



# Ecosan at low cost – with the potential for upgrading

Peter Morgan

**Ecological sanitation has been around in one form or another for many years – though not under that name. The simplest forms require only a shallow pit, a ring beam and a slab, but householders can build upon these basics to create more sophisticated models, if and when they so choose to do.**

The concept of recycling human excreta is not new, but in recent times there has been a revival of interest. Ecological sanitation, the new word for the old concept of recycling human excreta, is now being tried and tested in many parts of the world. Toilets which separate the urine and faeces at source, called urine diversion, are used extensively to spearhead the new move. The separated urine is valuable as a plant fertilizer and the solids (without urine) are much easier to handle. Urine-diverting toilets use almost no water and pollute the environment less than waterborne systems that do not work.

However the concept of ecosan is not confined to urine diversion alone. Systems which provide improved sanitation, and also enable the excreta to be recycled safely for the benefit of their users, are also encompassed under the same definition. Thus simpler systems that use shallow pits, where the composting of excreta is accelerated, have a wide application in areas where people currently use pit toilets or

no toilets at all. This group is huge and much of it concentrated in Africa.

## Basic principles

If soil and ash are added to human excreta, the rate of composting is increased significantly. A better product results if compostable materials like leaves are also added. This concept is also not new. The earth closet preceded the water closet in Britain. For many obvious reasons the water closet took hold and waterborne systems were developed, and this technology has made modern life possible all over the world. Similarly with the pit toilet, the concept of recycling human excreta by planting trees in abandoned pits has been known for generations. Even the Pilgrim Fathers used the concept and it is well known in many countries in Africa. Trees grow well on composted human excreta. Adding soil and ash to pit toilets not only promotes composting, but also cuts down on the potential nuisance of flies and odours.

## Revival of old ideas

In recent times, these well-established simpler concepts have been re-examined and put to use. In a toilet called the 'Arborloo' (the toilet that becomes a tree), a shallow pit is dug and protected, filled with a mix of excreta, soil and ash until it is nearly full. The toilet is then moved on to another site, the pit being topped up with soil and a tree planted. The young tree can be planted immediately in the topsoil or later during the rains. The trees (and also vegetables, like pumpkin and tomato) benefit greatly

from the nutrients in the pit. Trees of many types can grow on these organic pits, including those that provide fruit, timber, fuel and medicine.

In a related concept, two pits are used alternately, the composting rate also being accelerated by the regular addition of soil and ash. Under these conditions, shallow pits can be excavated in 12 months. By matching the filling rate to the composting rate, the portable toilet structure can be moved between the two pits on a yearly basis, with the compost being dug out and used on gardens. The two pits can be housed within a single permanent structure. This concept is known as the 'Fossa alterna' (alternating pit).

## Current programmes

In Ethiopia some 10,000 Arborloos are now in use and a further 14 000 planned. In Malawi about 14 000 shallow pit compost systems are in use. About half are Arborloos and half Fossa alternas. Their popularity seems to be that they are cheap and simple to build and their usefulness goes beyond the time when they are used as a toilet. In Malawi a simple version of the Arborloo has been designed for children. Children learn how to use a toilet slab and also are involved with planting trees. Both these activities benefit the child and the environment. Similar programmes are underway in Kenya and Mozambique and also in Zimbabwe.

## Upgrading potential

The simplest toilet system in the range is the Arborloo. It demonstrates very



A banana tree is growing at the site of an old pit.



The concrete ring beam is being molded between two brick circles, and reinforced with wire.

clearly how the nutrients in human excreta can be recycled. The concept is safe because the excreta are never touched by human hand. It also builds on local tradition, which makes it more acceptable as a concept. It is ideally used in the rural areas of Africa, as an entry point for ecological sanitation programmes. Once the evidence has been seen that human excreta can be of benefit, then upgrades can follow. In Malawi many Arborloos have been upgraded to the Fossa alterna concept where the toilet compost is dug out and mixed in with garden topsoil or stored in bags for future use. Where the soil is moderately firm, 'ring beams' of bricks or concrete can be used to protect the shallow pit which is dug down to a maximum of 1.5m depth. The ring beam is a useful concept, and for permanence it is best made once out of concrete. It helps protect the pit beneath from erosion and lifts the toilet slab above ground level, thus helping to avoid erosion during the rains.

Concrete ring beams and concrete slabs are cheap to make, each using one quarter of a 50kg bag of Portland cement. These two components can also be used on several types of simple toilet system, some ecological and some not. For instance, if a single ring beam and slab are used, an Arborloo can be built. If two ring beams and a single slab are used a Fossa alterna can be built. Further upgrading can take place by using the two ring beams, one on top of each other and separated by three or four courses of brickwork to form an above-ground vault. A urine-diverting

pedestal or squat plate can be fitted to the slab mounted on the upper ring beam. With a suitable superstructure and pipes which drain the urine into a plastic container, the unit becomes urine diversion. In another upgrade, the shallow pit can be deepened and lined with bricks. Using a corbelling (stepping in) technique with the brickwork, the same small economical concrete slab and ring beam can be used over a pit with considerable volume. Brick superstructures can also be built on pits lined with bricks. Using the same slab and ring beam a VIP toilet can be built – there are many possible variations. To reduce costs, vent pipes can be made by adding cement slurry to PVC pipes which act as moulds. Even plastic bottles can be used as the form for making vent pipes. Arborloos, Fossa alternas and even urine-diversion toilets as well as the VIP benefit by addition of the vent pipe. It takes away the odour, and can control flies in the VIP toilet, and for urine-diverting toilets it takes away the water vapour in the vault, thus hastening the drying process of the faeces.

These various methods can be performed at low cost for use in the rural areas where the poorest of people desperately need improved sanitation. Even urine-diverting pedestals and squat plates can be home made and are effective.

### Summing up

These methods may be able to solve many problems, particularly those related to achieving the Millennium goals for the poor who most deserve a



Once the ring beam has been made, the pit can be excavated beneath it.

safe user-friendly toilet and perhaps could best utilize the fertilizing effects of the compost and urine. Urine can enhance the growth of green vegetables by several times and the yield of maize can be doubled by the use of urine without fertilizer. The toilet compost can add humus and nutrients to existing gardens and vegetable beds. Tomatoes grow vigorously from toilet compost when watered. Simple toilets like the Arborloo can be built entirely in the homestead, and several programmes have shown that women can do all the construction and thus take over the man's role. That includes digging the shallow pit as well as making the concrete work.

The methods described in this article are intended for the poorer members of the world community. But these people have the greatest need and abound in the greatest numbers. By starting simple with the possibility of upgrading, ecosan can be useful, as the discipline is linked not only to excreta disposal but also to excreta recycling which touches on the huge disciplines of agriculture and forestry. Each single pit provides a sort of organic oasis in a land which may otherwise be barren. If a tree were planted for every shallow pit composting toilet used, the world would be a better place.

### About the Author

Peter Morgan is a semi-retired researcher who once worked for the Ministry of Health in Zimbabwe

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