

## SOIL EROSION COMBATING IS ESSENTIAL IN ORDER TO CONSERVE OUR VALUABLE SOIL RESOURCES

A. Introduction - Land is also a precious resource. Land is needed for agriculture and occupation. Land is under pressure due to increasing population. Land for agriculture has to be fertile in order to be able to support a good crop. The fertility of land lies in the quality of the soil.

Soil is formed as a result of weathering of rocks. There are also many living organisms in the soil. Soil is, in fact a product of the interaction of living organisms with rocks. Soil has many layers. The topmost layer is called the topsoil and is the most fertile. The removal of this topsoil is called soil erosion.

Soil erosion, in general, associated with deforestation and agriculture. Construction, urbanization, war, mining and other such activities are often significant in accelerating the erosion of the soil, but the prime cases are agriculture and deforestation. It is estimated that soil erosion on agricultural land operates at a rate of about 30t ha<sup>-1</sup> per year, which is approximately eight times quicker than topsoil is formed.

### B. Effects of Soil Erosion



\* Soil erosion results in the loss of soil fertility and makes the land barren.

\* Soil erosion also leads to desertification. Desertification refers to increase of desert areas.

Thus, soil erosion is a major and serious aspect of man's role in changing his own environment. Although there are many techniques available for attempting to reduce the intensity of the problem, it still appears to remain intractable.

C. Causes of Soil Erosion – The main cause of soil erosion is the removal of vegetation. Vegetation removal takes place due to removal of forest covers. Forest protect the underlying soil from the direct effects of rainfall, runoff is generally reduced. Tree roots bind the soil, and the litter layer protects the ground from rain splash. It is thus to be anticipated that with the removal of forest for agriculture or for other reasons rates of soil loss will increase and the mass movements will increase in magnitude and frequency. The rates of erosion that results will be particularly high if the ground is left bare, though under crops the increase will be less marked. Furthermore, unscientific farming has also led to barren lands. The method of ploughing, the time of planting, the nature of the crop, and the size of fields will all have an influence on the severity of erosion. Thus, the removal of vegetation exposes the topsoil to water and wind.

Water and wind cause the topsoil to be removed.

Water Erosion – Removal of topsoil by water is called water erosion. It takes place in the following ways:

Type of Soil Erosion

Sheet erosion

Rill erosion

Gully erosion

Riparian erosion

Wind erosion

Sheet Erosion – The removal of the entire topsoil as a result of heavy rains is called sheet erosion.

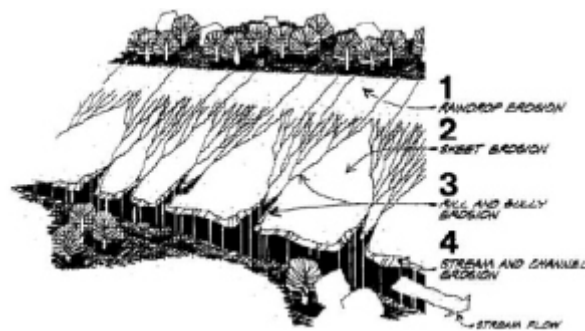
Rill Erosion – Runoff water moves across the soil forming small streams. The topsoil is removed only in these rills formed by the water streams.

Gully Erosion – Deep depressions called the gullies are formed by swiftly moving waters causing soil erosion by them.

Riparian Erosion – The banks of rivers lose top soil due to the action of the fast moving rivers waters. These waters remove the underlying soil and this results in the loss of topsoil.

Soil Leaching – The topsoil is fertile due to rich presence of minerals. Sometimes the rain water dissolves these minerals which go down into the soil along with the water. This results in the loss of fertility of the topsoil.

Wind Erosion – The other cause for erosion is wind. It is more in areas where there is less or no vegetation covering the land. The fast moving wind moves the fine particles to other places. The deserts are encroaching the fertile areas in this manner. The wind laden with fine sand deposits the latter and forms sand dunes. Shifting sand dunes are common in dry areas of Rajasthan, Gujarat and Madhya Pradesh. Expansion of deserts in this manner is called desertification.



#### D. Discussion on various aspects of Soil Erosion –

a. Deforestation and Erosion - After the lush vegetation of a rain forest is removed, an area rarely recovers. After deforestation the deforested valleys are eroded away because there is no longer a good root system to anchor the topsoil or decaying plant matter to replenish its nutrients. If the cycle continues, these areas may eventually resemble a desert.

In some cases the erosion produced by forest removal will be in the form of widespread surface stripping. In other cases the erosion will occur as more spectacular forms of mass movement, such as mudflows, landslides and debris avalanches.

b. Soil erosion associated with construction and urbanization - The highest rates of erosion are produced in the construction phase when there is much bare ground and much disturbance produced by vehicle movements and excavations.

c. Gully Formation Due to Soil Erosion - Gully formation, a severe form of soil erosion, is a natural geologic process that can be greatly accelerated by human activities such as urbanization, deforestation, overgrazing of cattle, and poor agricultural practices. Erosion attacks the moisture-bearing ability of soils and adds deposits to waterways. These destructive processes continue at an increased rate on every continent, as overpopulation and industrialization tax the remaining soil.

E. Techniques to check Soil Erosion - Because of the adverse effects of accelerated erosion a whole array of techniques has now been widely adopted to conserve soil resources.

Methods used to combat soil erosion:

i) Revegetation

a) Deliberate planning

b) Suppression of fire, grazing to allow regeneration

ii) Measures to stop stream bank erosion

iii) Measures to stop gully enlargement

a) Planting of trilling plants

b) Weirs, dams

iv) Crop management

a) Maintaining cover at critical times of year

b) Rotation

c) Cover crops

v) Slope runoff control

a) Terracing

b) Deep tillage and application of humus

c) Transverse hillside ditches to interrupt

d) Contour ploughing

e) Preservation of vegetation strips to limit field width

Tillage Land is prepared for cultivation by a process called tillage. During this process, plows break up the surface layer of soil in order to circulate air and moisture, prepare a good bed for seeds, and remove undesirable weeds and excess vegetation. Plowing is usually done in patterns that follow the contour of the land, an agricultural technique called contour farming. These patterns and lines evident well into the growth of the crop are made horizontal to the slope, or contour, of the land, which minimizes water runoff. When used in conjunction with the construction of ditches and terraces, contour farming can be a very effective method of soil conservation control.

vi) Prevention of erosion from point sources like roads, feedlots

a) Intelligent geomorphic location

b) Channelling of drainage water to non-susceptible areas

vii) Suppression of wind erosion

a) Soil moisture preservation

b) Increase in surface roughness through ploughing up clods or planting of windbreaks.

F. Further discussion on Prevention and Control of Soil Erosion -

\* Increase of Vegetation – When the land is covered with vegetation, the roots of the plants and trees interlock and interlace to bind the soil particles. This helps in two ways:

does not allow the soil particles to be carried away by wind or water

does not allow free flow of water over the soil which prevent erosion of soil by flowing water

the falling leaves of the plants get converted to humus by decomposing action of the soil microbes. This enriches the soil.

Several methods can be employed to increase the vegetation cover of land. Some of them are as follows:

\* Crop Rotation – The practice of growing different crops at different times on the same land is called crop rotation. This keeps the topsoil covered with vegetation. Rotation of cereal crops with legumes also keeps the soil enriched with nitrogen (from the legumes).

\* Reforestation – Slopes are more subject to soil erosion by running water. Growing trees on lands which have lost their vegetation is called reforestation. Trees like Albizia, Cassia, Butia, etc. are suitable for this.

\* Strip Cropping – It involves growing of crops in strips. The most common method followed is the contour farming where the strips of crop are at right angles to the slope. Wind-strip cropping is when the strips of crop are place at right angles to the direction of wind.

\* Restoring Soil Fertility – Fertile soil supports vegetation. Loss of fertility results in loss of vegetation and this exposes the land to erosion. Fertility of soil can be increased by addition of natural and synthetic fertilizers.

\* Control of Grazing – Covering the land with small plants and grasses helps the topsoil to remain in place as the roots of these plants bind with the soil particles. Cattle graze on these plants and expose the topsoil Thus, grazing should be allowed only on the land meant for the purpose and other areas should be protected from grazing.

\* Terracing – Fields are cut at right angles to the slope. This slows down the flowing water and allows it to irrigate the crops, as well.

\* Dam Building – With the dams the speed and amount of water flowing can be controlled. This will control the soil erosion of the river banks.

\* Wind Breakers – Trees are planted across the wind direction to protect against the high velocity winds. These rows of trees are called shelter belts or wind breakers.

G. Conclusion – Ideally, soil erosion control begins with soil erosion prevention, and certain plants are excellent at soil erosion prevention. But when it's too late for soil erosion prevention, you simply have to fix a problem that already exists. Building retaining walls addresses both kinds of soil erosion control issues — both preventing it and fixing an existing problem.

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