Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 06, Issue: 05 (SEP-OCT, 2026)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Every Grain of Soil Counts: Preventing Soil Erosion Before It Is Too Late

*Nayana S S and Devika J P
PhD Scholars, College of Agriculture, Vellayani, India
*Corresponding Author's email: nayanass2411@gmail.com

Soil erosion is one of the most serious environmental concerns affecting all natural and human-managed ecosystems. Soil erosion, besides having significant impact on productivity of cultivated land also adversely affects chemical, physical and biological functions of soil leading to soil degradation and depletion of multiple soil functions. Although soil erosion is a global phenomenon, it has intensified in recent years due to population pressures, developmental activities, unscientific land use and land management practices. Erosion induced loss in crop production and farmers income, are of utmost concern in India and globally. The total annual production loss was estimated as 13.4 million tonnes @ 15.7% (Sharda *et al*., 2010).

The risk of soil erosion in south Indian states is more serious as many lands can no longer be sustained for production, mainly due to high intensity rainfall, deforestation, overgrazing and faulty land use practices thus leading to their abandonment. About 22%, 9% and 5% of total geographical area (TGA) of Karnataka, Tamil Nadu and Kerala states, respectively, experiences moderate or moderate to severe soil erosion loss (Mandal *et al*., 2020). Further, these states suffer an annual production loss of 24.6%, 20% and 23.5%, respectively due to water erosion in rainfed cereal, oilseed and pulse crops (Sharda and Dogra, 2013). In an agrarian country like India, assessment of soil erosion risk is of paramount importance to preserve soil's productive potential and ensure sustainable land use (Mandal and Giri, 2021: Sharda and Mandal, 2018). Land managers and policy makers need to have adequate knowledge of intensity and distribution of soil erosion risk areas to check land degradation, and efficiently plan and execute various cost-effective land-based interventions to achieve the targets of land degradation neutrality (LDN) (UNCCD, 2013). Hence, it is imperative to quantify the risks associated with overuse of soil functions, which lead to land degradation and consequently impacting on eco-system services.

The uppermost layer of soil, known as topsoil, is generally rich in organic matter, nutrients, roots, and biological activity. It supports seed germination, root development, water retention, and nutrient cycling. When this layer is lost, the remaining soil may become less fertile, compacted, shallow, and less capable of supporting healthy crops. Soil erosion also reduces the water-holding capacity of agricultural land. As soil particles are detached and transported by runoff, sediments accumulate in rivers, canals, reservoirs, and irrigation systems (Madhu, and Jinger, 2025). This can reduce water-storage capacity, increase turbidity, and contribute to the degradation of aquatic ecosystems. Furthermore, erosion can contribute to climate change by removing soil organic carbon and transporting carbon-rich particles away from their original location. The overall impact depends on the landscape and the fate of the eroded carbon, but the loss of soil organic matter clearly threatens long-term soil productivity.

Practical Ways to Prevent Soil Erosion

Soil Covering: A protective soil cover is one of the simplest and most effective ways to reduce erosion. Cover crops, crop residues, mulch, and suitable vegetation shield the soil surface from the direct impact of raindrops and reduce the velocity of runoff. Leguminous cover crops can provide an additional benefit by contributing organic matter and, in suitable systems, biologically fixed nitrogen. Retaining crop residues after harvest also helps conserve moisture & supports soil biological activity.

Adopt Contour Farming: On sloping land, cultivation along contour lines rather than directly up and down the slope helps slow the movement of water. Contour cultivation, contour bunds, and vegetative barriers can reduce runoff velocity and encourage infiltration. For steep slopes, contour farming should be combined with other suitable measures based on slope, soil depth, rainfall, and local drainage conditions.

Practise Conservation Agriculture: Conservation agriculture emphasizes minimum soil disturbance, permanent soil cover, and crop diversification. Reduced tillage helps preserve soil structure and limit the disturbance of aggregates, while crop residues protect the surface. (Suresh *et al*., 2021). These practices should be adapted to local soil and cropping conditions. Reduced tillage alone may not prevent erosion if the soil remains bare or runoff is poorly managed.

Maintain Vegetative Barriers: Trees, grasses, hedgerows, and other suitable vegetation protect soil through canopy cover, root reinforcement, and improved surface conditions. Agroforestry combines trees with crops or livestock and can provide additional benefits such as carbon storage, biodiversity conservation, and diversified farm income. In erosion-prone areas, grass strips and vegetative barriers can interrupt runoff pathways and trap transported sediments. Vegetation should be selected according to local climate, soil, and land-use requirements.

Build Appropriate Soil and Water Conservation Structures

Engineering measures such as bunds, terraces, grassed waterways, check dams, and gully-control structures can help manage runoff and prevent the expansion of erosion features. These structures must be designed for the site. Poorly planned bunds or blocked drainage channels can concentrate water and worsen erosion. In high-rainfall areas, safe drainage and regular maintenance are especially important (Mishra *et al*., 2026). Every grain of soil carries the potential for future growth. When fertile topsoil is washed away, the loss extends beyond an individual farm to the wider food system and environment. The solution begins with practical decisions: keep the soil covered, protect vegetation, cultivate slopes carefully, manage runoff, increase organic matter, and plan conservation at the watershed level. Healthy soil is not an unlimited resource. Its protection is a shared responsibility and an essential condition for sustainable agriculture. If we save our soil today, we protect tomorrow's harvest. Every grain counts let us not wait until it is too late.

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