

The Arborloo Book

*How to make a simple pit toilet
and grow trees
or make humus for the garden.*



Written by Peter Morgan

Introduction

Most of the rural population of Africa do not have access to safe and reliable toilets. A good toilet, together with a safe reliable water supply and the practice of good personal hygiene can do much to improve personal and family health and wellbeing.

So there is an urgent need for the construction of simple, low cost, affordable toilets that are easy to build and maintain and are relatively free of odours and flies.

This booklet describes how to make a toilet which is both low cost and easy to make. Builders and artisans are not required, once the householder has learned the basic methods of construction.

To start all that is required is part of a bag of cement (between one eighth (5 litres) and one quarter (10 litres) of a 50 kg bag), and some good river sand and thick wire. With this the householder can build a concrete slab which will last for many years. The slab is mounted on a “ring beam” of bricks or concrete and a shallow pit is dug down inside the beam. A simple structure for privacy, made from locally available materials, is then built around the slab.

Flies and odours are controlled by regularly adding soil, wood ash and leaves into the shallow pit. By adding the soil, ash and leaves, the excreta in the pit turns into compost. It is possible to grow a tree on this compost, which will later form fruit or supply timber for fuel or building. It is also possible to dig out the compost after a suitable time and use this to fertilise the vegetable garden. So the simple toilet can have many valuable uses!

This particular toilet is called an Arborloo because a tree is planted on the filled pit. The Arborloo is then moved to a new place.

Over the years it is possible to improve on the original toilet using the same concrete slab. It is a small amount to pay for something that gives so much benefit to the family.

*The **Arborloo** is the name given to a simple pit toilet.
It is easy to construct & is cheap to build.
The **Arborloo** is made up from 4 parts:*

- 1. The **pit***
- 2. The “**ring beam**” to protect the pit*
- 3. The **concrete slab** which sits on the ring beam*
- 4. The **toilet house** which surrounds the slab.*

*The **Arborloo** 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 is put down the **Arborloo** pit*

*When soil, ash and leaves are added to excreta, it
changes quite fast into compost. The daily addition of
soil and ash also helps to control flies and smells.*

*When the **Arborloo** pit is full, the toilet is moved
to another place and a thick layer of soil and leaves is
placed over the pit contents*

*A young tree is planted in this soil and is watered and
cared for and also protected against animals
The toilet is used again in the same way in the new
Arborloo site. The same process takes place again.*

After some years trees will be growing where the toilet was before. A new orchard of fruit trees or a woodlot of gum trees will be growing, using the compost formed from the excreta. In this way our excreta is recycled!.

HOW TO BUILD THE ARBORLOO

1. How to make the 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 a ring of bricks laid on levelled ground. The bricks are laid around a circle marked on the ground, one metre in diameter (radius 50cm).



A sheet of plastic is laid in the mould



The squat hole is made by placing a shaped plastic bucket or shaped bricks in the slab mould.

*A mixture of fresh cement and very good river sand is now made up. The mixture is **5 litres of fresh cement and 30 litres clean river sand.***

If the cement is not fresh or the river sand is not clean it is best to make a stronger mix of 10 litres of cement and 30 litres of river sand.

This is mixed thoroughly in a wheel barrow before adding water.



The sand and cement must be very well mixed. After mixing the dry sand and cement add water (about 2 - 3 litres) to make a stiff mix. Mix thoroughly again. Add half the mix to the slab mould and spread out evenly



Add 4 reinforcing wires each 3 to 4mm in diameter and 90cm long in a square shape around the squat hole. Then add the rest of the concrete mixture. Spread out evenly. Also ram down hard with a wooden float. Smooth off with a steel trowel. Add two thick wire handles on either side for lifting.

After 3 hours take out the bricks (or bucket) from the squat hole and make the edges neat with a trowel



Cover the slab with a plastic sheet overnight.

*The following morning - wet down the slab and cover again.
The slab must be kept covered and wet for **10 days** before moving*

2. How to make the ring beam

The ring beam helps to keep the top of the pit from falling in. It supports the concrete slab and soil taken from the pit is rammed in place around it to make the toilet safer.

The ring beam can be made of bricks and anthill mortar or it can be made from concrete made with a mix of cement and clean river sand.

It is important to raise the toilet base above ground level.

The ring beam is made on slightly raised ground where the toilet is to be built.

2a. How to make the brick ring beam

Get some fired farm bricks and mark a circle on the ground 80cm in diameter (radius 40cm). Lay the bricks around the circle.



Now make up some ant hill mortar (Ivhu re pa churi) by breaking up ant hill soil and mixing with water.

Using a trowel add the anthill mortar between and above the bricks. Then add a second layer of bricks on the first layer. The upper layer of bricks should sit on the joint between bricks of the first course. Use the anthill mortar to hold all the bricks together.



Then dig out the pit inside the ring beam down to 1 metre or even 1.5 metres below ground level. Some of the soil which comes out of the pit is placed around the ring beam and rammed hard in place. This will help to make the ring beam strong in its place.



This ring beam and soil helps to raise the toilet above ground level and stops rain getting into the pit. The ring beam and surrounding soil helps to make the toilet stronger.

2b. How to make a concrete ring beam

If bricks are not available, but we have good river sand and fresh cement we can make a concrete ring beam to place the slab on.

*The same mixture for making the concrete slab is used to make the concrete ring beam. That is **5 litres of cement and 30 litres of river sand.***

*But the cement must be fresh and the river sand very clean. The measurements and the mixes must be exact and **10 days** curing for the cement is required. If the cement is not fresh or the river sand is not clean it is best to make a stronger mix of 10 litres of cement and 30 litres of river sand.*

*Level off some ground and lay a plastic sheet over the ground. Take some bricks and make two circles of bricks. The concrete ring beam will be made in between the two circles of bricks. Lay the bricks so the outer and inner circles will make a ring beam in between them which is **85cm** inside and **115cm** outside. Thus the width of the ring beam is **15cm** all round. Fill the spaces opened up between inner bricks with wet sand.*



Once the brick mould has been made, make up the concrete mixture of 5 litres fresh cement with 30 litres good river sand. Mix the dry parts thoroughly first then mix with about 3 litres fresh water. Mix thoroughly again. Add half of this mixture to the mould. Then take a length of 3 – 4mm wire and place above the concrete mix about half way between the inner and outer bricks. Then add the remainder of the concrete mix to the mould and level off with a wooden float.

Ram hard down with the wooden float. Steel handles can also be added if required. Finish off with a steel trowel.

Cover with plastic sheet and leave overnight. The following morning, wet the ring beam and keep wet and covered for 10 days. After 10 days the ring beam can be lifted and put into place. Dig down the pit inside the ring beam to 1m or more and place soil around the ring beam.

Stages in making and locating the concrete ring beam



Fill in spaces between inner circle of brick mould with wet sand. Make the 6:1 mix of clean river sand and fresh cement. Add half the mix, level off and then add the circle of 3 – 4mm wire



Add remainder of concrete mix, level off and ram flat with wooden float. Cover with plastic sheet and leave to cure for 10 days. Keep wet at all times. Then move to location on level ground.



Dig down hole within the ring beam to at least 1 metre below surface. Place soil around ring beam and ram in place hard. Add leaves to pit base. Lay anthill mortar or weak cement on ring beam and place slab on top. Bed in and level the slab. The structure can now be built around the slab.

Putting the slab and brick ring beam together

Once the slab has had time to cure (10 days) and become strong it can be moved into the place where the toilet will be built.



*First put a big sack full of dry leaves in the pit
The leaves will help the contents of the pit to compost.
Then lay the slab over the ring beam*

*It is best to lay the slab in some mortar placed on the ring beam.
This can be made of anthill mortar or weak cement and sands (20:1).*

Building the toilet house (superstructure)

We now build the house over the ring beam and slab with local materials like poles and grass.



This house structure is used to make the place private. There are many ways of making the house structure. It is best to make a roof to fit over the structure for shade and to keep the rain out.

HOW TO USE THE ARBORLOO

*When using the **Arborloo** we add dry soil, wood ash and leaves to the pit as well as our excreta. This mix of excreta, soil, ash and leaves helps to make good compost in the pit.*

Add soil and ash after every visit to deposit faeces, about a small cup full of soil and some ash, but not after every visit to add urine.

Sometimes add extra leaves.

Keep the toilet clean

Do not put rubbish down the pit like plastic and rags

Use the toilet until the pit is nearly full.

When the pit is nearly full it is time to move the Arborloo to a new place.

We take away the house or take it apart.

*We remove the concrete slab and ring beam. If it is a brick ring beam
We take the bricks apart and re-use them in the new site.*

*We cover the contents of the pit with leaves and
a thick layer (150mm deep) of good soil.*

*We now rebuild the brick ring beam in a new place.
If we are using the concrete ring beam it just needs to be moved*

*We dig a new pit inside the ring beam and surround the
ring beam with soil and ram hard.*

We add a sack of leaves to the bottom of the pit

We place the slab on the new ring beam and build the house as before

Then we can then start to use the new toilet.

For the old pit

We have covered the pit contents with leaves and plenty of soil

*We can leave this pit to settle and wait for the rains
before planting a new young tree*

OR

*We can plant a young tree in the soil and look after it. It will
require protection from animals and frequent watering*

Planting trees



The first trainees at Kufunda planting a mulberry tree on an Arborloo pit

Good trees for this Arborloo pit are mulberry, guava, mango, paw paw and banana. But we can plant many other trees

Plant the young tree in the soil above the compost. The young trees must be cared for. They must be protected from animals and must be watered often. In time the tree will grow big and provide many fruits.

Once the tree is established we can fertilise the tree with a mix of urine (2 litres) mixed with water (10 litres) and a mug full of wood ash every month to help it grow more.

*The Arborloo will move about in the garden and will help to make many new trees. It can be used to make a new **orchard** of fruit trees or a **wood lot** of gum trees. It can also be used to make shade or ornamental trees.*

The time to fill the Arborloo pit depends on the depth of the pit and the number of users. It will be between 6 and 12 months

Larger slabs and ring beams can be made for the Arborloo. The slabs can be 1.2 metres in diameter and fit over larger ring beams constructed over pits 1 metre in diameter. Then the pit will take longer to fill up. Larger slabs and ring beams cost more to make because they use more cement. Also if the sand is poor, or the cement is not fresh a stronger mix of sand and cement must be used (like 3:1, 4:1 or 5:1).

Making compost

If we wish to make compost in the pit for use on the vegetable garden, we can use the same small slab and ring beam. But we need to make another two ring beams and put in place so there are a total of 3 ring beams (with pits) in our garden.

The slab and toilet house will move from the pit 1 to pit 2 and then to pit 3, as the pits fill up with the mix of excreta, soil, ash and leaves. When pit 3 is full we empty pit 1 of the compost (after 12 months or more of composting). This compost is fertile and can be mixed with garden soil and used to grow vegetables. Mix one part compost with two parts topsoil. Also add leaf compost or garden compost if available. The slab and the house can then be put back on the pit 1 which has been emptied.

So we can rotate the slab and toilet between the three pits in the garden. The ring beams stay in place permanently

This way we can “harvest” the good compost from each pit every year, and use it to grow better vegetables. It is important that the pit be left for one full year to compost before being dug out. So with our toilet we can grow trees or we can make good compost for the garden.

UPGRADING

*The system which has been described is designed to be simple and low cost. The slabs and ring beams are small and are mounted over pits which have a small capacity (about 0.5 cu.m.). This is ideal for the **Arborloo** concept, and even with three small composting pits used on a rotation basis, a never ending source of compost can be made.*

The ring beam concept works well on a great range of soils, but obviously it will not work in very loose sandy soils. Ring beams of this type must be used with light weight toilet houses, like poles and grass or other light materials. It is very unwise to build a brick house around a pit lined with a ring beam only. The weight of the bricks may lead to pit collapse. Pits should be fully lined with bricks if a

*brick structure is used. This method however will be unsuitable for the **Arborloo** which is moved often from one location to the other.*

However once a strong 1 metre diameter slab and matching concrete ring beam have been made, it is possible to use these same components on larger or even brick lined pits in the future.

It is possible, for instance, to cast a larger ring beam with an internal diameter of 1 metre and an outer diameter of 1.3 metres using a mix of 6 litres of cement and 35 litres clean river sand. When the pit is dug down to one metre inside this larger ring beam the pit size is increased by about 1.5 times, compared to the 0.85m diameter pit. If the pit is dug down to 1.3 metres, the capacity of the pit is nearly doubled.

To use the smaller slab, which has already been made, the smaller ring beam can be placed on the larger ring beam and then the small slab placed on top. In the same way bricks ring beams can be stepped in (corbelled) so that the diameter of the lower courses is greater than the upper courses. This method is used a lot in Malawi.

When pits are dug with greater capacity they take longer to fill, and thus the movement of the slab and toilet house needs to take place less often. This may be seen as an advantage to many families. Pits can be dug deeper as well as wider to increase capacity. The conversion of excreta to compost will still take place if generous amounts of soil, wood ash and leaves are placed down the pit together with excreta.

ALTERNATING BETWEEN TWO PITS

*If the pits are wider in diameter (one metre) and dug deeper (1.2 – 1.5 metres), a family will take a year or more to fill the pit, even when soil, ash and leaves are added. In this case it is possible to make two permanently sited pits and alternate between them at yearly intervals. Fertile compost can be dug out and used on the garden once a year. This is a system called the **Fossa alterna**.*

*A pit 1 metre in diameter and 1.3 metres deep has a capacity of just over one cubic metre, about twice the capacity of an **Arborloo** pit 0.8m in diameter and one metre deep. This capacity is ideal for the use of the **Fossa alterna**. The effect is the same as the system described earlier with three smaller pits used in rotation.*

*With the **Fossa alterna**, it is only necessary to dig two pits, each of one cubic metre capacity, and these two can be used alternately for many years on one site. Once a year the compost is dug out of one pit and the slab and toilet house placed back on the emptied pit. In some cases the two pits can be dug and enclosed inside a single permanent toilet house. This method is popular in Malawi and Mozambique.*

Once again, plenty of dried leaves are added to the base of the pit before use. Dry soil and wood ash are added to the pit daily and leaves quite often. This mixture together with excreta composts well.

The compost dug out of the pit can be mixed with top soils to increase its fertility and humus content. When mixed with poor sandy soils in equal proportions the compost can increase vegetable growth considerably.

Using the systems described here it is possible to start off in a very low cost and simple way and over the years upgrade the system to suit the needs of each family.



A very neat Arborloo structure and citrus trees growing in Malawi

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