

■ SOIL EROSION

The literal meaning of 'soil erosion' is wearing away of soil. Soil erosion is defined as the movement of soil components, especially surface-litter and top soil from one place to another. Soil erosion results in the loss of fertility because it is the top soil layer which is ^{more} fertile. If ~~we look~~ at the world situation, ^{taken into consideration} we find that one third of the world's cropland is getting eroded. Two thirds of the seriously degraded lands lie in Asia and Africa.

Soil erosion is basically of two types based upon the cause of erosion:

(i) **Normal erosion or geologic erosion:** caused by the gradual removal of top soil by natural processes which brings an equilibrium between physical, biological and hydrological activities and maintains a natural balance between erosion and renewal.

(ii) Accelerated erosion: This is mainly caused by anthropogenic (man-made) activities and the rate of erosion is much faster than the rate of formation of soil. Overgrazing, deforestation and mining are some important activities causing accelerated erosion.

There are two types of agents which cause soil erosion:

(i) Climatic agents: water and wind are the climatic agents of soil erosion. Water affects soil erosion in the form of torrential rains, rapid flow of water along slopes, run-off, wave action and melting and movement of snow.

Water induced soil erosion is of the following types:

- ***Sheet erosion:*** when there is uniform removal of a thin layer of soil from a large surface area, it is called sheet erosion. This is usually due to run-off water.
- ***Rill erosion:*** When there is rainfall and rapidly running water produces finger-shaped grooves or rills over the area, it is called rill erosion.
- ***Gully erosion:*** It is a more prominent type of soil erosion. When the rainfall is very heavy, deeper cavities or gullies are formed, which may be U or V shaped.
- ***Slip erosion:*** This occurs due to heavy rainfall on slopes of hills and mountains.
- ***Stream bank erosion:*** During the rainy season, when fast running streams take a turn in some other direction, they cut the soil and make caves in the banks.

Wind erosion is responsible for the following three types of soil movements:

- *Saltation*: This occurs under the influence of direct pressure of stormy wind and the soil particles of 1-1.5 mm diameter move up in vertical direction.
- *Suspension*: Here fine soil particles (less than 1 mm dia) which are suspended in the air are kicked up and taken away to distant places.
- *Surface creep*: Here larger particles (5-10 mm diameter) creep over the soil surface along with wind.

(ii) Biotic agents: Excessive grazing, mining and deforestation are the major biotic agents responsible for soil erosion. Due to these processes the top soil is disturbed or rendered devoid of vegetation cover. So the land is directly exposed to the action of various physical forces facilitating erosion. Overgrazing accounts for 35% of the world's soil

erosion while deforestation is responsible for 30% of the earth's seriously eroded lands. Unsustainable methods of farming cause 28% of soil erosion.

Deforestation without reforestation, overgrazing by cattle, surface mining without land reclamation, irrigation techniques that lead to salt build-up, water-logged soil, farming on land with unsuitable terrain, soil compaction by agricultural machinery, action of cattle trampling etc make the top soil vulnerable to erosion.

Water Logging

In order to provide congenial moisture to the growing crops, farmers usually apply heavy irrigation to their farmland. Also, in order to leach down the salts deeper into the soil, the farmer provides more irrigation

water. However, due to inadequate drainage and poor quality irrigation water there is accumulation of water underground and gradually it forms a continuous column with the water table. We call these soils as waterlogged soils which affect crop growth due to inhibition of exchange of gases. The pore-spaces between the soil particles get fully drenched with water through the roots.

Water logging is most often associated with salinity because the water used for irrigation contains salts and the soils get badly degraded due to erroneous irrigation practices. The damages caused by some major irrigation projects is shown in Table 2.6.1.

Table 2.6.1. Water logging and salinisation caused due to some irrigation projects in India

Irrigation Project	State	Area affected (thousand hectares)	
		Water logging	Salinity
Indira Gandhi Canal	Rajasthan	43	29
Gandak	Bihar, Gujarat	211	400
Chambal	M.P., Rajasthan	98	40
Ram Ganga	U.P.	195	352
Sri Ram Sagar	Andhra Pradesh	60	1

*Source : B.K. Garg and I.C. Gupta (1997).**

An estimated loss of Rs. 10,000 million per annum occurs due to water-logging and salinity in India. It is a startling fact because the cost of development of the irrigation projects is very high and in the long run they cause problems like water logging and salinity thereby sharply reducing soil fertility.