TROZ Centre for Agriculture in the Tropics and Subtropics
Universität Hohenheim
Section: Agroecology in the Tropics and Subtropics

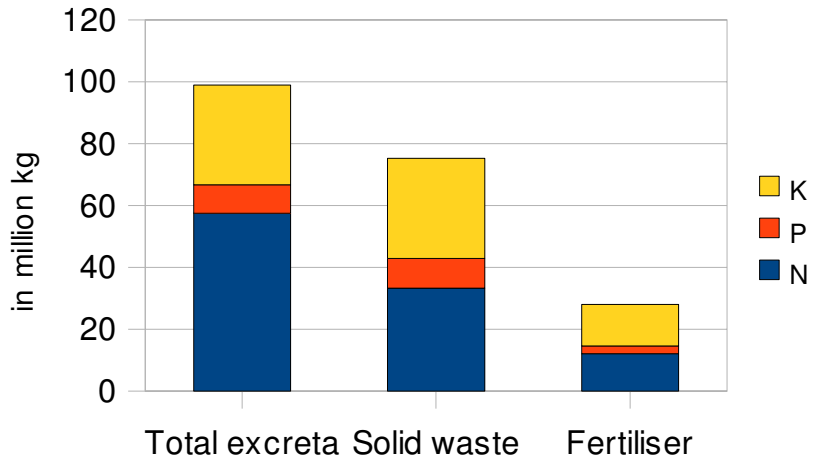
Urine diverting dehydration toilets to harness nutrients:
An estimation for Ghana

J. Germer & J. Sauerborn

Introduction

Public urine diverting dehydration toilets (UDDT) are promoted as a sanitary solution that safes water and allows recycling of significant amounts of nutrients back into productive agro-ecosystems. The advantage of such promotion seems obvious as in many developing countries where public toilets are widely used, soils are nutrient depleted and the sanitary nutrient flows are huge if compared with the nutrient content in solid household waste or with the current fertiliser consumption.

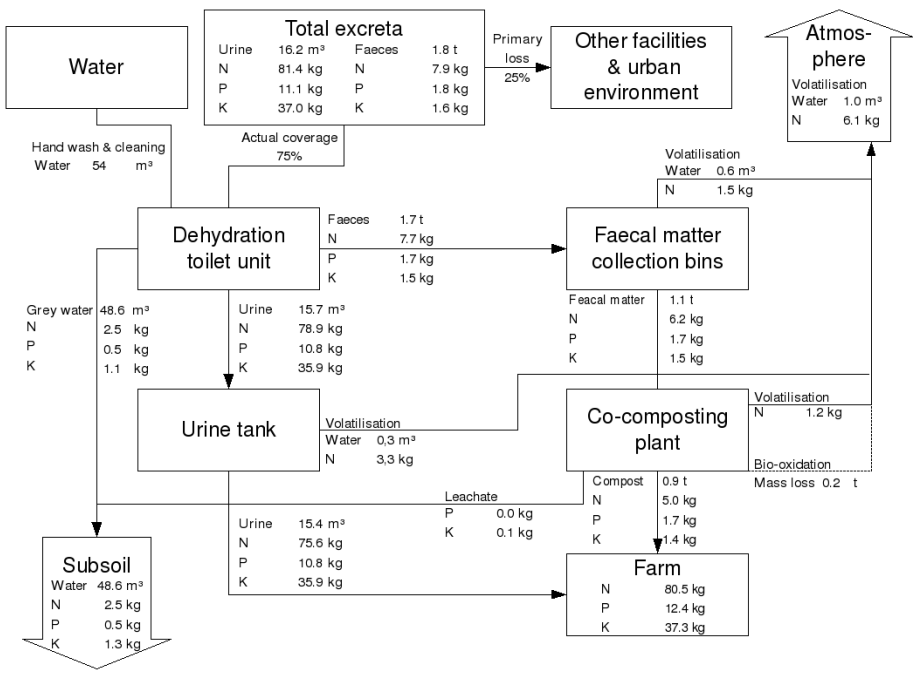
Berger Biotechnik GmbH in cooperation with the University of Hohenheim developed a locally adapted UDDT, the so-called Berger Biological Toilet (BBT), within the ecological nutrient cycle project at Valley View University in Accra, Ghana. The focus of the design is to achieve a high collection efficiency and to enable easy removal of urine and dried faeces as products.



Content of nitrogen, phosphorus and potassium in human excreta and solid waste produced and fertilisers consumed in Ghana

Objective

To analyse the potential to collect urine as liquid fertiliser and faeces as co-compost substrate with BBTs on the national scale for Ghana. To provide a mass and nutrient flow model to demonstrate advantages and disadvantages in comparison with the status quo and alternative solutions.



Estimated monthly mass and nutrient flows of a BBT dehydrating toilet unit serving 600 people

Method

Based on the current state of knowledge a flow model is developed for a toilet unit typically serving 600 people. The resulting use efficiency defined as nutrients collected per person and month is used to project the potential nutrient amount to be captured in Ghana's four largest cities: Accra, Kumasi, Tamale and Sekondi-Takoradi. About 30 to 50% of the 4.3 million inhabitants of these cities use public toilets. It is assumed that about 700 of these facilities used by 10% of the inhabitants can be substituted for BBTs.

In the described scenario BBTs are apt to harness over 140,000t of material (urine and dried faeces) per year. The nitrogen content of the collected material represents 6% of Ghana's annual nitrogen fertiliser consumption. Accordingly, it can provide 4% of the phosphorus and 2% of the potassium of the fertiliser consumed in the country's agriculture. The equivalent value of these nutrients is 900,000€; without the current subsidies the equivalent value is nearly twice as much.

Conclusion

The combination of the BBTs with agricultural use of the collected products offers a remarkable source of nutrients and deserves further consideration. Important questions that remain open are primarily related to the huge volumes involved: Are farmers willingly to pay and can this off-set the transport cost? Is storage an option and if not, what agro-ecosystem can make best use of the continuously supplied nutrients? What is the value of avoiding pollution or disburden waste water treatment plants and can this be accounted as a credit for BBT implementation and maintenance? Secondly, the decision maker will need to know how this solution performs economically and environmentally in comparison with other technologies (e.g. ventilated pit latrines).

Contact: Dr. Jörn Germer / Prof. Joachim Sauerborn
Plant Production and Agroecology in the Tropics and Subtropics
Section Agroecology
University of Hohenheim (380)
70593 Stuttgart, Germany
Phone: +49 711 958 03 75
Fax: +49 711 459 23629
Email: jgermer@uni-hohenheim.de
Web: www.uni-hohenheim.de/respta