ✚ **Rural Infrastructure Development Fund (RIDF):** Soil Conservation Department is engaged in most effective and gainful management of three vital interdependent natural resources mainly soil, water and vegetation by implementing various activities of land and water management on crop land on a sustained basis. The soil conservation Department implements various schemes on soil and water conservation with the objective of generating income to rural people. Need for conservation of soil
- Soil supports life; therefore, it is important to preserve it.
- Soil conservation is necessary because reducing climate change's destructive impact worldwide
- Soil Maintains a balanced climate cycle
- Soil Provides healthy ecosystems where plants, trees, and animals can thrive
- Soil Ensures healthy agricultural yields through sustainable farming practices

## Conclusion

From the above study we can conclude that Soil erosion is a geologic process that is occurring since the Earth formed. There are many reasons due to which soil erosion is caused. Water and wind are the principal causes. Soil erosion is affecting both biotic as well as abiotic components of the earth. But there exist many ways with the help of which soil erosion can be prevented. Afforestation, reforestation, mulching are the effective ones. Thus, we can save the land or soil if we pay heed to it.

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