



Terra Preta as alternative and sound sanitation is scientifically well documented and has potential to recover incredible amounts of precious plant nutrients¹. The annual supply of just one person's urine holds about four liters of Nitrogen, one liter of Potassium and half a liter of Phosphorus². The discussions leading up to The Nutrients Recovery made clear that there is significant resistance in our modern day culture to the idea that human waste products can be relevant and valuable to producing food. Upcycling urine and making anthropogenic soil therefore situates us in a special place because we are engaging with the natural world on one side and the social world order on the other.

What is the scope of this project?

The first round of closing the food cycle is just a one-person endeavour as it is meant to adapt and calibrate the Terra Preta method to the conditions in Canberra. Upon successful completion of the first 'food cycle', The Nutrients Recovery can be modestly expanded.

What are the timelines associated?

The entire process beginning with the collection of input materials to harvesting vegetables from human fertilizer will take up to one year. Terra Preta depends on a relatively long timeline (with multiple, interdependent metabolisms at work) that requires up to six months.

What are the advantages of Terra Preta sanitation?

Terra Preta conserves organic and human waste products into carbon-rich, highly fertile black soil. Contrary to conventional composting, the manufacturing Terra Preta sequesters CO₂ while green house gas production is negligible. Most importantly, the controlled metabolism provides a stable process with reliable pathogen elimination.

What are the risks of Terra Preta composting?

If moisture, temperature and timing aren't properly moderated and maintained, the microbial mix isn't able to successfully metabolise the input materials into safe fertilizer. Careful observation, pH-moderation and regular soil testing give clear indicators when intervention is needed to maintain the integrity of the substrate.

How does The Nutrients Recovery align with research activities at ANU?

This project's scientific advisor, Dr. David Freudenberger, is an ecologist and lecturer in the Fenner School for Environment & Society. His research includes the digestive physiology in animals, so The Nutrients Recovery can be seen as the human extension of that. Markuz Wernli, the initiator and aspiring Terra Preta soil maker of this project, works as a Research Design Manager in the College for Asia and the Pacific. There is a great research potential in traditional fermentation techniques across rural areas from China to Malaysia that this project aims to explore.

Does it make sense to manufacture Terra Preta on an university campus?

Terra Preta can be applied both at the household and community level, in urban or rural settings — since it is free of emissions. The only requirements are a source for human and organic waste and a demand for using fertilizer for food production (like the ANU Organic Garden). The proximity of waste production, compost and garden helps to minimize logistics and transportation.

I cannot see the real point of the project. What new insights does it bring?

To learn to make soil with ones own waste products is to put yourself on intimate terms with the laws of physics and chemistry, as well as the facts of biology and microbiology. Beyond the scientific aspects, this project is public in nature and anchored with a sense of urgency. With the environmental challenges of our time public engagement and action no longer suffice. We need to change the way we live, too. It means that the sites of our daily engagement with nature — our kitchen, gardens, toilets, cars — matter to the planet in a way they never did.

The single greatest advance in human health and longevity came from very basic 19th Century public sanitation that made sure that contact of human drinking water and human food with human waste was eliminated. This remains the big issue for a very large proportion of the human population still.

Western-style, public sanitation depends on enormous water and energy inputs while it is breaking the nutrient cycle. This unsustainable sanitation highlights that we need holistic approaches that consider the entire water cycle from source to sea, and back, and puts human influence on the water and nutrient cycle at the centre. Terra Preta helped ancient civilizations prosper

before the advent of the water closet because it interlinks the water and nutrient cycle while its controlled fermentation eliminates pathogens.

Emergence of ‘new’ pathogens make this now a much more risky business than 200 years ago. Escherichia coli is the least of our worries. Increasing populations of Hepatitis C sufferers for instance make the use of human waste for composting for human food production a very fraught process. There are many such persistent pathogens very widespread in human populations that are very major public health risks. How do you address pathogen control?

Indeed composting systems do harbour pathogens, which is why The Nutrients Recovery is purposefully based on a long, adjustable timeline, strictly moderated fermentation process, and careful containment of the substrate. We implemented the following risk management measures into the process:

1. Only urine that is fully stabilized by successful lacto-acid fermentation¹ is being applied (pH 4.5 or below).
2. Based on soil testing and temperature measurements the timeline of the project can be adjusted and prolonged.
3. The compost beds are constructed on elevated ground and on a clay base and framed by planks and an embankment of soil to avoid leakage and runoff.
4. The ratio between buffer material (carbs and fibers) and fermented urine (= 96% water) is 5:1 by volume, to ensure absorption and balance of nutrition.
5. The Terra Preta plot (vacant area next to SLC compost and chicken cage) is fenced on three sides and can easily be closed up to prevent children from entering.
6. Large amount of surplus mulch (shredded wood) will be stockpiled to bury and neutralize the entire compost beds if a problem arises.

There are many existing large scale industrial processes of alternative sewage treatments. How does this Terra Preta project differ from the 1990s Tumbarumba prison system where sewage was recycled to run a vineyard? Or the dry

toilets at the Thurgoona campus in Albury?

The Nutrients Recovery works without any changes on current infrastructure. It is an ad-hoc, plug-in solution on the individual level that integrates into the current lifestyle with little preparation. It is this small, personal change of habit that is self-empowering.

Why do you use only urine in The Nutrients Recovery?

Urine concentrates 80% of all soluble plant nutrients² released by the human organism. It is much easier to separate from the source and to store it than faeces. Mixing human excrements makes the controlled fermentation much more complex.

How does making 'human' soil influence the life routines and habits on the individual level?

Returning one's kidney supply it into the food cycle means that everything that one puts into the body will become the food supposed to nourish others species. That includes substances like drugs, medicine and alcohol that critters and earthworms don't really approve.



EVERY BATCH OF FERMENTED URINE WILL BE TESTED TO ENSURE ITS ACIDITY IS BELOW pH 4.5

REFERENCES

¹ Waterless Collection of Human Excreta by Application of Lactic Acid Fermentation, Asrat Yemanah, M. Bulbo, H. Factura, C. Bucie, R. Otterpohl, 2012, Institute of Wastewater Management and Water Protection, Hamburg University of Technology. http://www.drytoilet.org/dt2012/full_papers/4/Asrat_Yemaneh.pdf

² *New Insights in Matters of Plant Nutrition, Soil Microbes and their Role in Recycling of Human Excreta and Regenerating Soil Fertility*, Jürgen Reckin, 2010, Institute of Wastewater Management and Water Protection, Hamburg University of Technology. <http://www.sswm.info/library/708>