



Soil erosion

Soil erosion occurs when soil is removed through the action of wind and water at a greater rate than it is formed

SOIL

The soil covering the surface of the earth has taken millions of years to form and we must learn to respect it. Soil is formed at a rate of only 1 cm every 100 to 400 years and it takes 3 000 to 12 000 years to build enough soil to form productive land. This means that soil is a nonrenewable resource and once destroyed it is gone forever.

If we disregard this, a time will come when there would not be enough soil left to sustain life on earth, because the soil is a necessary growth medium for plants, a home for certain insects and animals, as well as a medium from which we get minerals, such as gold. It is important therefore to treat soil, especially topsoil, as a living entity.



agriculture

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WHAT IS SOIL EROSION?

- ◆ When a raindrop hits soil that is not protected by a cover of vegetation and where there are no roots to bind the soil, it has the impact of a bullet.
- ◆ Soil particles are loosened, washed down the slope of the land and either end up in the valley or are washed away out to sea by streams and rivers.
- ◆ Erosion removes the topsoil first. Once this nutrient-rich layer is gone, few plants will grow in the soil again.
- ◆ Without soil and plants the land becomes desertlike and unable to support life.

CAUSES OF SOIL EROSION

Erosion occurs when farming practices are not compatible with the fact that soil can be washed away or blown away. These practices are:

- ◆ Overstocking and overgrazing
- ◆ Inappropriate farming techniques such as deep ploughing land 2 or 3 times a year to produce annual crops
- ◆ Lack of crop rotation
- ◆ Planting crops down the contour instead of along it.

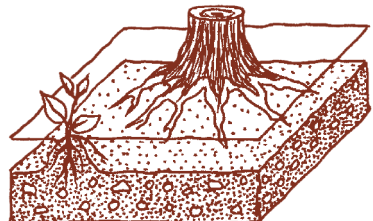
Water erosion

Water erosion causes two sets of problems:

- ◆ An on-site loss of agricultural potential
- ◆ An off-site effect of downstream movement of sediment, causing flooding and the silting up of reservoirs.

Sheet erosion

- ◆ Soil erosion is characterised by the downslope removal of soil particles within a thin sheet of water.
- ◆ Sheet erosion occurs when the entire surface of a field is gradually eroded in more or less uniform way.

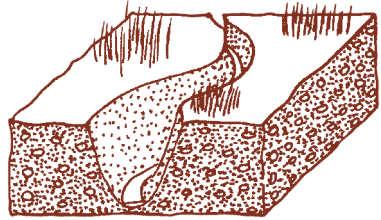


- ◆ It is a gradual process and it is not immediately obvious that soil is being lost.

Gully erosion (dongas)

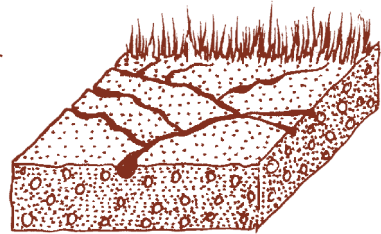
Dongas usually occur near the bottom of slopes and are caused by the removal of soil and soft rock as a result of concentrated runoff that forms a deep channel or gully.

On steep land, there is often the danger of gullies forming. Water running downhill cuts a channel deep into the soil and where there is a sudden fall, a gully head forms at the lower end of the channel and gradually works its way back uphill. As it does so, it deepens and widens the scar that the gully makes in the hillside. Gully erosion is related to streambank erosion, in which fast-flowing rivers and streams increasingly cut down their own banks.



Rill erosion (channel erosion)

Channel erosion can occur on steep land or on land that slopes more gently. Because there are always irregularities in a field, water finds hollows in which to settle and low-lying channels through which to run. As the soil from these channels is washed away, channels or miniature dongas are formed in the field.



Wind erosion

Wind erosion occurs when the land surface is left bare in regions that are arid enough, as a result of low rainfall, to allow the soil to dry out, and flat enough to allow the wind to carry the soil away over several consecutive days. Land may become susceptible to wind erosion through grazing animals, which remove the protective plant cover, and whose hooves break up the soil, especially round watering points. Arable land that has been left bare is also a major problem.

FACTORS DETERMINING SOIL EROSION

There are various factors determining soil erodibility of which the following are the most important:

Slope

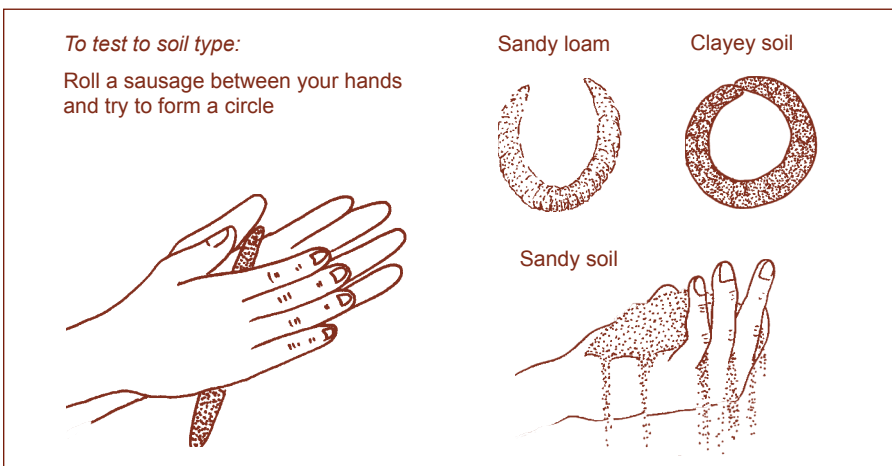
The steeper the slope, the greater the erosion, as a result of the increased velocity (swiftness) of water-flow. The length of the slope is very important, because the greater the size of the sloping area, the greater the concentration of the flooding water.

Soil texture

Soil texture is the size distribution of soil particles. The size of particles never changes. A sandy soil, therefore, remains sandy and a clayey soil remains clayey. The three main particles are sand, silt and clay. The more sandy a soil the easier it will erode.

Soil structure

The term soil structure means the grouping or arrangement of soil particles. Overcultivation and compaction cause the soil to lose its structure and cohesion (ability to stick together) and it erodes more easily.

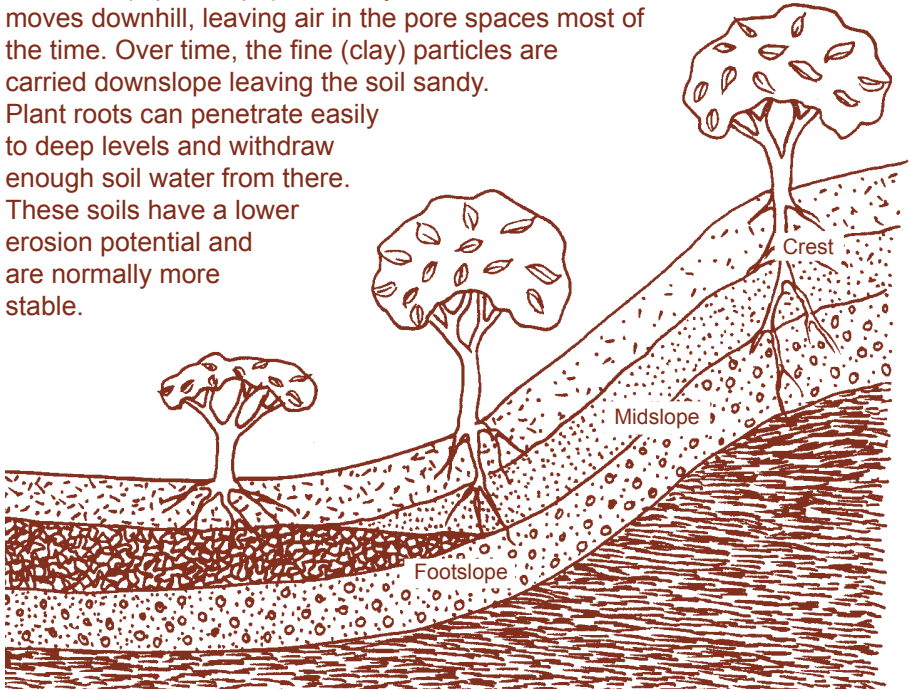


Terrain unit

The *crest* (top of slope) is usually well drained as soil moisture moves downhill, leaving air in the pore spaces most of the time. Over time, the fine (clay) particles are carried downslope leaving the soil sandy.

Plant roots can penetrate easily to deep levels and withdraw enough soil water from there.

These soils have a lower erosion potential and are normally more stable.



In the *midslope* soil moisture moving from the crest starts to dam up as a result of the clay-rich soil just downhill. The soils are moderately well drained with a higher erosion potential.

In the *footslope* the soil has been waterlogged (saturated with water) as a result of the long-term accumulation of clay which does not allow water to infiltrate. Plants that grow on these soils are limited to those that can adapt their root systems to grow laterally above the hard clayey layer. These imperfectly drained soils have a high erosion potential.

Organic material

Organic material is the “glue” that binds the soil particles together and plays an important part in preventing soil erosion. Organic matter is the main source of energy for soil organisms, both plant and animal. It also influences the infiltration capacity of the soil, therefore reducing runoff.

Vegetation cover

The loss of protective vegetation through overgrazing, ploughing and fire makes soil vulnerable to being swept away by wind and water. Plants provide protective cover on the land and prevent soil erosion for the following reasons:

- ◆ Plants slow down water as it flows over the land and this allows much of the rain to soak into the ground.
- ◆ Plant roots hold the soil in position and prevent it from being blown or washed away.
- ◆ Plants break the impact of a raindrop before it hits the soil, reducing the soil's ability to erode.
- ◆ Plants in wetlands and on the banks of rivers are important as they slow down the flow of the water and their roots bind the soil, preventing erosion.

Land use

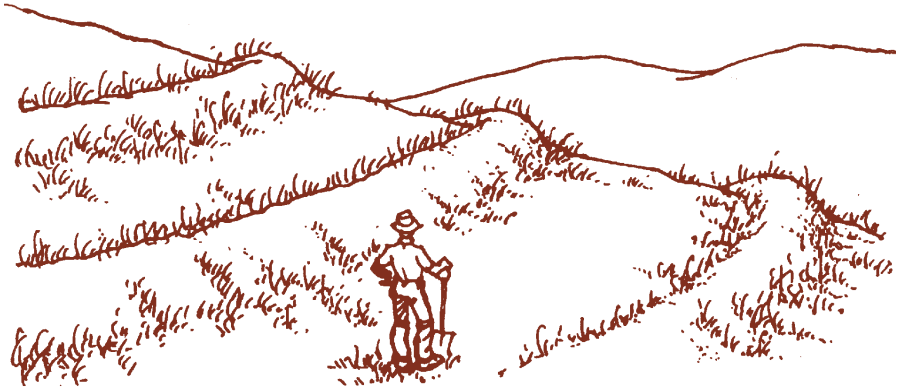
Grass is the best natural soil protector against soil erosion because of its relatively dense cover. Small grains, such as wheat, offer considerable obstruction to surface wash. Row crops such as maize and potatoes offer little cover during the early growth stages and thereby encourage erosion. Fallowed areas, where no crop is grown and all the residue has been incorporated into the soil, are most subject to erosion.

PREVENTING SOIL EROSION

Some of the following measures can be implemented to prevent soil erosion:

- ◆ The use of contour ploughing and windbreaks
- ◆ Leave unploughed grass strips between ploughed lands (strip cropping)
- ◆ Make sure that there are always plants growing on the soil, and that the soil is rich in humus
- ◆ Avoid overgrazing
- ◆ Allow indigenous plants to grow along riverbanks
- ◆ Conserve wetlands

- ◆ Cultivate land, using a crop rotation system
- ◆ Minimum or no tillage
- ◆ Encourage water infiltration and reduce water runoff.



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