4. *Fossa alterna* - The Double Pit Compost Toilet

The double pit compost toilet, *Fossa alterna*, is made up of six parts:

- Two pits
- Two ring beams to protect the two pits
- A single concrete slab which sits on one of the ring beams
- The toilet house which provides privacy

Like the earlier system each pit fills up with a mix of excreta, soil, wood ash and leaves. Leaves are put in the base of the pit before use and every day some soil and wood ash are added to the pit. Dry leaves are also added to the pit. No garbage such as plastic, rags, and bottles is put down the pit. One pit fills up first. During the first season the second pit is unused or is filled with leaves. After the first year the first pit will have filled.

4.1 Managing the double pit compost toilet

When the first pit is full, the toilet slab and structure are moved on to the second pit and top soil is placed over the contents of the first pit which is then left to compost. The second pit is then put to use whilst the contents of the first pit are composting. For a small to medium sized family, after a year of use the second pit will be full with excreta, soil, ash and leaves and the first pit will be ready to empty of its compost. After the original pit is emptied the toilet slab and structure can be placed back again over the empty pit and the recently filled pit covered with soil and left to compost for a further year. This ritual of changing pits every 12 months can continue for many years in the same site. If the pit filling rate is faster, it is possible to remove pit compost after 6 or 9 months and transfer to a tree pit and plant a tree rather than use on the vegetable garden. The regular addition of soil, ash and leaves to the pit helps the composting process considerably. The system not only provides a valuable toilet facility but also a valuable annual supply of compost for the garden.

4.2 Examples of double pit composting toilets

There are many options for making a portable structure. With two rectangular concrete ring beams and slabs, a portable structure can be made of poles and reeds (Figure 4-1) or a steel frame (Figure 4-2). The structure itself moves with the slab at yearly intervals in this design.

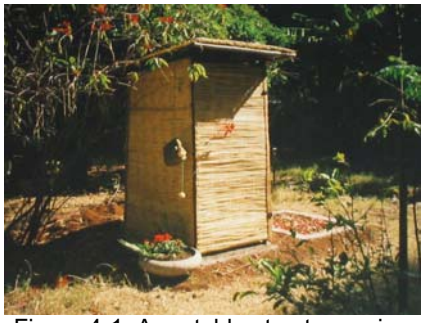

Figure 4-1: A portable structure using poles and reeds

Figure 4-2: A portable structure using a steel frame

Figure 4-3: A permanent structure housing both pits

Figure 4-4: Inside of the permanent structure

A permanent structure can also be made for housing the double pit composting toilets. In Malawi and Mozambique, the most popular method of building the *Fossa alterna* is to house both pits within a single superstructure (Figure 4-3). Domed round slabs are often used in Malawi (Figure 4-4). Soil and ash are added to the pit after each use. This helps to control flies and odours and also helps the pit contents to compost faster.

4.3 Building the double pit compost toilet

The first step is to make a rectangular concrete slab. The concrete slab is made with a mixture of cement and good quality river sand with some wire reinforcing. The mould for the concrete slab is made from bricks laid on levelled ground.

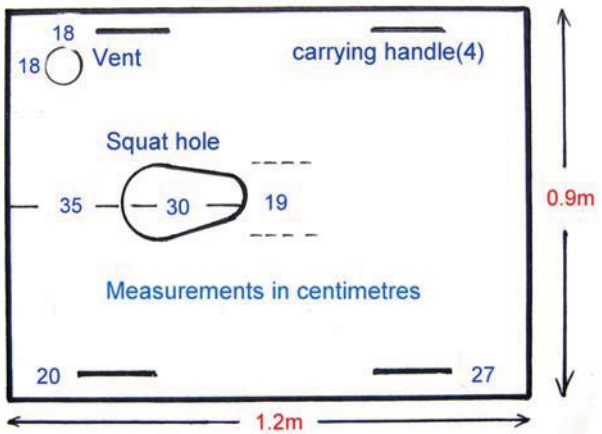

Figure 4-5: Measurements for the 1.2m X 0.9m concrete slab

The slab is 1.2m long and 0.9m wide in this case. It is made by mixing 10 litres of cement with 50 litres clean river sand. Holes for the squat hole, and vent pipe if required, are made by inserting moulds within the brick mould (Figure 4-5). Half the mix is added to the brick mould first. Eight reinforcing wires - four of 1.15m and four of 0.85m - are laid within the mould. The wire is 3 - 4mm thick. Then the second half of the mix is added and smoothed down with a wooden float and finally finished with a steel float. 4 steel handles can be added if required.

Figure 4-6 shows an example of a slab mould made of bricks and wooden shuttering. The eight pieces of 3mm reinforcing wire have been cut and laid on the plastic ground sheet. Four carrying handles have also been prepared. A 10 litre bucket with the base removed has been shaped by drawing in the two sides with wire. A 75mm length of 110mm pipe has also been cut to make the hole for the vent pipe.

Figure 4-6: A slab mould made with bricks and wood

Half the mix is added first, the reinforcing wire is laid, followed by the remaining concrete which is smoothed down. The handles are added by pushing them into the concrete mix (Figure 4-7). A little extra cement can be added around each handle to increase the strength of the concrete at this point. Finally the slab is smoothed down flat with a steel float and left to cure for 7 – 10 days.

Figure 4-7: The completed slab inside the mould

The next step is to make rectangular concrete ring beams for the double pit compost toilet. In the example described here, the external measurements of the beam are 1.3m X 1.0m and the internal measurements - the size of the hole - are 1.0 X 0.7m (Figure 4-8). This ring beam is made for a slab measuring 1.2m X 0.9m. The mould can be made with bricks. 10 litres of cement are mixed with 50 litres clean river sand. Half the mix is added first. Wire reinforcing is used within the concrete mix with two strands of 3 - 4mm wire down each length, making a total of 8 pieces. The total length of wire required is approximately 9 metres. Then the second half of the mix is added and smoothed down with a wooden float. The beam is covered and left to sure for at least 7 days.

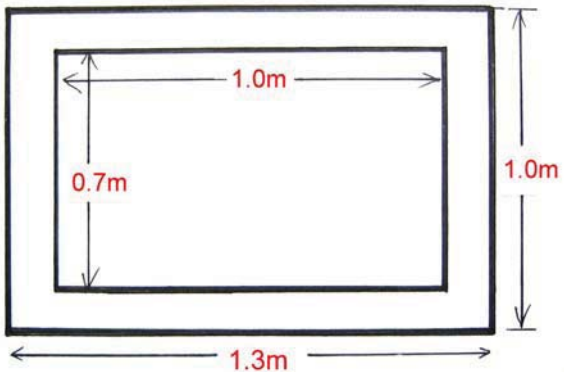

Figure 4-8: Measurements for the rectangular ring beam

When constructing the double pit composting toilet, the two ring beams can be cast on the actual toilet site directly on the ground, at least 0.5 metres apart. A level piece of ground, preferably on a slightly elevated site, is best. Alternatively the two ring beams can be cast away from the toilet site and moved on to the site after curing. In this case a plastic sheet should be laid on the ground on which the ring beams can be made. The mould for the ring beam can be made with bricks (Figure 4-9). Wooden shuttering can also be used as a mould, or a combination of bricks and wood. The ring beams are made 75mm thick, about the thickness of a brick. After a few days the bricks can be carefully removed but the watering continues. Note the handles inserted into the ring beam at the edges – these are useful if used with the *Arborloo*, but not necessary with the *Fossa alterna*, since the

ring beams will never be moved. In practice handles are rarely used on the ring beam.

Figure 4-9: Ring beam mould using bricks

Figure 4-10: Digging the pit for the *Fossa alterna*

In the case of the *Fossa alterna* the two ring beams can be cast on the site where they will be used about 0.5m apart. In the case of the *Arborloo*, the ring beam is best made offsite and then placed in position as it will be easier to move later. Once the ring beam has been positioned and made level, the soil inside is excavated to the required depth. This is about one metre for the *Arborloo* and between 1.2 and 1.5m for the *Fossa alterna* (Figure 4-10). The excavated soil is deposited around the ring beam and rammed hard. This simple procedure will protect the pit in all but the loosest soils.

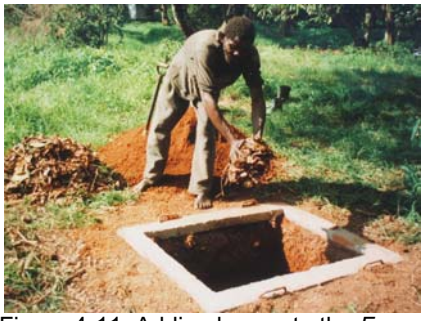

Figure 4-11: Adding leaves to the *Fossa alterna* pit

Figure 4-12: Completed *Fossa alterna* pit

Before the slab is fitted it is a very good idea to add a sack of dried leaves to the base of the pit which will be used first (Figure 4-11 and Figure 4-12).

This will help the composting process from the moment fresh excreta is added. This composting process will take longer if the excreta falls on barren soil at the base of the pit. It is also a good idea to fill the second pit with leaves which will make good leaf compost.

The next step is to add the concrete slab (Figure 4-13 and Figure 4-14). Add a layer of weak cement mortar or traditional mortar for the slab to rest on top of the ring beam. This helps the slab to rest on the ring beam without strain. Also if a vent pipe is used, the pit should be air tight, thus allowing the suction of the pipe to draw air down the squat hole or pedestal. This should lead to odourless conditions in the toilet.

Figure 4-13: Addition of the concrete slab

Figure 4-14: The completed pits for the double pit composting toilet

4.4 Superstructures with rectangular slabs

The same toilet house superstructure options used for the *Arborloo* can be applied for the *Fossa alterna*. One example is to use a wooden structure and two shallow pits with brick ring beams (Figure 4-15). Another example, from a *Fossa alterna* in a low density suburb in Harare, uses two concrete ring beams and a structure made with a steel frame overlaid by grass and a PVC vent pipe (Figure 4-16).

It is always important to always include a hand washing facility. For the hand washing facility shown to the left of the *Fossa alterna* in Figure 4-17, the waste water falls into a flower pot. In the same figure, the second pit is shown filled with leaves and compost during the first year; the second pit was also used to grow comfrey. Inside the toilet house (Figure 4-18) a homemade pedestal has been fitted. The yellow bucket contains a mix of

soil and wood ash and cup for dispensing the mixture. Leaves are also added occasionally.

Figure 4-15: *Fossa alterna* using a wooden structure

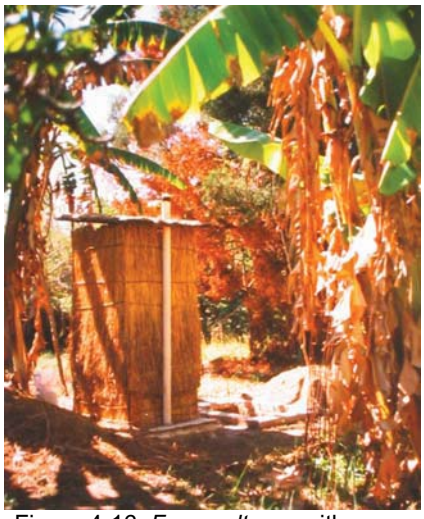

Figure 4-16: *Fossa alterna* with grass walls

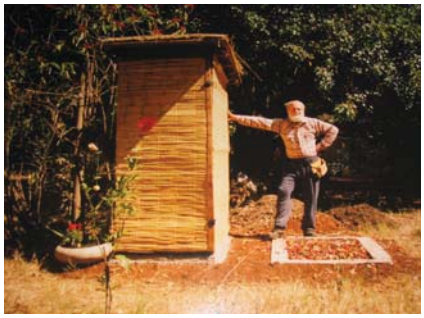

Figure 4-17: *Fossa alterna* at Woodhall Road, Harare

Figure 4-18: Inside a *Fossa alterna* that has been fitted with a pedestal

Figure 4-19 shows the fitting a portable superstructure to one of the twin *Fossa alterna* pits in Epworth, close to Harare. During the first year the second pit was filled with leaves and soil to make leaf mould. After 12 months the leaf mould was dug out and the slab and structure moved to the second pit. The pit filled with excreta, soil, ash and leaves has been topped up with soil (Figure 4-20, right-side).

Figure 4-19: Fitting a portable superstructure to a *Fossa alterna* pit

Figure 4-20: A *Fossa alterna* after the second year

Figure 4-21: *Fossa alterna* with a permanent structure

Figure 4-22: Excavating the humus from the pit

Figure 4-23: Digging out compost in Hatcliffe, Zimbabwe

Figure 4-24: Digging out compost in Epworth, Zimbabwe

The *Fossa alterna* can also be enclosed by a permanent structure. This example from Niassa Province, Mozambique (Figure 4-21) shows the twin pits enclosed in a single pole and grass superstructure which is permanently

located. A washing area is also constructed as part of the system. These are very popular units, as they are almost odour and fly free, unlike many earlier toilets built in the area. They are also relatively low cost. The pits are each 1.5m deep and protected by brick ring beams. The pits do need to be excavated to use the humus (Figure 4-22, Figure 4-23 and Figure 4-24).

Figure 4-25: Construction of a portable structure for a *Fossa alterna*

Figure 4-26: A *Fossa alterna* with a permanent brick and thatch structure

Figure 4-27: *Fossa alterna* with a metal structure

Figure 4-28: Brick double pit composting toilet

Further examples of structures for the *Fossa alterna* include a portable structure in Kusa Village, Kisumu, Kenya (Figure 4-25), a permanent brick and thatch *Fossa alterna* in Kufunda Village, Ruwa, Zimbabwe (Figure 4-26), a *Fossa alterna* with a metal structure in Maputaland, South Africa (Figure 4-27) and a brick built double pit composting toilet in Lilongwe, Malawi (Figure 4-28).