

Insight into soil erosion by water and its agronomic remedies

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Introduction:

Soil erosion is phenomenon that refers to the erosion of the top layer of dirt known as topsoil, the fertile material vital to life by the natural physical forces of water and wind. It can be a lengthy process. It is either unnoticed or occurs at an alarming rate, resulting in significant topsoil loss. Other serious soil degradation conditions that can accelerate the soil erosion process include soil compaction, low organic matter, loss of soil structure, poor internal drainage, Stalination, and soil acidity. Soil erosion, whether it is by water, wind or tillage, involves three distinct actions i.e., soil detachment, movement and deposition. In addition to being a significant social and economic issue, soil erosion is also crucial in determining the health and function of an ecosystem. Human activity is largely to blame for accelerated erosion. Tillage, grazing, and timber cutting are the primary

causes. Other than human activities, the rate of erosion can be accelerated. About 175 million hectares of India's 328 million hectares of land are experiencing severe soil erosion as a result of massive deforestation and inadequate land management (Mishra *et al.*, 2022).

Soil erosion caused by water:

The removal of soil by water and transportation of the eroded materials away from the point of removal are referred to as water erosion. Rain erodes the soil and causes activities such as gully, rill, and stream erosion, which leads to downstream effects such as flooding and sedimentation. Water erosion severity is influenced by slope, soil type, soil water storage capacity, underlying rock type, vegetation cover, and rainfall intensity and period (McIvor *et al.*, 2014). The other factors that influence the rate and magnitude of soil erosion caused by water are

rainfall and runoff, soil erodibility, slope gradient and length, cropping and vegetation, tillage practices, *etc.*

Forms of Water Erosion:

The major forms of water-borne soil erosion are:

a. Sheet Erosion

The movement of soil caused by raindrop splash and runoff water is known as sheet erosion and it usually occurs evenly across a uniform slope and goes unseen until the majority of the productive topsoil has been vanished. At the bottom of the slope or in low areas, the eroded soil settles.

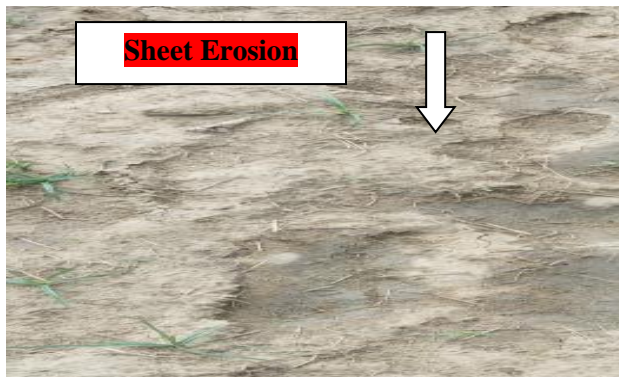


Fig. 1. Sheet Erosion in jalandhar near lovely professional university, N 31°14'55.15" E75°41'57.41" Geological coordinates

b. Rill Erosion

The removal of soil by concentrated water flowing through tiny streamlets, or head cuts, is known as rill erosion. If the amount of sediment in the flow is less than what the load can carry and the flow is greater

than the soil's resistance to detachment, detachment will occur in a rills and it will get wider and deeper as detachment goes on or flow picks up. The development of small, clearly defined channels results from concentrated overland water flow, which is the main cause of rill erosion and finally these channels serve as both transport and source channels for sediment, which causes soil erosion.

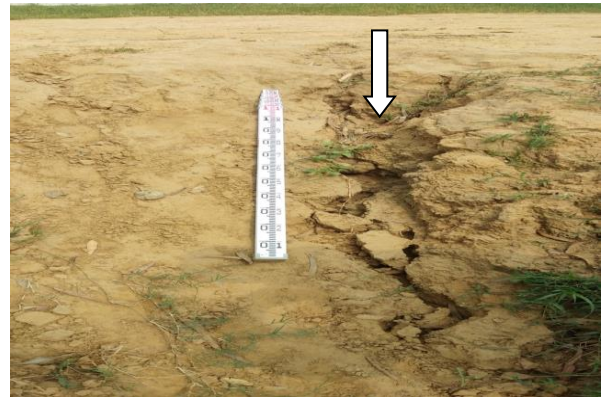


Fig. 2. Rill Erosion in jalandhar near lovely professional university, E 31°14'54.91" N 75°1'56.55" Geological coordinates

c. Gully Erosion

Gully erosion is "the removal of soil or soft rock material by water, forming distinct narrow channels, larger than rills, which typically carry water only during and immediately after rains". Rill erosion has progressed to the stage of gully erosion. A gully is a distinct channel that is formed at the base of a hill slope or valley by infrequent or transient runoff. Such channels are formed

when the force of flowing water, which is determined by its mass and velocity, is greater than the resistance of the subsoil. Significant amounts of land are taken out of production as a result of gully erosion, which also puts farm machinery operators in danger.

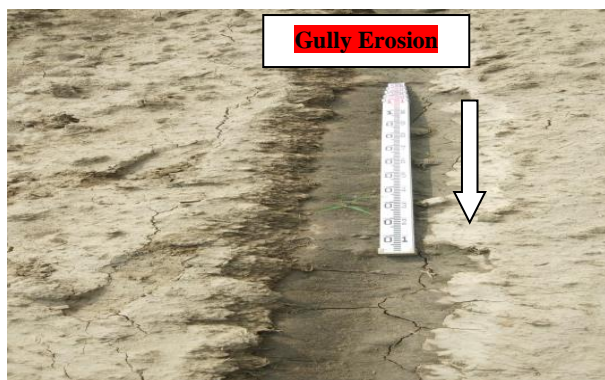


Fig.3. Gully Erosion in Jalandhar, N 31°14'55.08" E75°41'59.33" Geological coordinates

Agronomic measures to control soil erosion control:

- **Tillage Practices:** The depth, direction, and timing of ploughing, the type of tillage equipment used, and the number of passes all have an impact on the potential for soil erosion by water. Water erosion can be reduced by using no-till or minimum-tillage practises. Tillage and other practises carried out on field slopes create pathways for surface water runoff and can hasten soil erosion.
- **Terracing or terrace farming:** Growing crops on the sides of hills or mountains by planting on graduated terraces built into the slope. Though labor-intensive,

the method has been used successfully to maximise arable land area in varying terrains while also reducing soil erosion and water loss.

- **Perimeter runoff control:** On construction sites, perimeter runoff control is critical. Filtering water runoff and controlling sediment pollution are critical for regulatory compliance. Windbreaks are tree and shrub plantings that are designed to provide economic, environmental, and community benefits. Most windbreaks are designed to slow the wind, making it more beneficial to soils, crops, livestock, wildlife, and people.
- **Cover crops/crop rotation:** Planting cover crops in your garden can help you control erosion, suppress weeds, reduce soil compaction, increase soil moisture and nutrient content, improve yield potential, attract pollinators, and provide habitat for beneficial insects and wildlife.
- **Soil-conservation farming:** Soil contains essential nutrients for plant growth, animal life, and millions of microorganisms. The life cycle, however, comes to a halt if the soil becomes unhealthy, unstable, or polluted. Soil conservation is concerned with keeping soils healthy through a variety of practises and techniques. Individuals who are committed to soil conservation help to keep

soil fertile and productive while also protecting it from erosion and deterioration.

Conclusion:

Water erosion of soil is a geologic process that has occurred since the Earth's formation. The most common human activities that contribute to accelerated erosion are agricultural practises that take place over vast areas covered with soils that are highly productive but easily eroded if not protected from erosive forces. Soil erosion is still a major issue for agriculture in many countries. Long-term agricultural productivity requires proper management of this valuable resource. Soil conservation practices are tools that farmers can use to prevent soil degradation and increase organic matter in their fields. Crop rotation, reduced tillage, mulching, cover cropping, and cross-slope farming are examples of these practices.

References:

1. Balasubramanian, A., 2017. Soil erosion—causes and effects. Centre for Advanced Studies in Earth Science, University of Mysore, Mysore.
2. Reddy, R.S., Nalatwadmath, S.K. and Krishnan, P., 2005. Soil Erosion Andhra Pradesh. NBSS Publ, (114), p.76.
Van Alfen, N.K., 2014. Encyclopedia of agriculture and food systems. Elsevier. Academic press London.
3. Mishra, P.K.; Rai, A.; Abdelrahman, K.; Rai, S.C.; Tiwari, A. 2022. Land Degradation, Overland Flow Soil Erosion, and Nutrient Loss in the Eastern Himalayas, India. Land, **11**(2): 179.