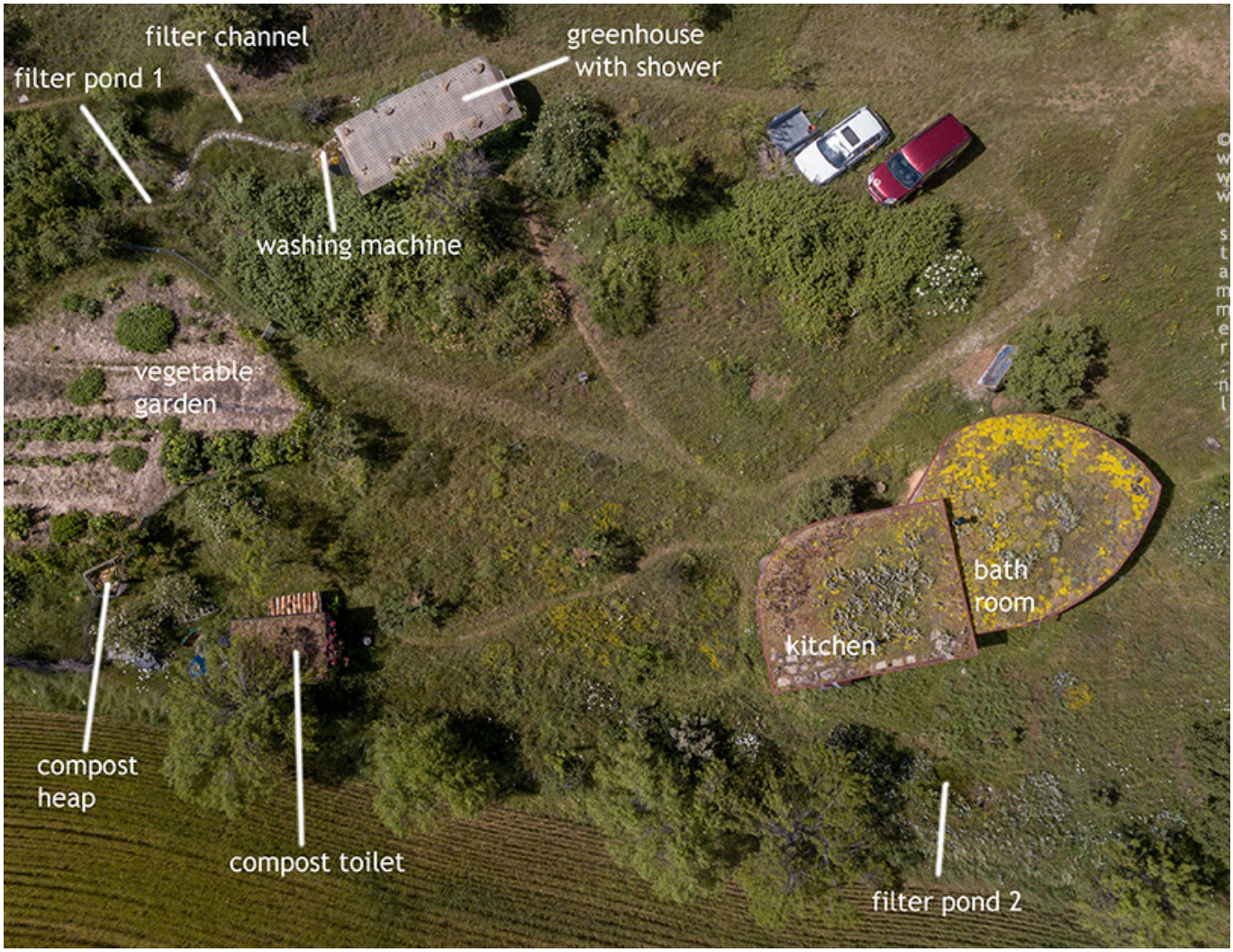
grey and dark matter

written by Andreas | 25 September, 2019

the treatment of grey water and human excrement



An aerial overview of the present situation with the different elements of the filter and compost systems.

March 2010. The greenhouse on the left and the first ´module´of the strawbale house on the right. The down sloping filter canal is made with black EPDM sheet and filled up with gravel and irregular (´conglomerate´) stones, while the filter pond is lined with smoother river boulders and gravel to avoid

damaging the sheet.

As I live almost off the grid, half a kilometer from the village (but am connected to the public water supply system) I had to find ways to treat the waste (´grey´) water from the sink, shower and washing machine and the `dark` material from the toilet. After studying the internet, I decided to start with relative simple systems and make them more sophisticated if needed. After almost 10 years I can say that more sophistication is not needed and that the systems work quite satisfactorily. By that I mean that there are almost no smells and for example the vegetation in the filtering ponds is doing fine. Part of the success is probable due to the use of biodegradable detergent, soap and straw. I will give a brief description of the two filter ponds and then discuss the equally successful compost toilet which treats the ´dark´ waste.

March 2010. Excess water flows into the vegetable garden via two roof tiles. The pond was later filled up with gravel and sand and planted with marsh plants.

The first filter pond was installed in February 2010 to clean the grey water from the shower and the washing machine, located in and next to the greenhouse. As the vegetable garden is near I used the opportunity to lead the grey water through a 6 meter long canal down to the filter pond and then let it overflow into the garden. The canal consists of a sloping trench filled with rough rocks and sand of all sizes which was left over from the foundation of the house. These angular (conglomerate) stones offer nice growing possibilities for moss, algae and other ‘dirt eating’ organisms. Also the irregular flow through the canal will help with the oxygenation necessary for decomposition. The canal and the pond are lined with the typical waterproof EPDM sheet. This sheet must stick out at least some 5 centimeters above ground level to avoid the invasion of plants into the canal. The canal was covered with bigger river stones, mainly for esthetic reasons.

The canal is covered with nice river boulders. Gravity leads the water through the filter canal, the pond and finally into the vegetable garden.

The canal comes out into a small pond lined with smooth river stones to protect the underlying EPDM. This pond is about 4 meters long and 40 cm wide and can hold about 500 liters. The water overflows via two roof tiles into the vegetable garden. First I didn´t introduce almost any soil or sand but this would give the opportunity for mosquitoes to thrive, especially if the water is not too clean and there is no stable and mature ecosystem with sufficient predators. So I later decided to fill up the pond with sand, gravel and a bit of soil. I planted *Valeriana officinalis, Lysimachia nummularia, Iris pseudacorus, Lythrum salicaria, and Sparganium erectum*

July 2018. The filter pond with the canal on the right. *Lythrum salicaria* is flowering abundantly.

September 2019. Regrowth of *Lythrum salicaria* after a dry period in my absence.

With the exception of *Sparganium*, the plants have survived well, even in periods of almost totally dry conditions in my absence during some summer weeks. Upper parts may die then, but the plants revive after receiving water

again. Sometimes when there is too much water inflow, especially when the washing machine is operating, there is some undesirable overflow of soapy water into the vegetable garden. The quantities are small and get spread over a considerable surface because of the sloping ground and I don´t consider it a big issue. With more people and more frequent washing, the system should nevertheless be amplified with a considerable bigger and deeper pond.

March 2015. This filter pond is about 6 meters from the house and receives the grey water from the water basin in the bathroom and the kitchen sink. The size of about 3 by 1 meter and the depth of maximum 60 cm should be sufficient to receive and treat this water from one person.

In 2015, after finishing the additional wing to the original garden house, I installed another similar filter pond for the sinks and shower of the house. It covers about 3 square meters and is 60 cm deep at its deepest point. It was also filled up with alternating layers of sand, gravel and small stones. The design is in such a way that the possible water level is always below the substratum in order to avoid a breeding place for mosquitos. I planted some *Lysimachia nummularia, Iris pseudacorus, Lythrum salicaria,* and *Mentha pulegium.* After one or two years there was a welcome spontaneous invasion of *Juncus effusus.* The grey water flows downwards into the pond via two PE pipes from the kitchen sink and from the bathroom shower and sink. As I prefer to use the shower (with heater) in the greenhouse the inflow from the bathroom shower is practically non-existent. The inflow of fat, oil and bigger organic particles is avoided as much as possible and also the (frugal) use of biodegradable soap helps not to overload the filtering capacity.

July 2015. Also the rain water from the roof is captured and put to several good uses.

August 2019. The part nearest to the inlet of grey water, to the right of the centre, shows the highest and most abundant vegetation

August 2016. *Mentha pulegium* and *Lythrum salicaria* flowering abundantly in mid-summer.

Again, after almost 5 years, there are practically no smells. Only if you put your nose some centimeters above the surface are you able to discern something. The only maintenance practiced is a yearly mowing of the vegetation, where I try to avoid cutting e.g. *Iris pseudacorus* too excessively to favour its regrowth the following year. The pond rarely overflows and then most often with very heavy rains.

The compost toilet building was built in 2009 as a temporal solution but it showed to be quite stable and was so practical and cosy inside that I decided to maintain it, for at least 5 or 10 years more probably. A vegetation roof was installed and the front features a firewood store.

Apart from the grey waste water you have to deal with the ´black´ (and ´yellow´) waste material of the toilet. Again, I opted for the simplest method and again with satisfying results. The system in various degrees of sophistication is known as the compost toilet or dry toilet. No clean drinkable water is used for flushing the toilet. Instead, in the system I chose, straw is used to cover the excrement, which after some period are taken to the compost heap where it further composts into a fertilizer for the vegetable garden. Many systems use big subterranean tanks for collecting the excrement, but then you need ventilation and problems with smells, flies and

others may arise. I simply use small buckets which are emptied and cleaned on a (two-)weekly basis which avoids most of these problems. Again, smells are minimal, thanks to the strong absorbent qualities of the straw. For practical and better results I crush the straw with an improvised ‘weed-wacker` which is actually an electric drill and cement mixer with some strings of weed-wacker string attached.

Inside the straw bale toilet building. On the left is the closet and the bucket on the right contains the crushed straw.

There are usually questions arising around the use of human excrement for fertilizing vegetable gardens, concerning risks of germs and medicine. There are nevertheless almost no reports about illnesses arising from the use of this kind of fertilizer, but letting the compost heap rest for 2 years (instead of the usual one) should probably avoid all the risks. In China there is a millennium old tradition of using human excrement for fertilizing without any mayor incidents.

February 2016. The miraculous compost heap. Installed in 2009, its level has stayed like this for the last 5 or 6 years, even swallowing toilet paper and orange peels. It´s total size is around 1 cubic meter.

Curiously my own compost heap is
doing very, almost excessively, well as it simply doesn´t grow. For almost ten
years it ´eats´ all the organic waste material from kitchen and garden and it remains half full as if by magic. It certainly indicates that the composting process
is doing fine, even with all the controversial material I throw onto it, like

white toilet paper and orange peelings. It would be interesting to do an analysis of the stuff by a professional laboratory, after I let it rest for two
years.

Some words about legal matters. As I am trying to get a legal ´habitability´ status for my house, I had to sign a special document to assume the risks concerning the use of a dry compost toilet. But it should be inside the house and I therefore made some kind of pre-installation in the big cupboard of the bathroom, but prefer to use the toilet outside, partly because of the straw dust and particles.

Concluding I can say that the
systems described work well in all their simplicity. The saving of clean drinkable tap water is tremendous and the avoidance of accumulating organic waste by recycling is considerable.

March 2017. On the terrain there are two other ponds but not so much for filtering as for attracting wildlife: insects, birds, wild boar, badgers and foxes. Also quite successful, but with their own specific problems and dynamics which will be treated in another article.