



40 • The Double Pit Latrine

A double pit latrine is a sanitation system specifically constructed to produce valuable fertilizer for gardens. It consists of two pits. As one is being used the other undergoes the process of composting.

How the double pit latrine works

The double pit latrine is designed so that human waste is transformed into fertilizer over a period of 12 months. In a normal latrine it would not be possible to achieve composting in only 12 months, but this can be done with the addition of soil, ash, and leaves to the pit.

The volume of soil, ash, and leaves added to the pit should be equal to the volume of human waste, and should be distributed evenly throughout, that is to say, it should be added regularly. Fertilizer will not form if soil or ashes are added only occasionally. The transformation to fertilizer is also helped if the soil added is in itself fertile. Adding wet clay, for example, will not lead to a good fertilizer.

After each visit to the pit to defecate, a cup or tin of soil should be added. After urination it is not necessary to add anything, this may lead the pit to fill up rapidly and with too much soil.

An additional advantage of using soil and especially ashes is the fact that they help to reduce odours. After 12 months of composting, the fertilizer can be removed from the pit and used in the garden. In order for this system to work, it is important that the pit that is being used is not filled completely within 12 months. The measures described here will fit for a household of six persons.

The two pits that constitute the double pit latrine are shallow, each one being about 1.2 metres deep, with 1.5 being the maximum. It is recommended

that the user mixes the contents of the pit from time to time so as to take advantage of all the available space and distribute the ingredients evenly. This helps the process of transforming the waste to fertilizer.

When compared to a traditional sanitation system, the double pit latrine has several advantages:

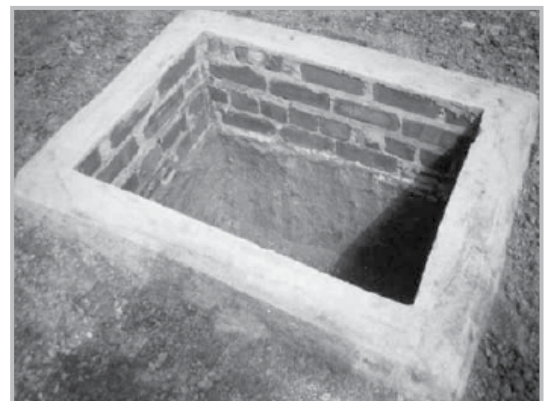
- The excavation of the pit is relatively easy
- There is a small quantity of material in each pit and it is quite porous, which permits more oxygen to enter and promotes the growth of beneficial microorganisms
- The risks of contamination by ground water are reduced because the pit is relatively shallow.

Multiplication of harmful bacteria is also harnessed because of the composting process.

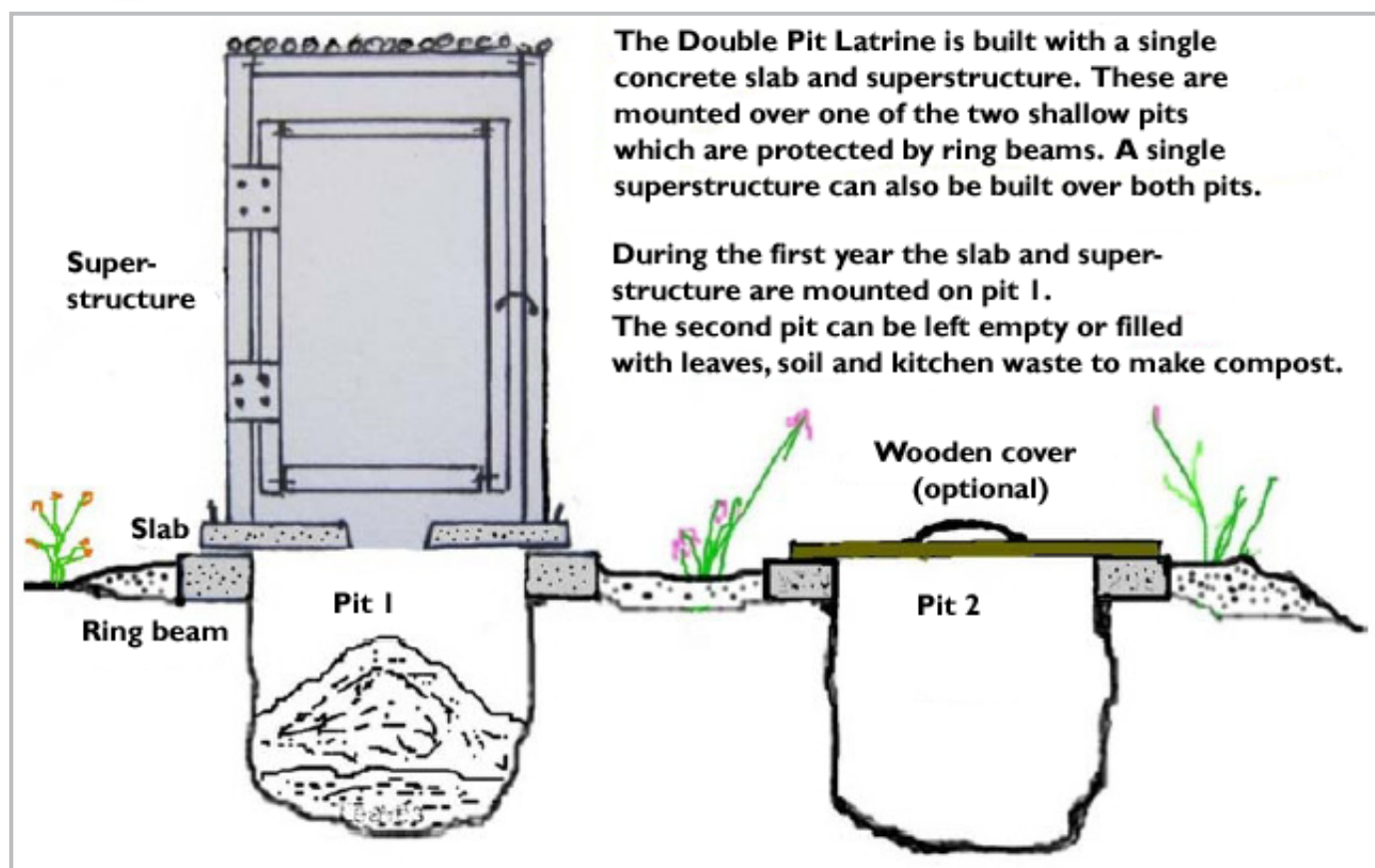
It is important to avoid the simultaneous use of both pits. For the composting process to be effective, it must be allowed to run for one year without new human waste being added. In order to reduce the likelihood of both pits being used simultaneously,



Two pits in the same house



A pit lined with bricks lasts many years



there should only be one latrine slab in the system.

The system can be equipped with a portable structure, like the Arborloo (see previous section), so that moving the superstructure from one pit to the other is easy and convenient. Alternatively, the double pit latrine can have a permanent structure covering both pits; many such systems exist in Mozambique and Malawi.

Excavating, or “digging out” conventional pit latrines after use is not commonly practised in Africa, or in any part of the world. Consequently, first time users of the double pit latrine are cautious at first about this part of the latrine management process. Some users will not immediately agree to excavating the pit. They will need to be convinced. It helps if potential users can see other double pit latrine pits excavated without difficulty, and examine the humus

for themselves. It also helps if they can see evidence that the mixing of the humus with poor local top soil does actually enhance the growth of vegetables. After a season of use, however, they will be persuaded of the benefits of the system.

If the pit has been filled up faster than expected and there is doubt about the safety of the compost, then it can be transferred to sacks for storage for an additional length of time. By excavating and placing the compost in bags, the material is turned and aerated, and this certainly helps to promote the composting process. This period of extra composting in bags may also be preferred if it is not the season for planting vegetables. (Alternatively, some gardeners may prefer to dig the humus into the bed some time in advance of planting.)



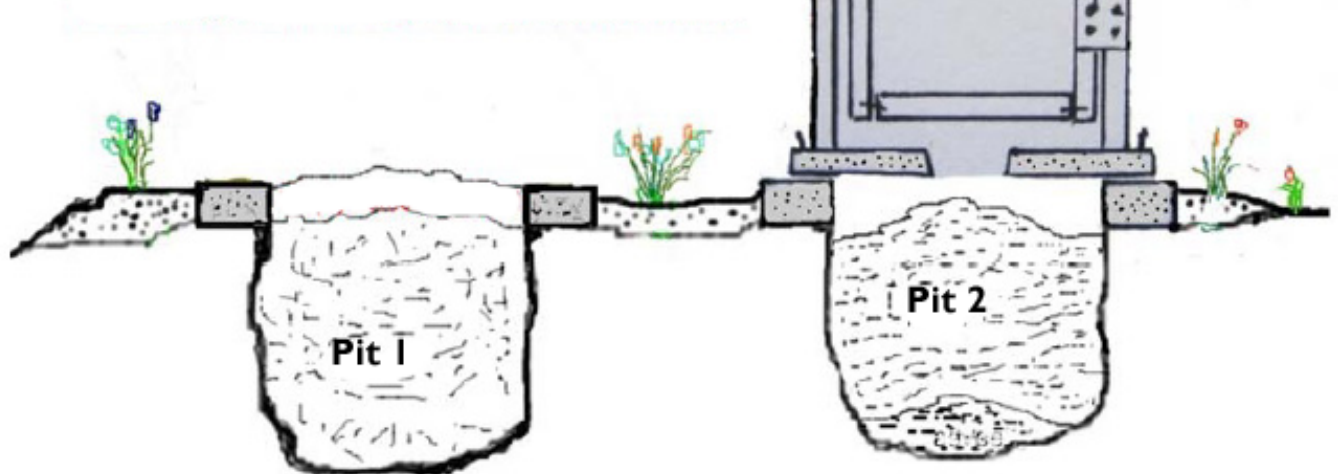
The Double Pit Latrine after the second year

Pit 2 is nearly full.

It is time to change pit again.

The contents of pit 1 will now have changed into humus.

Empty the content of pit 1, and mix with the same quantity of garden soil to grow vegetables.



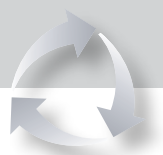
A latrine in itself is not enough to reduce a number of diseases and improve sanitation. It is naturally important to follow basic hygienic rules and for example, have hand washing facilities in connection to the latrine (see section 8 titled "Tippy Tap").

As the above demonstrates, projects supporting the implementation of the double pit latrine require an effective component of education and demonstration. It does require more attention and effort than the use of a normal deep pit latrine.

Information and photos courtesy of Peter Morgan, Aquamor Ltd., Zimbabwe.
<http://aquamor.tripod.com>



Movable structure and two pits



41 • Wastewater Reuse

How to reuse wastewater in a safe way

This section demonstrates some simple systems for recycling wastewater from kitchens and baths (grey water) so that it can be used for watering in the vegetable and flower garden and - with extra treatment - also for other purposes such as bathing or washing.

There is less and less fresh water available for people around the world. This is because populations are increasing on the one hand, while more water is getting polluted by salt or chemicals on the other. Besides collecting more rainwater, one response to this problem is to reuse as much wastewater. In many places, wastewater from baths and kitchens goes directly into the ground. This water could instead be used to water vegetables or flowers. The nutrients in wastewater will also fertilize the garden.

In developed countries, wastewater is treated to:

- avoid the spread of diseases caused by microorganisms
- reduce the amount of nutrients containing nitrogen and phosphate, which cause water pollution

Most microorganisms that spread diseases do not grow outside the body, but can survive if they are inside faeces. This is why wastewater from toilets (black wastewater) should never be used untreated for irrigation or fertilisation. Grey water does not normally contain these microorganisms and can be used safely in simple ways as described below. Many developed countries have strict rules as to what is allowed.

Wastewater has to be filtered through a sand or soil filter (this can be done decoratively as a flower bed). After this it is often only allowed to be used for underground irrigation or for flushing toilets.

Developing countries have less strict rules and it is possible to make safe systems where the grey wastewater is reused for irrigation. It can also be treated very simply so that it can be used for general purposes like bathing, washing, etc. by:

- filtering it through a simple sand filter in a drum or container
- sending it through a shallow pond containing duckweed
- sending it through a reedbed system containing plants like vetiver

The purpose of the filter is to remove food waste, hair etc. This can be done easily by filtering the water through a drum or a container filled with sand. This will remove practically all organic material from the wastewater. Some nutrients (nitrogen and phosphate) will still be there, but these are good for plants. There is no need to remove them if the water is going to be used in the garden. The sand filter will eventually fill up with waste, and the top layer should then be changed. Because the waste in the sand is all organic it can just be buried in a hole.

A duckweed pond or reedbed can be used to clean the waste water so that it can be used for bathing and washing. A duckweed pond might be appropriate for people who keep chickens or ducks since duckweed is very good feed for them. However, with a duckweed pond there is a daily requirement to remove some of the duckweed. A reedbed needs less attention. Once or twice a year the plants in the reedbed, such as vetiver grass, need to be cut. This can then be used for thatching or as mulch in the garden. If you are using vetiver grass, new plants - "tillers" - will be formed at the



base. These can be harvested and sold to be used to make contour rows to prevent erosion.

How to make a sand filter

- Take a fuel drum or plastic barrel that has a top with an opening so you can connect a tube to it. This will be the outlet opening.
- Cut out the bottom, hammering where you cut to avoid sharp edges
- Connect the outlet of the drum to a hose, either using a fitting to the hole in the drum or using tyre rubber to make the attachment leak-proof
- Turn the drum upside down and raise it on some stones so the outlet is free
- Tie a piece of mosquito net like a bag over the drum outlet
- Fill the drum with sand
- Tie a piece of mosquito net like a bag around the hose or pipe bringing wastewater to the filter
- This bag should be emptied every day of the waste collected

The sand filter can be connected to the pond or reedbed with pipes if water can run down by itself. Or you can simply move the filtered water with a bucket.

How to make a duckweed pond

The size of the pond required depends on how much water it has to treat. For every 1000 litres of water you use per day you will need a pond that is 2 square metres in area and about 50 cm deep. Mosquito larvae cannot survive if the duckweed layer is complete, but if you are in an area with high incidence of malaria, it is probably better to make a reedbed system.

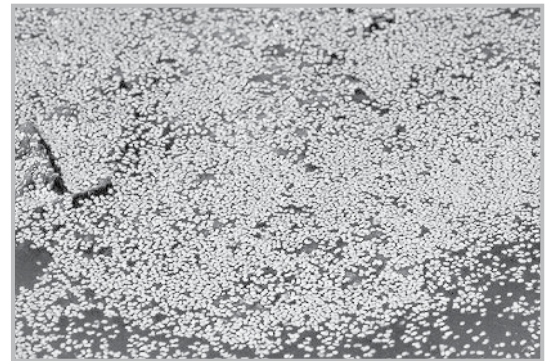
Before you start, make sure that you can find duckweed in your area. It usually grows

on any small pond containing many nutrients, for example where there are cattle or towns nearby.

- Make a hole 50 cm deep in the ground
- Make the pond narrow - not more than 2 metres wide - to ensure it is easy to harvest
- Cover the base of the reedbed with a sheet of plastic (not necessary if water does not penetrate into the soil)
- Fill the pond with (waste) water
- Make a system so that overflow water can run out of a pipe instead of flowing over the sides
- Tie a net over the inlet of this pipe, so that the duckweed cannot flow out
- Collect the treated water in a container

Use the water for gardening until the duckweed are growing well.

Later it can be used for general purposes, but should be treated before drinking by boiling or using the SODIS system (solar disinfection - see section 4). Harvest the duckweed every one or two days by removing half of it with a net. The harvested duckweed is good food for chickens - it can make up one third of their food. Duckweed can also be dried in the sun and used later or sold as feed.



Duckweed can also be used as chicken feed



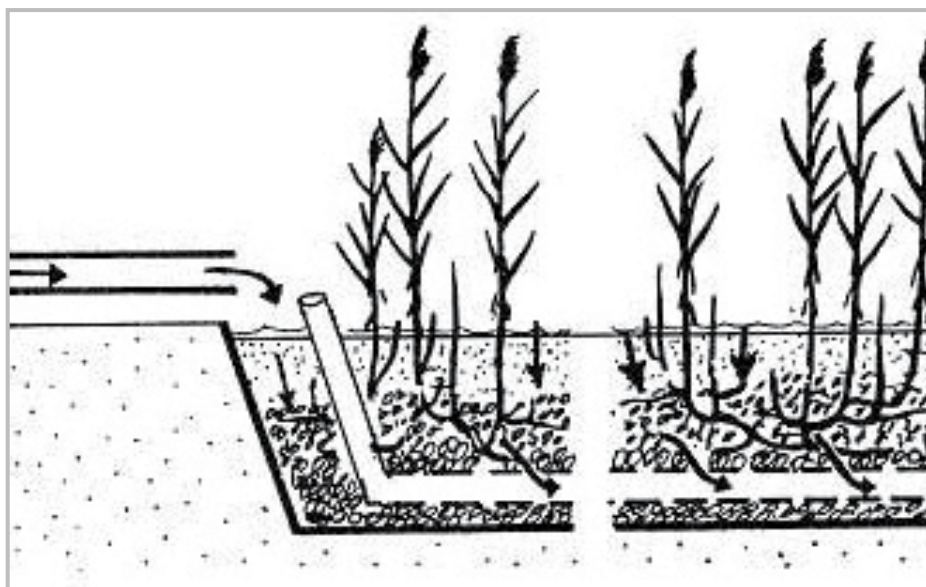
A child collects duckweed pushing the duckweeds together using a stick



How to make a simple reedbed system

- Make the bed - by removing soil to a depth of 40-50 cm. The reedbed should be created at a relatively low-lying location where the wastewater can flow easily downwards to the reedbed.
- The size of the reedbed should be about one square metre per person in the household
- Cover the base of the reedbed with a sheet of plastic (not necessary if water does not penetrate into the soil)
- Put a drainpipe (a PVC pipe with slots - cut with a saw) at the bottom where the treated water can run out
- Tie a piece of net around the inlet of the drainpipe
- Cover the drain pipe with a layer of small stones or shells. Then fill the reedbed with sand
- Plant reeds such as vetiver, bamboo, papyrus, or wetland plants such as canna lilly or iris
- Lay the pipe delivering wastewater across the reedbed. Close off the end and make many small holes in the pipe, so that the wastewater is distributed right across the reedbed.
- Collect the treated water in a container

Use the water for gardening until the plants are growing well. Later it can be used for general purposes but should be treated before drinking - by boiling or using the SODIS system (solar disinfection - see section 4).



The cultivated reed bed - or constructed wetland. The plants use the nutrients and microorganisms in the sludge decompose the organic material. The waste water is thus cleaned. In most tropical areas the evaporation is high, and it is then not necessary to have a drain for excess water