



UNIVERSITÀ
CATTOLICA
del Sacro Cuore



PRODUZIONE DI CIBO APPROPRIATO: sufficiente, sicuro, sostenibile

HOW TO CULTIVATE HILLY SLOPES SOILS?

- **In order to prevent erosion.**

Erosion can be a severe problem in conventional farming, especially on steep slopes. In particular, water erosion from agricultural land is a critical phenomenon due to the speed at which it happens, as well as the great losses it causes, not only for the agricultural exploitation, but also for many other economic activities and for the environment. It causes floods during the rainy season followed by water shortage in the dry season. In view of the losses caused by water erosion, the development of techniques that increase the efficiency of soil conservation is fundamental.

Below there are represented 4 different methods to cultivate hilly slopes soils.

- **Vegetative strips**

A *vegetative strip* is a strip planted with grass, shrubs or trees that runs across the slope (fig. 1). It slows down water flowing down the slope, and catches sediment that has been eroded uphill. Over time, soil may build up behind the strip, forming a terrace.

Vegetative strips are cheap and easy to establish. Once they are growing, they are easy to maintain, and they can provide valuable fodder for animals.

You can cut mulch from the strips and use it to cover the land in between. If your field has stones, you can lay these along the contours as an additional barrier.

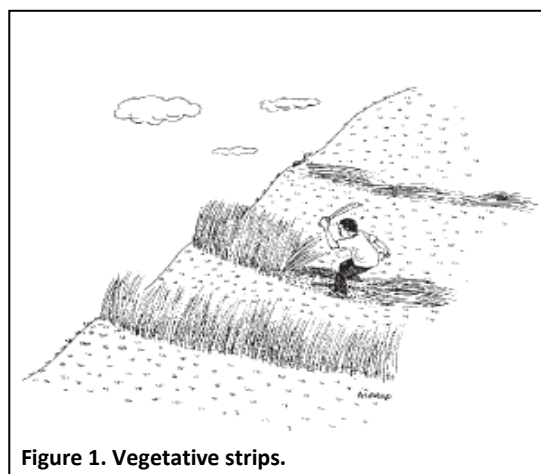


Figure 1. Vegetative strips.

- **Stone lines**

Stone lines are similar at vegetative strips (fig. 2).

They are used wherever there are loose stones in the field, both in dry and humid areas.

The distance between the lines depends on the slope and how many stones are available. On 2–5% slopes they are often 25–50 m apart. You can make stone lines from stones in your field and then plant grass or trees on either side.

Planting pits are often used in combination with stone lines.

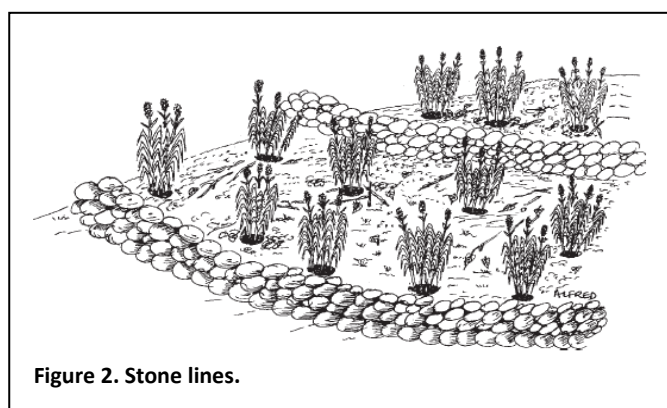


Figure 2. Stone lines.

- Contour ridges

Contour ridges are ridges of soil that run along the contour of the hill (fig. 3). Like other contour barriers, they slow down water flow and catch sediment before it is washed away.

You can make small ridges (called “cross-ties”) at right angles to the contour to make the contour ridges more effective at trapping water. These cross-ties prevent the water from flowing along behind the contour ridge and collecting at the lowest point, where it may break through the ridge and start a gully. Space the cross-ties 10 m apart on steeper slopes and in areas with heavy rainfall).

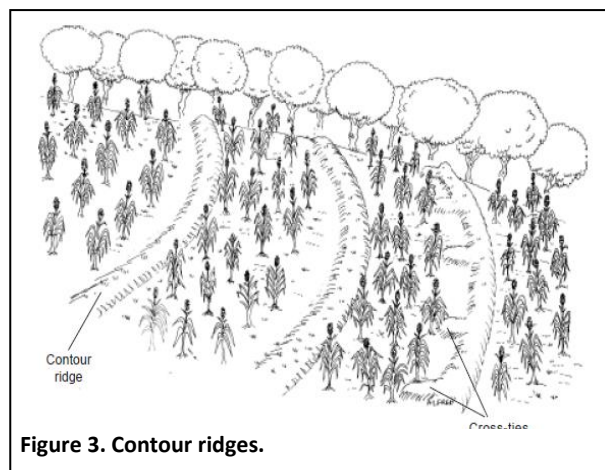


Figure 3. Contour ridges.

- Bench terraces

Terracing of agricultural land represents one of the most known and used practices by farmers to control water erosion. It consists in building terraces, transversally to the terrain slope, creating physical obstacles that reduce the runoff speed and mitigate the water movement on the soil surface (fig. 4).

Bench terraces are usually found on medium to steep slopes by moving soil from one place to another on the slope. Terraces are aligned by eye and constructed by hoe (fig. 5).



Figure 5. Terracing realization.

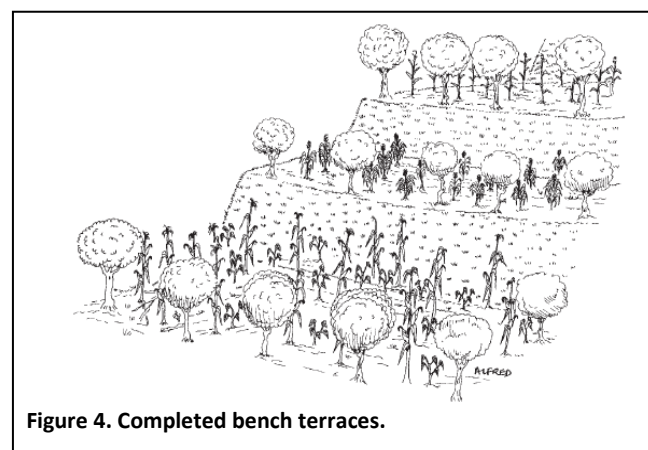


Figure 4. Completed bench terraces.

They consist of beds which are more or less level, and risers (walls or bunds). The width of the bed is 1.0–1.5 m depending on slope, though there are no specific technical guidelines. The length of each terrace can be up to 25 m. Down the slope, after every 3–4 terraces, there are lateral drainage channels, approximately 20–30 cm wide and 10 cm deep (fig. 6). After harvest of annual crops, the land is left until immediately before the next rainy season.

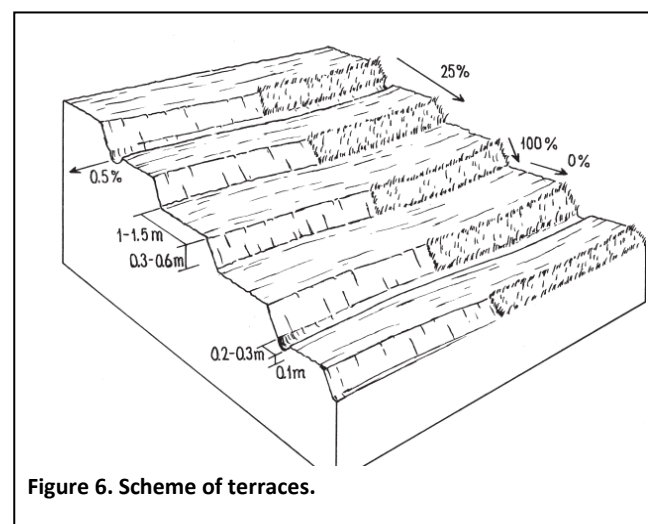


Figure 6. Scheme of terraces.

The terraces at this stage are covered by weeds and grasses. To be effective, bench terraces must be well maintained. Maintenance includes building up/repairing of risers and levelling of terrace beds as required. Keep the risers planted with grass, and repair them if necessary.

A terracing system can be beneficial in a number of ways for the area where it is constructed, such as: splitting the slope in several segments, resulting in the reduction of the amount and rate of surface runoff and a consequent reduction of erosion activity causing nutrient losses; the increase of water availability for crops; a notable decrease in the peak flow of water courses.

- **In order to conserve water.**

Another important issue is to conserve water in areas with poor rainfall, there may not be enough water to grow crops reliably. But even in dry years in these areas, more than half the precious rainwater may be lost through evaporation or because it runs off.

There are various techniques to harvest extra water, either in the field itself, or by bringing water in from outside to where the crops are growing. Techniques to manage water include:

- **Planting pits**

Planting pits are a variation on the idea of planting basins. They are hand-dug circular holes which collect water and store it for use by the crop (fig. 7). Each pit is about 20 cm across and 20 cm deep. After planting, the holes are left partly open so they collect water. Planting pits take a lot of work to dig when the soil is dry. But they produce good yields in areas where otherwise crops might die because of a lack of water. Once made, the pits can be used again, season after season. Leave the soil covered, and add compost or fertilizer to the pits to increase their fertility.

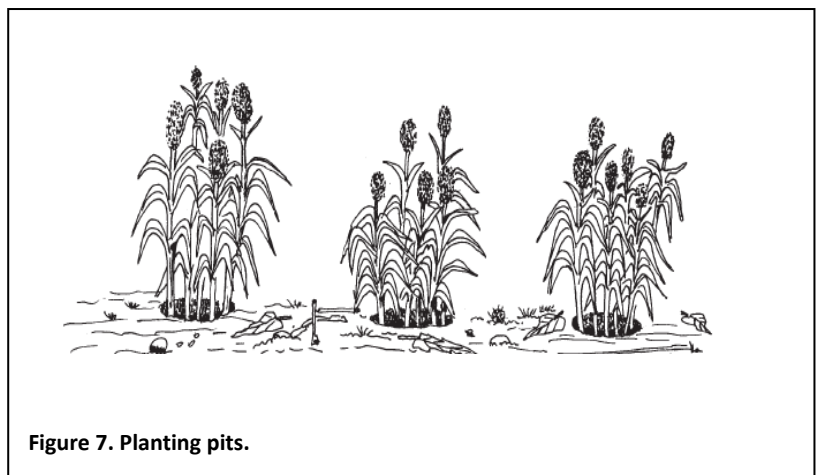


Figure 7. Planting pits.

- **Road catchments**

Water from *roads* and from other unproductive areas such as paths and homestead compounds can be channelled onto fields. It may be possible to divert water from terraces. Or special bunds can be built around fields close to the road. Another possibility is to direct the water into a pond, which can be used to irrigate crops.

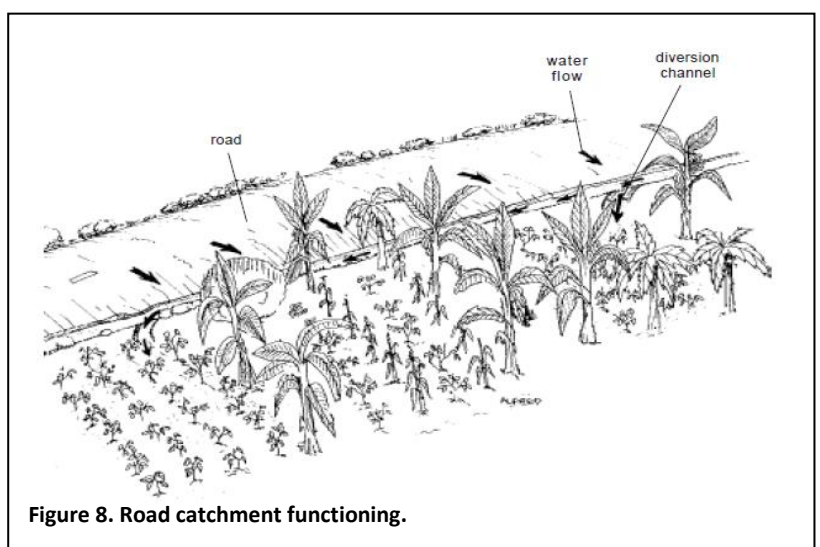


Figure 8. Road catchment functioning.

- Half-moon microcatchments

Half-moon microcatchments are small, semicircular earth bunds (fig. 9).

Crops such as sorghum, millet and cowpeas can be planted in the lower portion of the half-moons. The half-moons catch water flowing down a slope.

Half-moons are also helpful to rehabilitate degraded land and to practice conservation agriculture techniques.

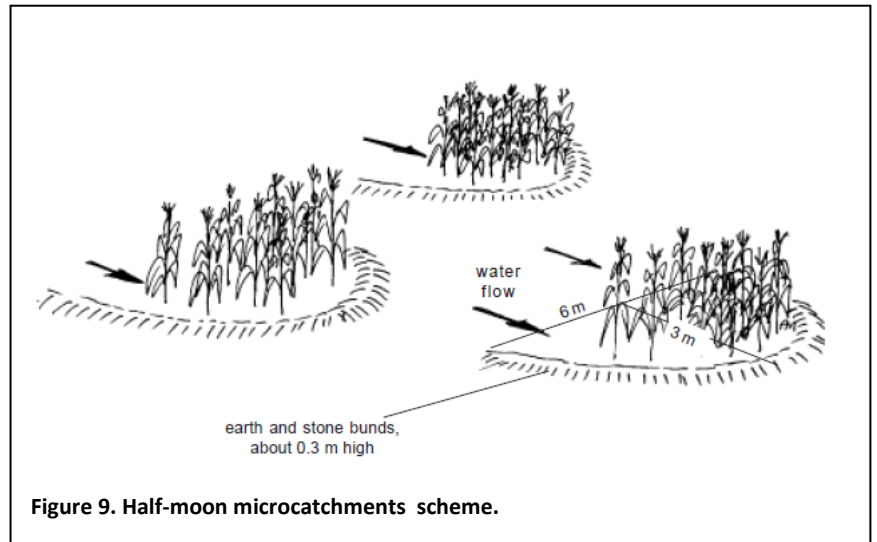


Figure 9. Half-moon microcatchments scheme.

- Permanent strips

In very low rainfall areas, it is possible to grow crops by planting them in *strips*. By sloping the ground in between towards the strips, rainwater will flow towards the strips, close to the crop.

A farmer could make his cropped strips 0.8–1 m wide and 3.3 m apart, with a depth of 0.7 m (fig. 10).

The shape of the land between the strips may have a slope towards the cropped strips, so rainwater will flow towards the crop. Two plants of maize are sown in each strip, and it is possible sow between the strips.

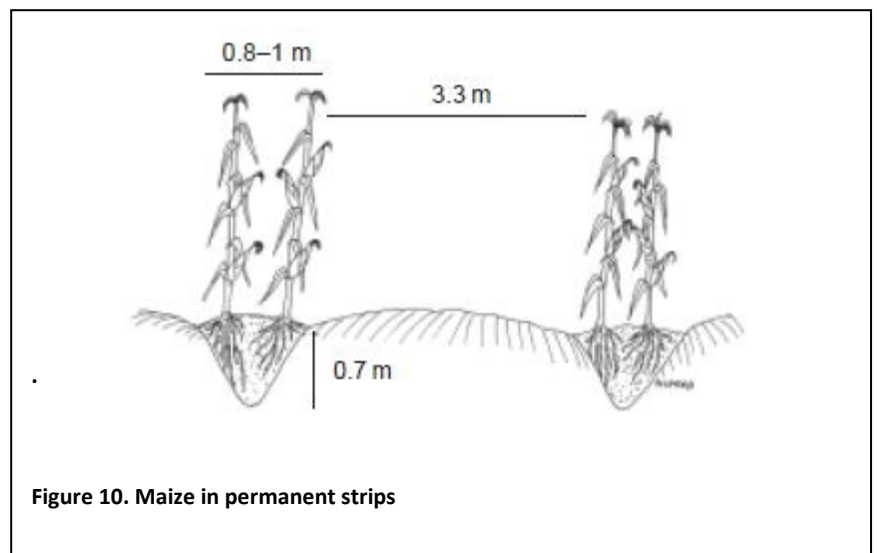


Figure 10. Maize in permanent strips

These strips are permanent: they can be used to grow crops season after season.

The soil in the strips gradually improves in fertility as crop residues accumulate there. Rotating maize with a legume crop will improve the soil fertility further.