Resource Material for Homestead Food Gardeners

Chapter 5: Handouts (English)

1. Saving and using water

All our water comes from rain. If we live in areas with little rain, or long periods without rain, we need to harvest this water. We harvest water to have more water over a longer period of time.

Water harvesting can happen in a number of different ways:

- We can collect the water where it falls
- We can save the water we do have.
- We can collect water from surfaces or catchments

Collecting water where it falls

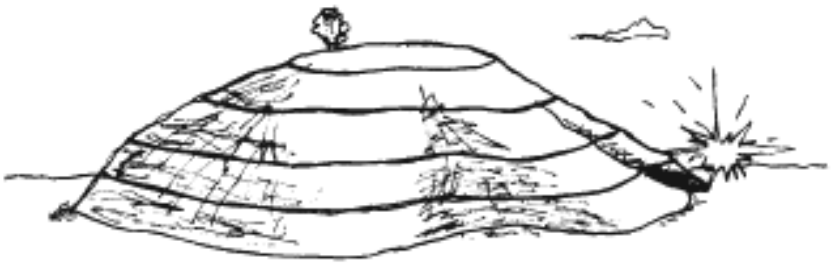
Here we try to slow down the water, catch it and let it sink into the ground. Below are some examples of how we can do this in our homes and gardens.

- Add organic matter to the soil. We have spoken about this in the *Improving Your Soil* and *Bed Design* leaflets in this series.

- Mulch. See the *Mulching* leaflet in this series.
- Keep the soil covered with growing plants. Use ground covers, bushes and trees.
- Protect your garden from wind. See the *Wind and Frost Protection* leaflet in this series.
- If your garden is on a slope, make your beds across the slope. This will catch the water and stop it from running down your beds and off your land.
- Construct earthbanks/bunds, to slow down, catch and store water.
- Construct swales. These are earth banks that are constructed in a particular way. This is explained in the sections below.

Earth banks/bunds

These banks are laid out across a slope, along a contour line. A contour is a line or a series of points that runs straight across a slope. Everything along the line is level.



Contour lines drawn on a picture of a hill to show the areas that are level

How to mark out a contour line

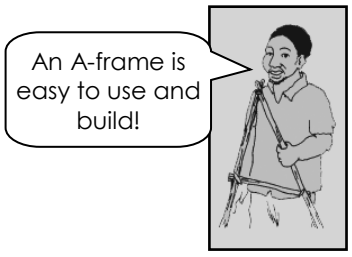
You can use an A-frame to mark out the level points along a contour.

How to build an A-frame:

1 Take the two poles of the same length and tie them together at one end, using string or wire.

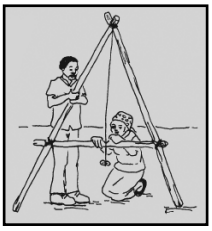
Materials:

2 poles, each about 3 metres long;
1 pole, about 2 metres long;
String and wire;
A small stone.



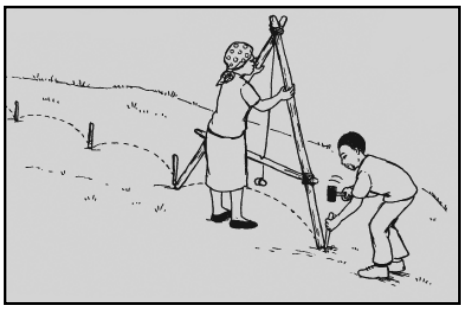
2 Then, tie the third pole across, between the two other poles, about 1 metre from the bottom.

3 Now tie a piece of string onto the frame at the top. Attach the stone onto the end of the string. When you hold the frame up, the stone should hang just below the cross pole/bottom pole. Hold the A-frame upright on a level piece of ground/floor. Mark the place where the string hangs across the bottom pole. This should be close to the middle of the pole.



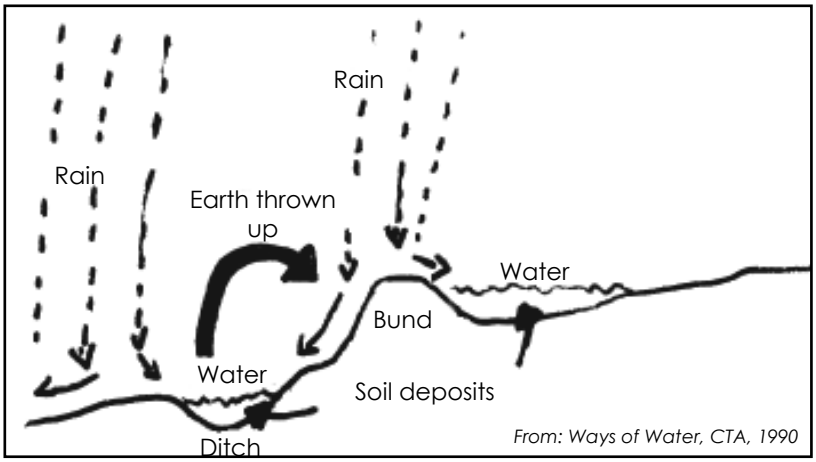
How to use an A-frame:

4 Find two level points on the left-hand side of the area where you are trying to establish the contour. Mark the two points with pegs. Now swing the A-frame on its right leg, swinging the left leg around. Find the level for this leg by moving it until the string with the stone attached is at the marked mid-point. Continue moving the frame in this manner.



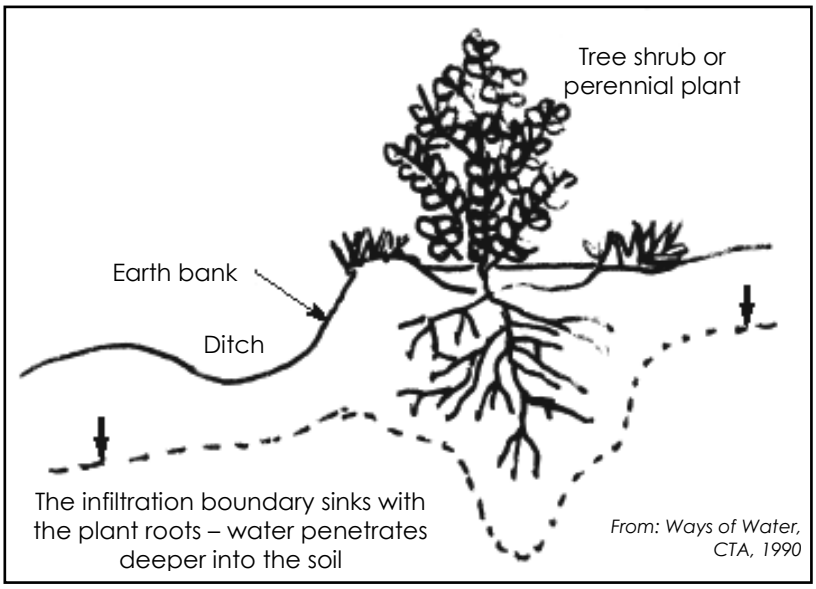
From: Farmer-to-Farmer Handbook, FSG, 1996

Build an earth bank by digging a ditch across the slope, along a contour line. Place the soil from the ditch above the ditch. Dig the ditch about 30 cm deep (the width of a spade) and 30 cm wide. Rain water will accumulate above the earth bank/bund and in the ditch. This water will sink into the ground instead of running off your land. As soil is washed down the slope and accumulates behind the bank a small flat terrace/area will be formed. This will take some time.



From: Ways of Water, CTA, 1990

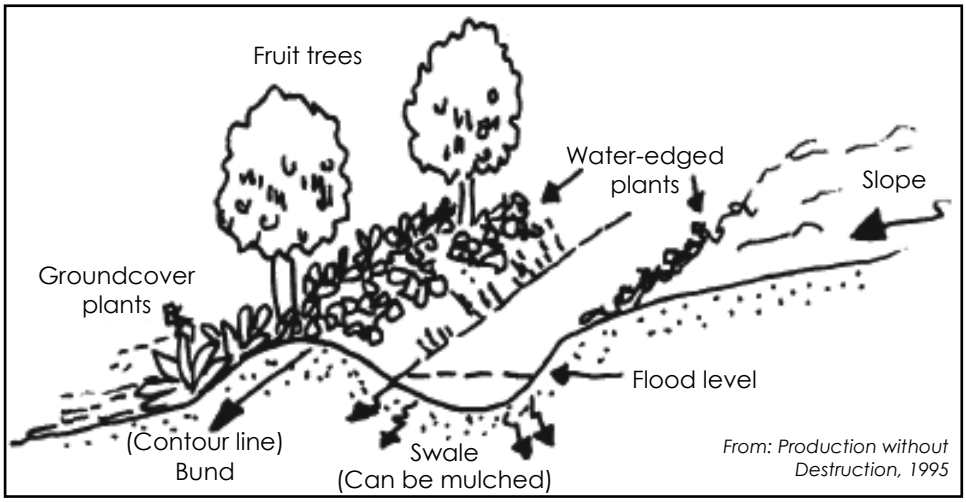
Plant long-living or perennial plants along these banks. This helps to hold the soil on the bank. It also provides your bushes and trees with water. This is a good place to plant fruit trees and medicinal plants. See also the Wind and Frost Protection leaflet in this series for some more ideas of what to plant. The ditches will fill up with soil over time and need to be cleared out when



From: Ways of Water, CTA, 1990

this happens.

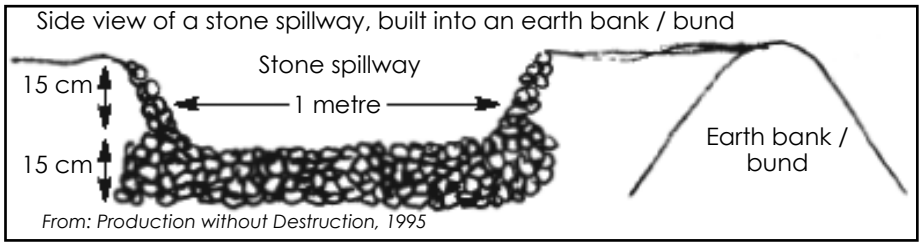
Swales



Swales are also earth banks/bunds built along a contour line. The difference is that the earth is piled below the ditch rather than above. This is a very good way to concentrate water on the land. In this way, you can keep double the amount of water in your soil.

Earth banks and swales must be built high enough so that water never flows over the top of the bank. If there is a danger of this, spillways need to be built into the banks. These will lead the excess water down the slope in a safe way.

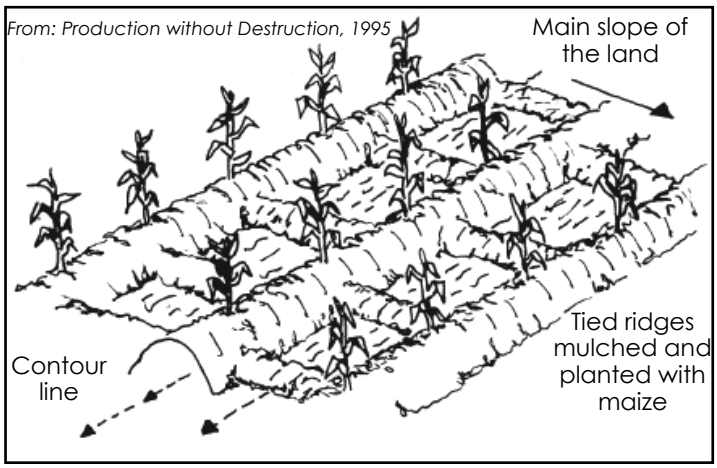
Swales do not lead to low terracing as the first method does. The banks are also planted with water loving and long living plants. The ditches fill up with soil over time and need to be cleared out when this happens.



Tied ridges

These earth banks have small cross walls or ridges that help the water penetrate into the soil where it falls. The cross walls also ensure that the water in the ditches do not become "streams" in heavy rain. This reduces the danger that the ditches will overflow and cause erosion.

Build the cross walls about half as high as the earth banks/ ridges. Once the ridges are made, they are left intact. You may need to lift crumbled soil back onto the ridges and rebuild some of



the small water holding ties from time to time.

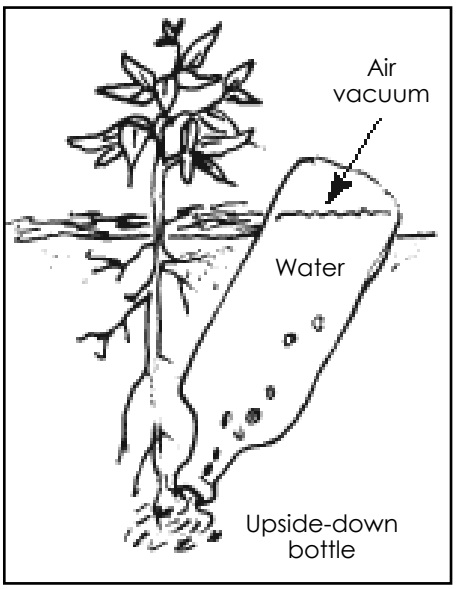
Saving the water we do have

Here we will briefly look at recycling or re-using water and at different ways to water gardens.

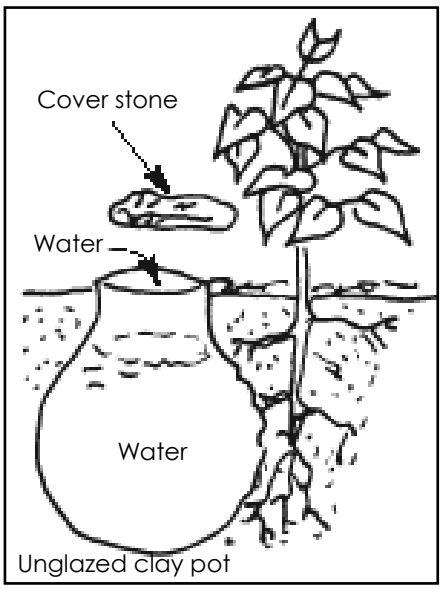
- **Greywater:** This is water that has been used in the home for washing and bathing. This water can be re-used in the garden.

- **Drip irrigation:** Applying water directly to the roots of plants saves a lot of water. Below are a few ideas of how you can do this.

Methods of irrigation to minimise water loss



From: Production without Destruction, 1995



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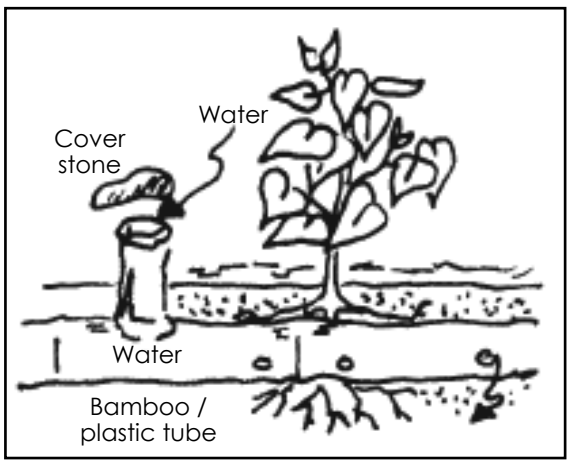
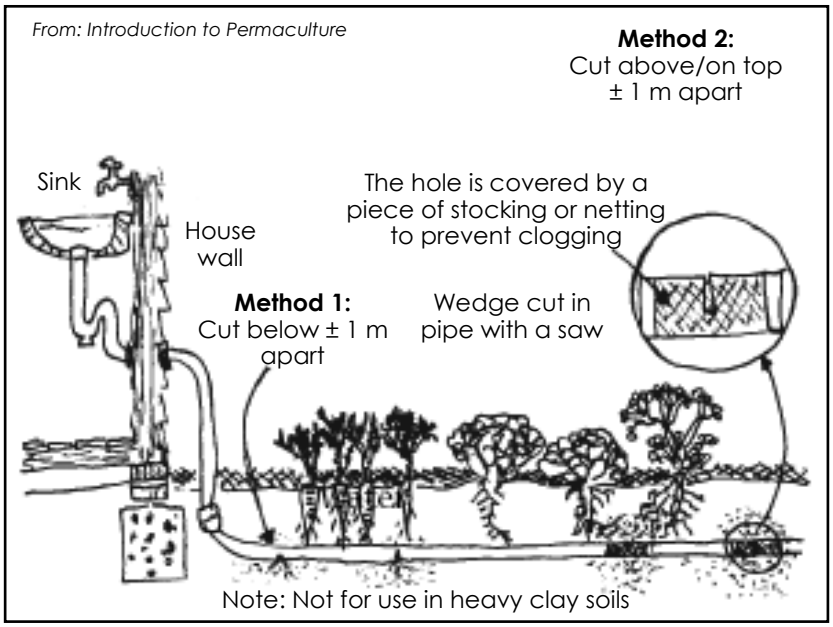


You can also use a pipe with slits/holes in it that is laid beneath the ground.

Water can be poured straight into the opening of your underground pipe or water can be led from a sink through a pipe. You can use grey water. Make sure there are no bits in the water that will clog up the slits/holes in your pipe.

If you have really sandy soils, you can lay plastic or feed bags at the bottom of your trench before building up your bed. This will help to keep the water in your bed.

A slotted pipe delivers water to plants. Crops that like more water should be planted closer to the house

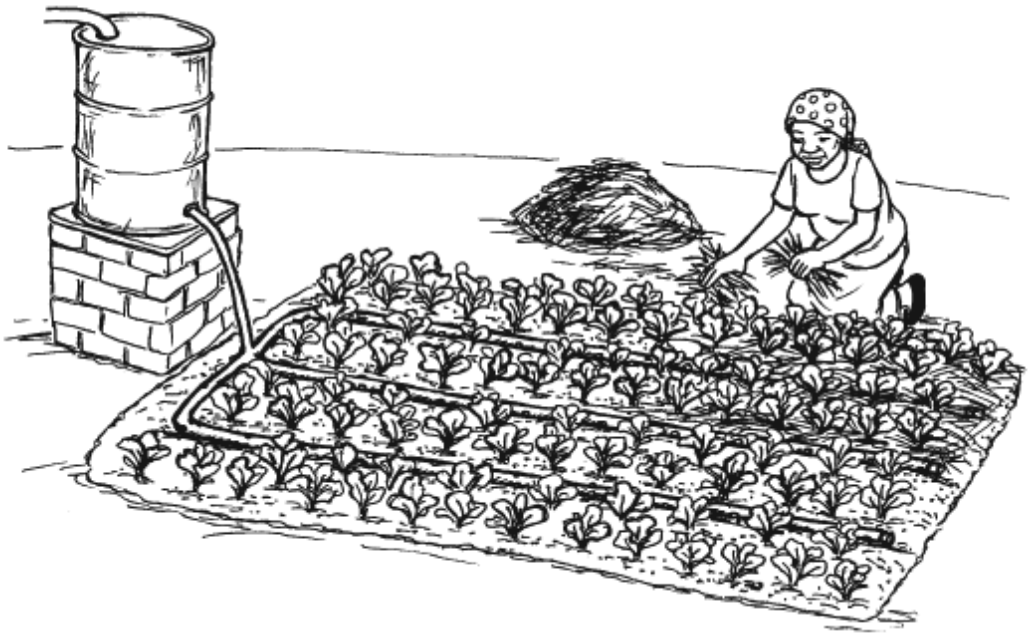


Below is another method of drip irrigation that you can use. Here we use pipes with small holes drilled or burned in the plastic. The pipes are laid on top of the ground and the whole bed (including the pipes) is covered with a good layer of mulch.

The holes in the pipes should be about 20-25 cm apart. The one end of each pipe is closed with a plug. The other ends are attached to each other and to a pipe leading into a large water storage container. The container must be at least 1 metre above the ground. The vegetable beds must be as level as possible.

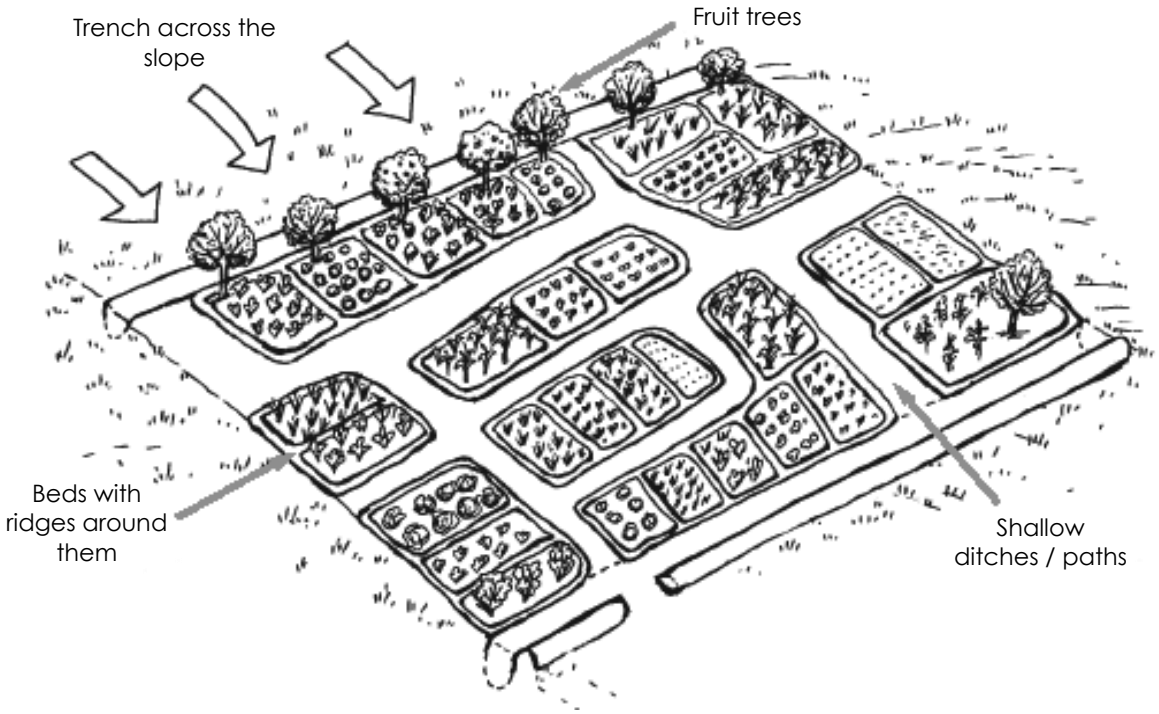
If you use this method, you will need less than half the amount of water to wet the whole bed than you would use if you were pouring or spraying the water onto the bed.

Drip irrigation pipes can be bought from **Maluti Irrigation in Maseru, Tel: 588 31394**.



Another way to use water well, which does not require pipes and tanks, is described below:

- A trench is dug across the slope to catch rain water
- Below the trench the vegetable beds are dug 1metre deep. They are filled with organic matter – grass, leaves, manure and ash – and mixed with soil. The beds are fertile and absorb and hold water.
- The beds are edged with ridges. Some are reinforced with small stones to stop the soil from being washed away.
- Between the beds, a network of shallow ditches/channels connects the trench above the beds with a second trench lower down. The water flows along these channels. The channels are also the footpaths to get to the beds.
- Fruit trees are planted on the lower side of each trench, so that their deep roots can benefit from the extra water.

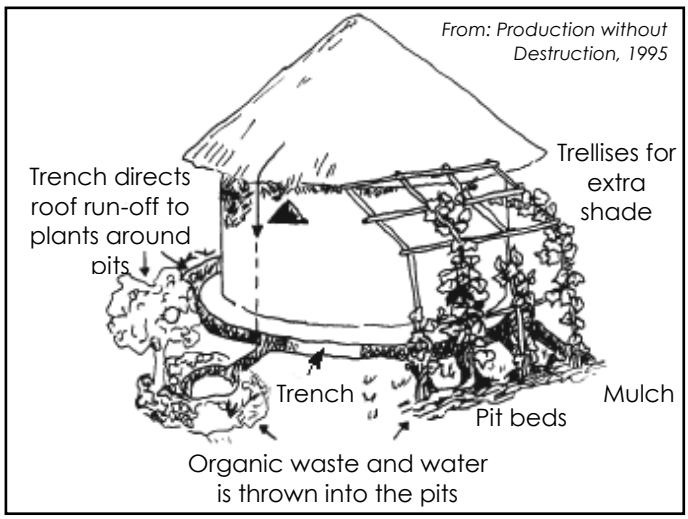


Collecting water from surfaces or catchments

❖ Roof run off

A good surface for collecting run off water is the roof of your house.

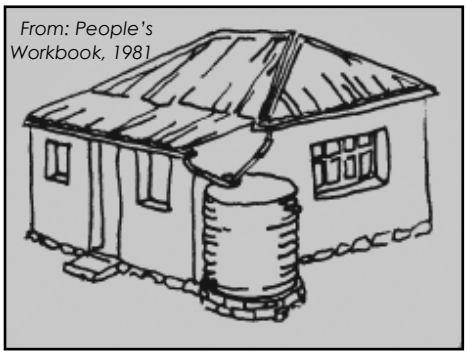
- It is possible to dig a ditch around the house where the rain pours off the roof. Water is led along this ditch to pit beds (See the *Bed Design* leaflet in this series for an explanation on how to make a pit/keyhole bed).



- It is also possible to put gutter on your roof. This can lead the water straight into a storage tank. It is much easier to do this with a metal or tile roof. Water collected from your roof is good drinking water.

You may want to catch the first bit of rainfall after a long dry period in a different container and use it in the garden. This water is likely to contain a lot of dirt.

You can build a tank that will hold enough water to be able to water a small vegetable garden throughout the dry periods.



Water is channelled by gutters to the storage tank

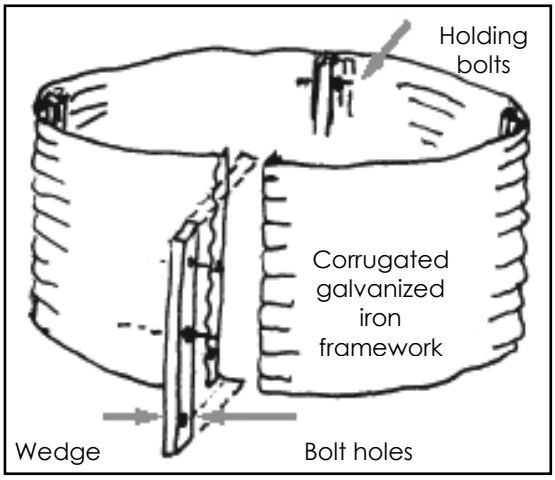
How to build a ferrocement water tank

Size of tank: 10 000 litres

You will need: Cement - 600kg
Sand - 1 000 kg
Gravel - 500 kg
2.5mm plain wire - 200 metres
Chicken mesh (50 mm mesh, 1 mm thick wire), 1 metre wide – 16 metres
Water pipe (metal) 20mm bore -1 metre
Water tap - No1
Overflow pipe, 8cm diameter metal or plastic pipe - 20cm

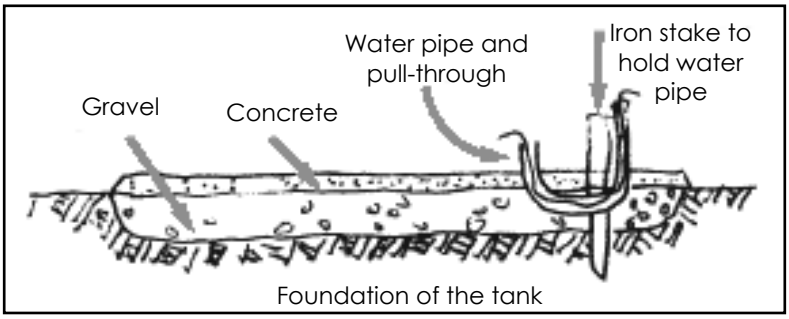
Sheets of corrugated iron and angle iron for the roof.

The formwork: You will need a solid structure onto which to build the cement tank. This is called the formwork. The easiest and most reliable formwork to use is circular, corrugated, galvanised iron sheets. You can use 16 standard roofing sheets that are at least 2 m long. Steel angle iron (40 mm x 40 mm x 5 mm) is bolted vertically on the inside face at the ends of each set of 4 sheets. They can then be bolted together to form a circle. Between the ends of each section there is a wedge that is pulled out after the tank is built to allow the formwork to be dismantled or taken apart.



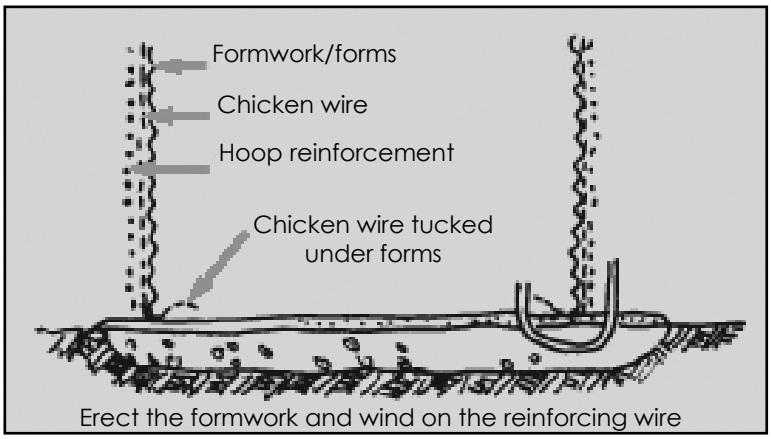
Formwork to build a ferrocement tank

The floor: Excavate a circular area that measures 2.8 metres (almost 3 spade lengths) to below the loose top soil. Lay a 10 cm layer of sand and gravel evenly in this area. Also lay in a 1 metre length of steel pipe that curves, so that it will stand out 10 cm above the floor inside the tank. Now lay a slab of cement 7.5 cm thick over the sand and gravel. Use a stiff mixture of cement. Here cement sand and gravel is mixed in quantities of 1 x cement with 2 x sand and 4 x gravel.



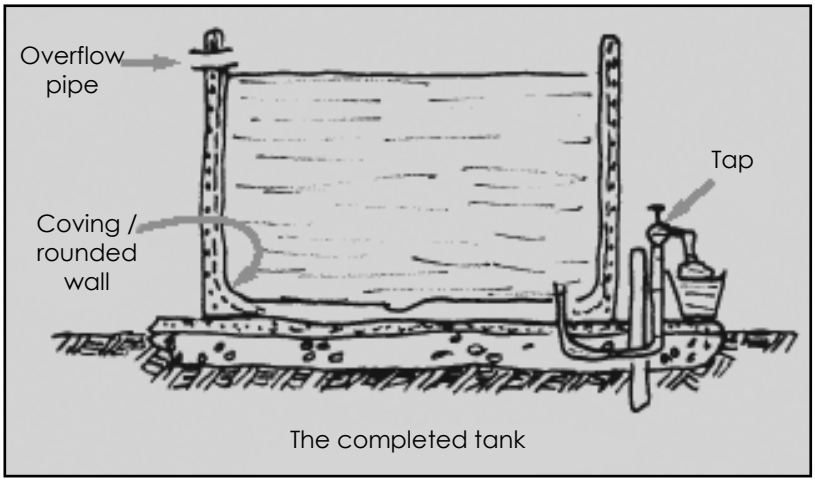
Foundation of the tank

The walls: The formwork is put together and place on top of the hardened floor. Wind the chicken mesh around the outside of the formwork and tie it into place. Tuck the mesh under the formwork to join it into the floor slab later. Wind the wire around the outside of the mesh. Do this carefully and space the wire in the corrugations of the metal.



Erect the formwork and wind on the reinforcing wire

Now make your mixture of sand and cement (3:1) and apply this to the walls in layers of 1cm thick. Make only enough cement to use in about half and hour. Work from the bottom of the tank upwards. When this has hardened, brush the surface and add a second layer of cement 1 cm thick. This layer is finished smoothly, as it is the outside of the tank.



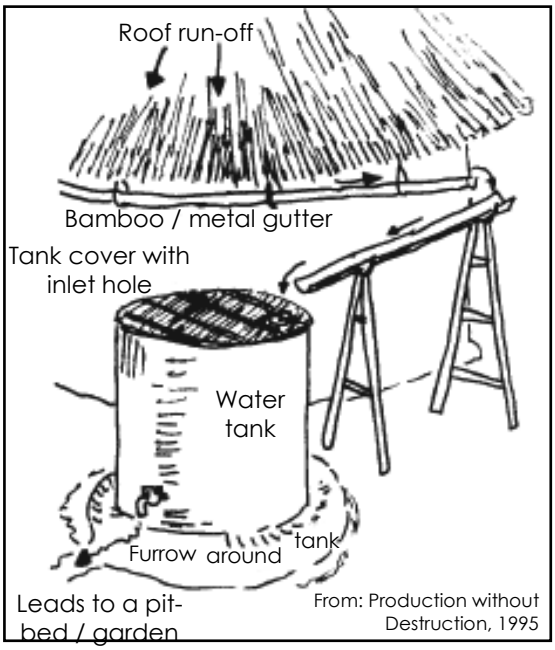
The completed tank

The next day, the formwork is taken out. The inside cement wall is built up to fill up the corrugations of the iron and any reinforcing wire that is sticking out. When the first layer of the inside wall has hardened, add a second and final layer of cement. Complete any one layer on the same day, or at least in a band around the tank, so that any joins are horizontal. This will reduce cracking. A 5 cm thick layer of cement is than laid onto the floor of the tank and the junction/join of the floor and the walls. This is called a coving. Finally, paint the inside of the tank with thick slurry of cement to seal it.

Then a small amount of water is put in the bottom of the tank and it is covered with black plastic or wet sacking for 7-10 days to cure. Break out any pipe fitting needed in the first few days. The tank needs to be filled slowly with water. Leave a shallow bit of water in the tank for about a week before filling it.


An example of a tank built from stone and cement

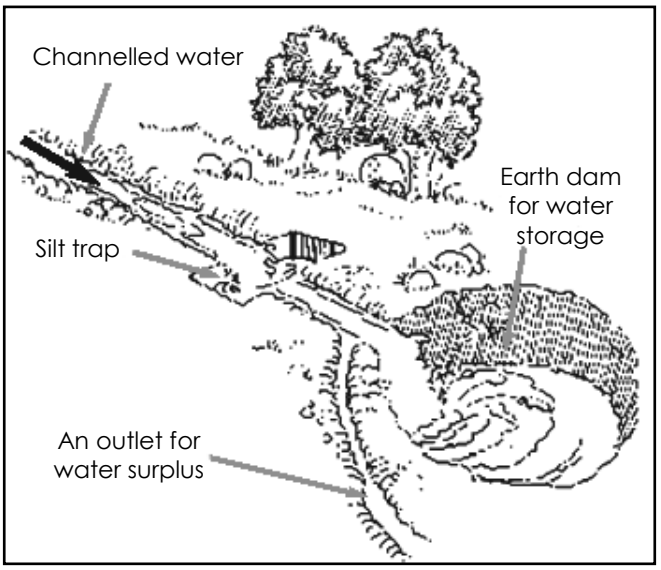
With a thatched or grass roof, hanging gutters can be made from bamboo or metal. This water is usually too dirty for drinking.



Collecting run-off from a thatched roof for use in the garden

❖ Underground storage

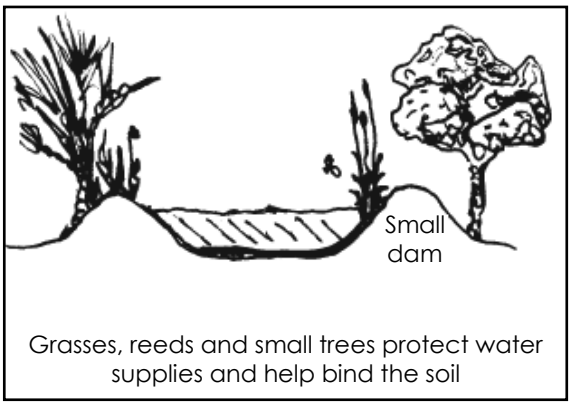
- Ponds



Ponds can be dug into the soil and filled with rainwater or from a small stream or gulley. These ponds generally do not hold water for very long. Ponds can be lined with plastic or cement to increase their water holding ability.

You can decrease the amount of water that evaporates into the air by digging a deep pond with a small surface. A shallow pond with a large surface loses a lot of water through evaporation. You can also surround your ponds by shelter belts / windbreaks. See the Wind and Frost Protection leaflet in this series.

- Underground tanks



Grasses, reeds and small trees protect water supplies and help bind the soil

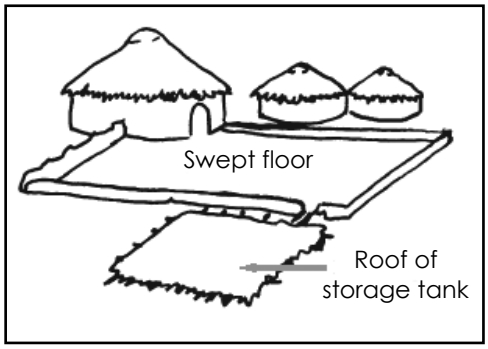
You can collect rainwater from a flat surface, such as a large rock, or the clearing in front of your house, by building a low wall along the rock or clearing and making it slope down towards an underground tank.

These tanks are large holes that are dug in the ground. They can be made large enough to hold all the water you will need in your garden. The earth walls of the tanks can be sealed in a number of different ways:

- Reinforcing mesh can be placed along the walls and floor and can then be plastered with cement. An experienced builder is needed here, otherwise your tank is likely to leak.

- The walls can be built from cement blocks that are plastered with cement. This method is easier, quite cheap and does not need materials that are difficult to find.

- The tank can be lined with a plastic lining. One type of lining is called HDPE, which is thick plastic and is made to fit in a factory before transporting to the site. Another is called geofabric, which is laid into the hole in pieces and is painted with a sealant. This method requires the least labour and is not too expensive. You must however be able to buy the geofabric and sealant.



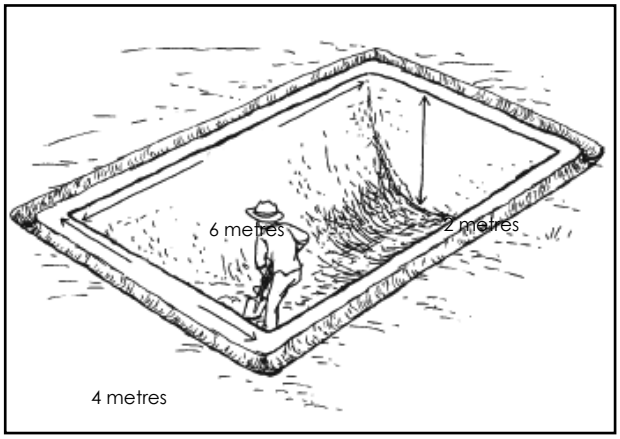
On the left is picture of Eva Masha from Limpopo province in South Africa, next to the tank she built herself.

Below left, Emily scoops water from her tank, which is lined with thick plastic (HDPE) and covered with corrugated iron sheets. This picture was taken during a drought when water was very scarce. Water from the tank is used to irrigate her garden (picture on the right).

Pictures courtesy of the Water for Food Movement, PO Box 796, Derdepoort Park, 0035, South Africa

How to build an underground tank, using a geofabric liner and sealant

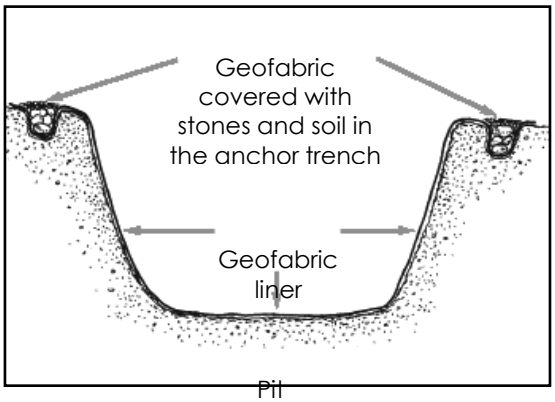
This tank holds 48 000 litres of water. It is inexpensive to build. The most labour is required for actually digging the pit.



Dig a pit 6 metres long, 4 metres

wide and 2 metres deep. There is a slight slope on the inner walls. This means that they are not dug straight down, but at a slight angle. When the pit is dug, stamp the soil inside the pit down, so that it is firm and smooth.

Dig a trench about 30 cm deep around the outside of the pit. This will anchor the geofabric liner.



Pit

Lay the geofabric inside the pit and the anchor trench. Make sure there is about 1metre of the fabric in the anchor trench. Now cover the fabric in the trench with stones and soil. This will make sure the fabric does not slip down into the tank. You will need about 90 square metres of fabric to line this size pit.

Now the fabric is painted with a bitumen type sealant. The sealant needs to stay flexible or stretchy at low temperatures. Otherwise the sealant will crack as the water gets cold. You will need about 210 litres of sealant.

Names and contact details of suppliers:

Geofabric:

Kaytech factory in Johannesburg,
South Africa.
Phone: 011 - 452 5310

Sealant:

Tosas; Spartan factory in
Johannesburg South Africa
Phone: 011 - 902 1905