

## **Terra Preta Sanitation: providing new options in ecosan systems**

by Ralf Otterpohl (and inputs by Horacio Factura and Christopher Buzie) ,1 December 2009

An analysis of a former civilisation in the Amazon, nowadays Brazil, reveals concepts which enable a highly efficient handling of organic wastes. Terra Preta do Indio is the anthropogenic black soil that was produced by ancient cultures through the conversion of biowaste and faecal matter into long-term fertile soils. These soils have maintained high amounts of organic carbon even several thousand years after they were abandoned (Lehmann et al., 2003b). It was recently discovered that around 10% of the originally infertile soils in the Amazon region was converted this way from around 7,000 until 500 years ago (Glaser, 2007). A hectare of meter-deep terra preta can contain 250 tonnes of carbon as opposed to 100 tones in unimproved soil (Lehmann et al., 2006). One of the surprising facts is that this soil is highly productive without fertiliser addition.

It is believed that in deriving terra preta from faeces and biowastes the first sanitation treatment steps used in this culture were lactic-acid fermentation and vermicomposting with the addition of charcoal. Results from the Terra Preta Sanitation (TPS) lab scale experiments at the Institute of Wastewater Management and Water Protection at the Hamburg University of Technology (TUHH) and from system sampling in the house of Haiko Pieplow (Ministry of the Environment, Germany) are supporting this hypothesis.

Research on practical application of the principles of modern TPS has shown that it is possible to convert in a hygienic and sustainable way biowaste and faecal matter into highly fertile humus-like material. TPS makes use of lacto-fermentation of faeces followed by vermicomposting in a two-stage process. The lacto-fermentation process is similar to silage production process in agriculture that works under anaerobic conditions but without gas formation during the process. In our initial lab experiments we used lactic-acid formers from sauerkraut and “effective microorganisms” (EM A).

One of the main advantages is that the lacto-fermentation works efficiently and stable without air exchange and produces no offensive odours. What is required is only a simple bucket system (with a lid) for faeces collection and an addition of half a cup of a charcoal mixture: ground charcoal, lime, some stone dust and lactic-acid bacteria to the faeces after every toilet usage. Toilet paper is collected separately. Faecal chamber should be closed air-tight after every usage but with some remaining air the system still works. During collection of faeces addition of more bacteria including *Bacillus subtilis* and some sliced-cut wood would make the faecal substrate adaptable for the worms during vermicomposting as experienced by Dr. Jurgen Reckin (Pflanzenvielfalt e.V. i.gr., Berlin, Germany). The added wood that eventually decomposes becomes part of the final organic matter (terra preta).

**Now for the Ecosan community it is important to know that these soils are the end product of a brilliant dry sanitation system** that is described by Haiko Pieplow. With our own experiences in using the TPS system we are convinced that **this is the key to further development in dry UD-sanitation**. There is no need for faecal desiccation and toilet ventilation anymore. No double chamber system is needed.

We do see a strong link with urban agriculture like rooftop gardening. The more people apply this method the more terra preta soil is produced and more food can be produced using less energy input.

We have now started an informal researchers' network that is open to all. For those who are interested you may contact me in email: [ro@tuhh.de](mailto:ro@tuhh.de). An extensive paper on Terra Preta Sanitation is almost ready and will be distributed soon. A powerpoint presentation in English is available on request.

There are industries nowadays that are misusing the Terra Preta idea as "Biochar" to get permission to cut down large quantities of plants or trees for producing charcoal and energy and then sequester the coal to the soil. Their lobby is so strong that they even have a session in the Copenhagen Climate Summit. It is unlikely that charcoal alone is bringing long term fertility. Biochar is charcoal prepared by pyrolysis (a special case of thermolysis above 300°C, related to the chemical process of charring) of wood. Terra Preta is the black soil (compost-like soil) resulting from many years of degradation of biochar (as in the Amazon). TPS is rather a charcoal-supported composting of rich organic matter like faecal matter and bio waste.

### **Recommended references about Terra Preta:**

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