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Rainwater Harvesting for Increased Pasture Production



Rainwater Harvesting for Increased Pasture Production

What is rainwater harvesting?

It is the collection and concentration of runoff water from the land surface before it is lost to a stream or river. Rainwater harvesting makes more water available for agricultural, household or other needs.

Why harvest rainwater?

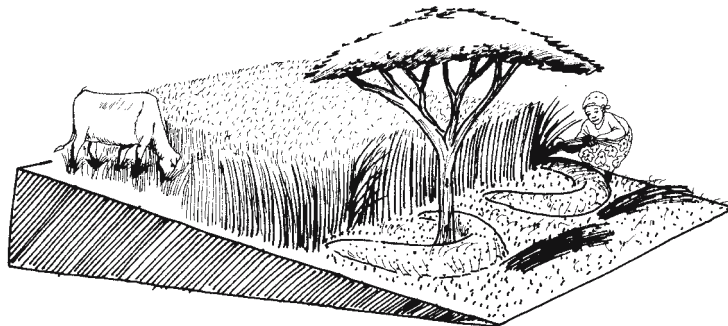
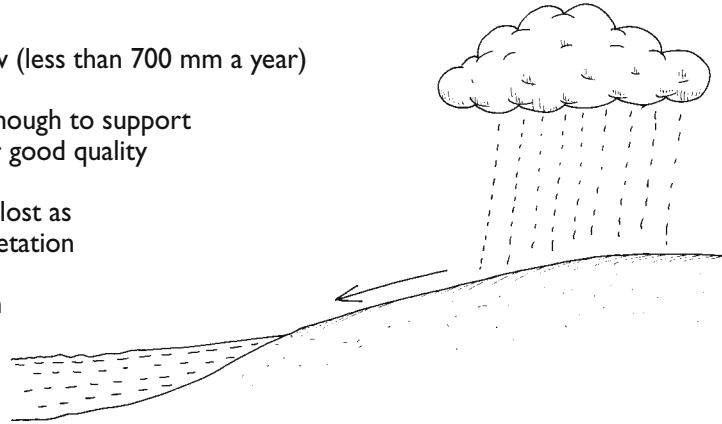
- In dry areas rainfall is low (less than 700 mm a year) and poorly distributed.
- Available rainfall is not enough to support growth of many crops or good quality pasture.
- Most of the rainwater is lost as runoff due to lack of vegetation cover.
- Runoff can cause erosion and loss of soil.

Simple methods are available that reduce runoff, prevent erosion and allow more time for rainfall to soak into the soil and be available to crops and pasture. This process is called rainwater (or runoff) harvesting.

This leaflet describes one method of rainwater harvesting – using hoops. This method is particularly suited to pasture production in dry areas.

What are hoops?

They are raised earth structures (bunds) constructed as semi-circles on gently sloping land. They are made so that the tips of the bunds or hoops point up the slope and are on the same level with the contour line. The hoops capture rainwater that runs down the slope,



allowing it to soak into the soil. Excess water drains around the tips, where it can be caught in more hoops further down the slope.

The size of the hoops can vary from small (2 metres across) to large (60 metres across). The smaller hoops can be used to grow better crops, shrubs and trees. The larger ones can be used to grow better grass or fodder and also help in rangeland rehabilitation.

Why semi-circular hoops?

There are different methods of harvesting rainwater suited to different uses. For example, water for domestic use can be harvested from roofs using gutters and stored in underground or raised tanks. Water for irrigation can be harvested using canals and stored in pits, tanks or dams. But water for rain-fed crop or pasture production can simply be harvested and stored in the soil for use by the crop – that is by using semi-circular hoops. Use of semi-circular hoops is the recommended method for harvesting rainwater for pasture production in dry areas because it is simple and cheaper.

Where can semi-circular hoops be used?

They are suitable in dry areas where rainfall is too low for reliable growing of crops or good-quality pasture but can still cause erosion. Runoff and erosion can occur even where there is very little rainfall. For hoops to work, the land needs to have a gentle slope (ideally about 3%) but they can also be used on land with a steeper gradient if spaced closer together. They can also be used on most types of soils, but are unsuitable for use on cracking clays. Gradients can be assessed using an A-frame - your local extension officer can assist you if necessary.

What are the benefits?

Harvesting water using hoops has many benefits. These include:

- increased pasture production
- more productive and healthier livestock
- increased milk production
- extra income from sale of hay and grass seeds
- reduced erosion and soil loss
- simple and affordable method
- ordinary skills and simple tools.

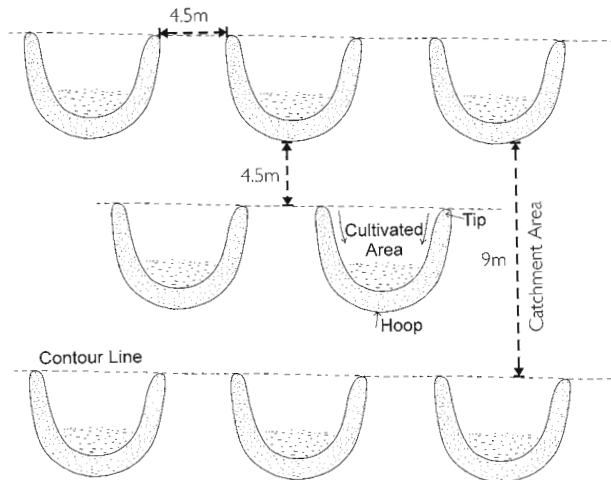
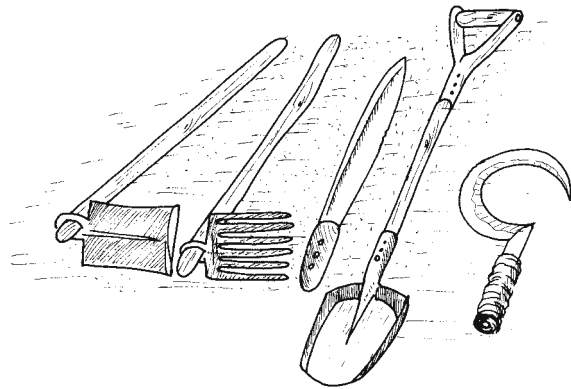
What are the requirements?

- Land with a gentle slope
- Tools: hoes (jembes), forks, spades, machetes (pangas)
- Labour
- Desire to increase pasture production
- Suitable pasture seeds, such as *Cenchrus ciliaris*, *Eragrostis superba* or *Digitaria macroblephara*. For pasture species suitable for your area, consult your local extension officer.

Procedure

Tip:

A rough position for a semi-circular hoop can be found using only your eyes - in the same way you may be able to identify the correct position for a bench terrace. If you are not sure how to do this, ask your local extension officer.



Step 1:

Use a hoe (jembe) and start from the contour line. Dig shallowly in a semi-circle, throwing the soil on the lower side (downhill slope). The hoop should be about 30 cm high in the middle, gradually decreasing in height and reaching ground level at the tips.

Step 2:

Construct a series of hoops in this way along a contour line to form a row. The distance between two hoops in a row should be slightly less than the width of one hoop.

Step 3:

Make another row of hoops, 4.5 metres below the first row. The second row of hoops is placed in line with the gaps in the first row (see diagram).

Step 4:

Continue making hoops in this way until the intended area is covered.

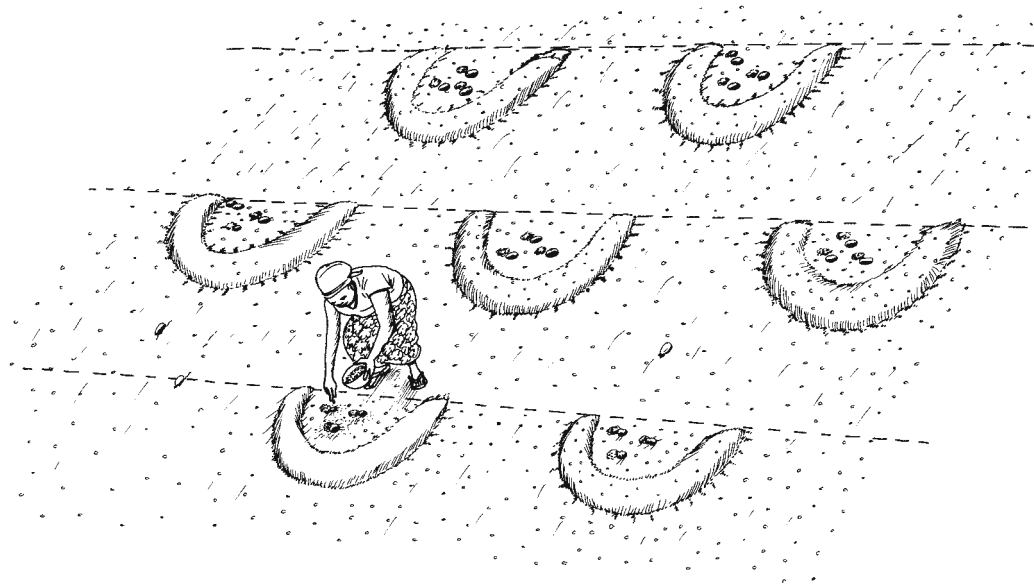
Step 5:

Sow grass and legume seeds recommended by your extension officer. Grass should be sown inside the hoop and legumes, such as cowpeas, inside and on top of the hoop. A crop of cowpeas can be harvested during the first season.

Step 6:

Before grazing or making hay, allow grass to grow for 2 wet seasons or until the pasture is well established (a uniform and continuous stand of grass 30 cm high or taller).





What can go wrong

Problem	Solution
Livestock or wild animals damage hoops	Fence to keep out animals Repair hoops during the dry season
Storms wash hoops away	Reconstruct or repair hoops before the next rainy season
Stray livestock or wild animals eat cultivated grass	Fence to keep out animals
Labour may not be available to cover intended area	Make hoops with available labour each season until you cover whole area
Pasture seeds unavailable	Ask your local extension officer where you can buy suitable seeds. Save own seed
Failure of seeds to germinate	Get good quality seeds. Ask your local extension officer

Case Study

Josephine and Jeremiah Ngaya of Twaandu location, Makueni District, Kenya, learned to harvest water using semi-circular hoops from the Kenya Agricultural Research Institute (KARI) research station at Kiboko in 2000. At that time they did not have enough grass for their cattle. After their training, they started making semi-circular hoops on their land and sowed seeds of four types of recommended grasses (*Cenchrus ciliaris*, *Eragrostis superba*, *Enteropogon macrostachyus*, *Chloris roxburghiana*). Initially they planted 8 hectares. They fenced the area to protect it from stray animals and, when the grasses matured, harvested the seeds and used them to expand the area planted with the new grasses.

Thanks to their increased grass production, they were able to increase their herd from six to 12 indigenous zebu and saw daily milk production double to 2 litres per cow. They were able to save from their increased income and bought an additional 9 hectares of land.

They have now planted a total of 11 hectares with the improved grass. On average they harvest 120 bales of hay per hectare each year. They use a simple hay-box method and store the bales under shade. The hay is used for their own animals and they also sell the surplus to neighbouring farmers for US\$2.85 per bale. In addition, they rent grazing land to other farmers and harvest more than 100 kg of grass seeds each year, which they sell for US\$4.30 per kg.

The Ngayas are a happy family. The demand for their hay and seed exceeds their supply. They now plan to build more semi-circular hoops and plant the remaining part of their land with the new grasses.

