

Human Waste Recycling Systems

Introduction

What is it?

These are systems for [composting](#) all human faecal matter, urine and paper, which would normally be flushed down a toilet in an urban home.

Why is it important?

Human waste is a resource which can be used to improve soil fertility. Conventional treatment uses considerable resources to process sewage, which is seen as a problem rather than a solution. In areas of low rainfall, such as southern Spain, using water to flush away sewage, is a waste of a precious resource

At Semilla Besada, all the sewage, sometimes called humanure, is composted and re-used to improve soil fertility and water retention. The only toilet that uses water is that in the guest accommodation. Our experience of two methods of recycling human waste is as follows.

Sun-Mar EXCEL NE Composting Toilet

In 2001, we installed a non-electric composting toilet in the farmhouse. We chose this model based on the catalogue description which described the Excel as the standard toilet for those living off the grid which has a composting capacity for residential and continuous use for 2 to 3 people. It seemed the perfect solution as it composted the waste in situ, avoiding the need for further processing. The unit was shipped with a starter pack of materials to begin the process.

The manufacturer's description of the process was as follows: there are three main chambers in the unit, the compost drum, the finishing drawer and the evaporation chamber. The waste is deposited into the composting drum, where it partially composts, when the waste in the drum reaches 1/2 to 2/3 full, some should be released to the finishing drawer, where it will sit for 3-4 weeks to finish composting. Excess moisture will exit through the drum screen at the back bottom of the drum into the evaporation chamber (the entire floor of the unit, under the drawer) where it collects to evaporate. In residential use, the overflow safety drain should be connected to provide excess liquid someplace to go in the event of heavy use (more liquid than can be evaporated).

When using the unit, one cup of bulking mixture should be added after every bowel movement. Every other day, the drum should be turned 4-6 complete revolutions of the drum (36-40 revolutions of the handle). The bulking material should have 30% peat moss (this helps absorb ammonia and adds the needed carbon to the compost) and 70% pine wood shavings, not cedar, to add air space to the compost).



Our Experience of the Sun-Mar Excel

We decided that when we had exhausted the SUN-MAR starter pack of materials (peat moss bulking material, Microbe Mix and so on) we would use whatever we were able to generate at Semilla Besada ... wood ash, sawdust, pine wood shavings, leaf litter or straw. It seemed a *non sequitor* to have materials air freighted to support an eco-toilet.

By the end of the summer, we were plagued by fruit or vinegar flies, which covered every surface of the bathroom. After a night of rain, we also found out that we needed to put a chimney onto the air pipe because the evaporation chamber filled with water and we had liquinure pouring out onto the bathroom floor. We had installed a small fan which ran off our solar, but other than ensuring any smell was eliminated, did not seem to have any beneficial

effect. We also found that the waste did not compost at all in the composting drum, and we needed to drop it into the finishing drawer as raw waste. The result of this process was very messy because we were not dealing with well composted material, and we had to empty the finishing drawer regularly into another contained area outside to continue composting. After 18 months, we abandoned the use of the SUN-MAR Excel NE, having on two occasions completely cleared out the unit and started again.

Our Assessment of the Experience of the Sun-Mar

We feel that the unit:

- was too small for use by three on a residential basis, We wondered whether the use capacity had been worked out on the basis of a omnivore diet, whereas we were largely vegetarian and probably produced more material.
- only worked efficiently if SUN-MAR's products were used (coarse peat moss mix, Microbe Mix, Compost Quick) and it would require a great deal more experimentation to find an alternative system that would ensure that the material composted correctly.

Considerations of Alternatives

At Semilla Besada, we needed to consider the following when making our design choice:

- Semilla Besada is located in a brittle landscape which has implications for the capacity of stored waste to decompose satisfactorily. See the Brittleness Scale for more information
- the location of the farm is in a Natural Park, which involves complying with a variety of regulations.
- the farm is situated at 1300m on steeply terraced mountainside
- the soil is very stony and free-draining
- everyone on the mountainside relies on spring water for drinking
- there are numerous residential properties below us

In addition, we wanted a simple system that required the minimum of management.

We considered the following designs:

- the Long-Drop: a single chamber toilet, with a 15m deep shaft dug into the ground. The composted material is left and not re-used
- the Twin-Chamber: a double chamber toilet, with a 0.5 sq.m. chamber size

We rejected both designs for the following reasons

The Long-Drop:

- we wanted to use the compost to add fertility to our soil
- we did not have the soil depth or composition to create the necessary depth of shaft
- we had concerns about the potential impact on spring water for our neighbours

The Twin-Chamber:

- based on our experience of [composting](#), we did not believe that the anaerobic approach to waste recycling would work in this environment

We looked at a variety of aerobic composting toilets, but we wanted a system that was economical and easy to manage.

Bucket n' Chuck-it



We eventually decided on the use of a bucket, the contents of which would be composted in a heap elsewhere. We built a simple box, which was tiled, within which sat a galvanized bucket. A standard toilet seat and lid was fitted to the top of the box. We used leaf litter, shredded prunings and ash to soak up urine. When the bucket was full, it was simply emptied into the designated composting area.

Our Experience of the Bucket N' Chuck It

We have found the whole system has worked perfectly for our purposes. We have had no odour or fruit flies. The system has provided a use for excess dead plant material. The contents are easily emptied and the bucket easily cleaned. The compost management is minimal. A galvanized bucket lasts about two years before the acidity of the contents erodes the metal. We then use the buckets for patio plants.

Composting Tyre Stacks

When we first began to recycle our humanure, we created a three metre high stack of used car tyres. This was held erect by a section of wire fencing encircling the column of tyres. A wooden lid was placed on the top. The buckets of humanure were emptied into the column of tyres. When the stack was full, a sheet of black plastic was tied over the opening, and another stack started.



We filled eight stacks in the space of a year, with a resident occupancy of three people plus 50 guests. At the end of the year, the first stack was dismantled to reveal a reduction in bulk to a third of the original content, all of which was perfect compost. There was, however, the surprise find of a family of rats in each stack! Unwittingly we had provided the perfect environment in which rats could rear their young, with the attendant consequences on our maize crop. As a result, we discontinued using the tyre stacks and moved to creating [compost cages](#).

Compost Cages

We erected three compost cages, each metre and a half high with a circumference of a metre.



Into this, we put the humanure, covering it with additional dead plant material. We filled a single compost cage in a year, with a similar occupancy as previously. At the end of the year, we turned the contents into the second compost cage. At the end of the second year, we turned the contents into a third cage. At the end of the third year, we used the compost to improve as an activator for other compost cages, or as a fertile mulch around trees and shrubs.

We found that the humanure did not break down as rapidly in the compost cages as it had done in the tyre stacks, although at the end of the process we had approximately the same amount of useable compost.

Our Assessment of our Experience of the Composting Process

We have found that both processes have worked very well. Something that has surprised us is how much humanure can be processed in this way and how little compost is generated as a final product. We could use significantly more compost than we are currently capable of generating.