

Food Security and Productive Sanitation: Practical guideline on the use of urine in crop production

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The upcoming publication titled *Practical guideline on the use of urine in crop production* gives practical guidance on the use of urine in crop production as a vital component of sustainable crop production and sanitation systems. It also includes guidance on how to initiate activities that will facilitate the introduction of new fertilisers to the agricultural community.

The guideline was a collaborative effort of several international organisations and institutions active in the field of sustainable sanitation and agriculture under the aegis of the Sustainable Sanitation Alliance (SuSanA) working group on Food Security and Productive Sanitation led by the Stockholm Environment Institute (SEI). The guideline is directed towards the donor community and decision makers, extension workers and other professionals active in the areas of agriculture, water and sanitation, planning and the environment. The main target group, however, is professionals in the agricultural sector.

The use of urine as a fertiliser can help mitigate poverty and malnutrition, and improve the trade balance of countries importing chemical fertilisers. Food security can be increased with a fertiliser that is available free for all, regardless of logistic and economical resources. Safe handling of urine including treatment and sanitisation before use is a key component of sustainable sanitation as well as sustainable crop production.

Consumed plant nutrients leave the human body with excreta, and once the body is fully grown there is a mass balance between consumption and excretion. This has three important implications:

- The amount of excreted plant nutrients can be calculated from the food intake, for which data is better and more easily available than for excreta.
- If all excreta and biowaste, as well as animal manure and crop residues, is recycled, then the fertility of the arable land can be maintained.
- Irrespective of the amounts and concentrations of plant nutrients in the excreta, one important fertilising recom-



The ecostation in sector 19
Photo: Linus Dagerskog, CREPA

mendation is thus to strive to distribute the excreta fertilisers on an area equal to that used for producing the food.

Source separation and safe handling of nutrients from the toilet systems is one way to facilitate the recirculation and use of excreta in crop production. Urine contains most of the macronutrients as well as smaller fractions of the micronutrients excreted by human beings. Nitrogen, phosphorus, potassium and sulphur as well as micronutrients are all found in urine in plant available forms. Urine is a well balanced nitrogen-rich fertiliser which can replace and normally give the same yields as chemical fertiliser in crop production (see the other articles in this issue for examples).

The urine from one person during one year is sufficient to fertilise 300-400 m² of crop to a level of about 50-100 kg N/ha. Urine should be handled in closed tanks and containers and should be spread directly onto the soil, not on the plant, in N doses equivalent to what is recommended for urea and ammonium fertilisers. At a small scale, plastic watering cans are suitable for spreading the urine, while at larger scale, spreaders for animal slurry are suitable. Air contact should be minimised in order to avoid ammonia losses; and the urine should be incorporated into the soil as quickly as possible.

The economic value of the urine can be calculated by comparing it to the price of mineral fertiliser on the local market or by calculating the value of the increased yield of the fertilised crop. Calculations in Burkina Faso show that the annual amount of plant nutrients in the excreta from one family is roughly equal to the quantity in one 50 kg bag of urea and one 50 kg bag of NPK (see the next article). The value of this per person is approximately USD 10, while the value of the increased yield of maize is approximately USD 50 per person. The value of a 20 l jerrycan of urine was estimated to be USD 0.25.

Health risks associated with the use of human urine in plant production are generally low. Source separation of urine is a strong barrier against pathogen transmission since most pathogens are excreted with faecal matter. The amount of faecal cross-contamination is directly related to the health risk in the system for urine use in crop production. Collection systems for urine should be designed to minimise the risk of faecal cross-contamination. Groups that are potentially at risk are collection personnel and field workers, households, local communities and product consumers. The possible health risks of other contaminating substances excreted with human urine (heavy metals, hormones and pharmaceuticals) are far smaller than those associated with the common sanitation system; and the risk of negative effects on the quantity and quality of the crops is negligible.

The *WHO guidelines for safe use of wastewater, excreta and greywater* (2006) promote a flexible multi-barrier approach for managing the health risks associated with the use of excreta in agriculture. This concept is comprised of a series of measures/barriers from 'toilet to table'. Each of the barriers has a potential to reduce health risks associated with the excreta use. WHO recommends that several of these barriers be put in place as needed to reduce the health risk to an acceptable minimum.



Barrier concept for safe use of urine as a fertiliser

Barriers include for example storage, crop restrictions, withholding periods and reduced contact, correct handling and cooking of the food crop. The *Practical guideline on the use of urine in crop production* gives examples of how urine can be handled safely to minimise the risk of pathogen transmission, as outlined in the WHO guidelines for safe use of excreta in crop production.

Institutional aspects are increasingly important as productive sanitation systems become mainstream. A challenge is to integrate the use of excreta in existing regulatory frameworks. Initially, the following activities are suggested when



Ouedraogo Ablassé at the ecostation in sector 27 with some solid and liquid fertilizer by the storage chambers for dried faeces
Photo: Linus Dagerskog, CREPA

productive sanitation systems are implemented:

- Identify stakeholders and clarify drivers and restrictions for each one in relation to the implementation of urine use in crop production.
- Include and target the farmers in the initial planning.
- Organise an arena for feed-back and interaction between stakeholders,
- Organise local communities so that there is a structure for implementation and a structure for monitoring.

Knowledge on the use of urine as a fertiliser is best gained and disseminated through local demonstration experiments involving organisations that work with small-scale farmers and local communities as well as local research organisations. The new fertilisers should be introduced with the same methodology that is used when introducing any new fertiliser in the agricultural community.

To implement a productive sanitation system in a local context, it is often necessary to translate or adapt the information given in the *Practical guideline on the use of urine in crop production* to the respective local site conditions. The last chapter of the book gives recommendations on how local guidelines can be developed and reasonably structured and it summarises the most important factors that directly or indirectly influence the farming activities related to the urine use. This information is complemented by examples of existing local guidelines from Burkina Faso and the Philippines.

The *Practical guideline on use of urine in crop production* is published in 2010 and available from the EcoSanRes and SuSanA web pages www.ecosanres.org, www.susana.org

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