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

This paper describes an upcoming publication containing a practical guideline on the use of urine in crop production.

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Abstract

The publication "Practical Guideline on the Use of Urine in Crop Production", is 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 with Stockholm Environment Institute (SEI) as the lead. It will be launched during 2010.
The Guideline is directed towards decision makers, professionals and extension workers in the sectors of agriculture, water & sanitation, planning and environment as well as the donor community. The main target group is professionals in the sector of agriculture. The text gives practical guidance on the use of urine in crop production as a vital component of sustainable crop production and sanitation systems. It covers key aspects of how to use urine as a fertiliser in productive sanitation systems and also includes guidance on how to initiate activities that will facilitate the introduction of new fertilisers to the agricultural community. The handbook should help in establishing links between research and professionals interested in implementation of sustainable sanitation systems. It is easy to read and informative, with examples from case studies and tips on further reading for those interested.

Use of urine in 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:

1. 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.
2. 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, as the recycled products contain the same amounts of plant nutrients as were taken up by the crops.
3. Differences in composition of excreta between different regions reflect differences in the uptake of the consumed crops and thus in the plant nutrient supply needed for maintained crop fertility in the region. Irrespective of the amounts and concentrations of plant nutrients in the excreta, one important fertilising recommendation 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

Key massages:

- Urine used as a fertiliser can help in the mitigation of 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.
- Safe handling of urine including treatment and sanitisation before use is a key component of sustainable sanitation as well as sustainable crop production.
- The "Practical Guideline on Use of Urine in Crop Production" will be published during 2010 and will be available from the EcoSanRes and SuSanA webpages, i.e. www.ecosanres.org and www.susana.org, respectively.

is a well balanced nitrogen rich fertiliser which can replace and normally gives the same yields as chemical fertiliser in crop production (Figure 1).

Figure 1. The yield and size of vegetables improves with urine use (Picture from Moussa Bonzi, CREPA, Burkina Faso).

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. In the small scale, plastic watering cans are suitable for spreading the urine, while in 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.

Economics

The economical value of the urine can be calculated by comparing with the price of mineral fertiliser on the local market or by calculating the value of the increased yield of the fertilised crop. An example from Burkina Faso gives at hand 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. According to Dagerskog and Bonzi (2010) the value of this per person is approximately 10 US$, while the value of the increased yield of maize is approximately 50 US$ per person. The value of a 20 litre jerrycan of urine was estimated to be 25 US cents.

Barriers protect producers, workers and consumers

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. As regards other contaminating substances excreted with human urine (heavy metals, hormones and pharmaceuticals) possible health risks are far smaller than those associated with the common sanitation system and the risk for negative effect on the quantity and quality of the crops is negligible.

The WHO guidelines for safe use of excreta in agriculture (WHO, 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 and it is recommended by WHO to put in place several of these barriers if needed in order to reduce the health risk to an acceptable minimum (Figure 2).

Barriers include for example storage, crop restrictions, withholding periods and reduced contact, correct handling and cooking of the food crop. The practical guideline gives examples of how urine can be handled in a safe way in order to minimise risk of pathogen transmission based on the WHO Guidelines for safe use of excreta in crop production.

Institutional aspects for up-scaling

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

- Identify all stakeholders and clarify drivers and restrictions for each of these groups in relation to the implementation of urine separation, storage, transport and use;
- Include and target the end users (the farmers) in the planning process;
- Organise an arena for joint analysis, planning and monitoring of the stakeholders;
- Organise local communities so that there is a structure for implementation and a structure for monitoring

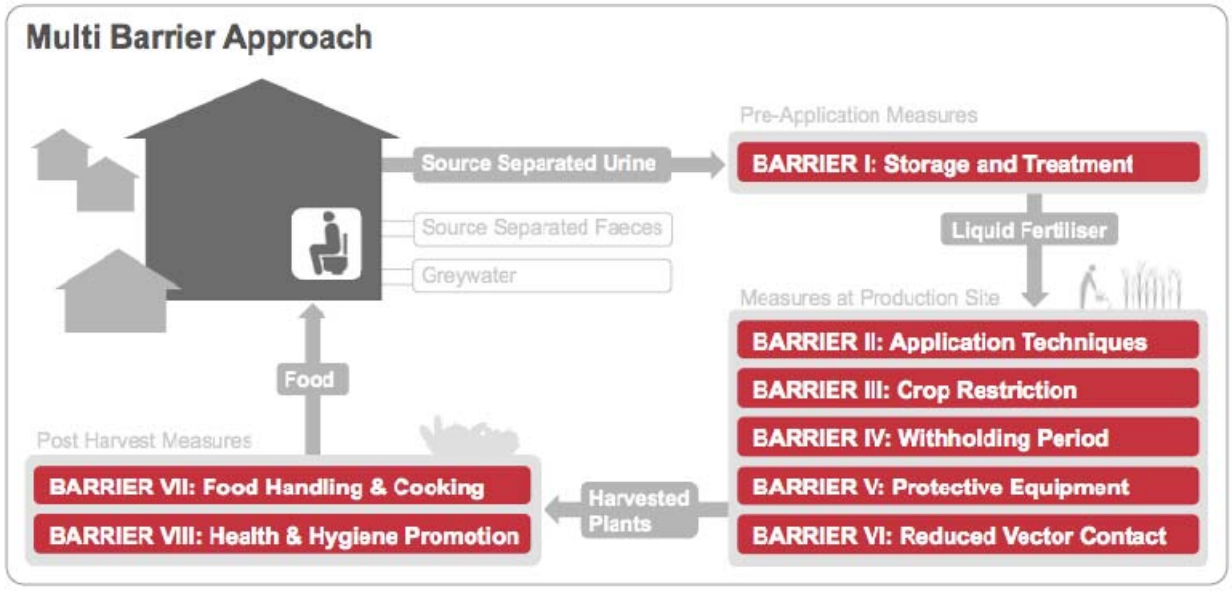

Figure 2. Barrier concept for safe use of urine as a fertiliser.

Very important in dissemination and up-scaling of the use of urine as a fertiliser are participatory local demonstrations involving all parties. Urine as a fertiliser needs to be introduced in the same way as any new fertiliser to the agricultural community. Logistics for handling of urine are discussed in the guidelines and examples are given for large and small scale handling of urine. The logistics are a challenge and there are environmental as well as practical and economical implications of transporting urine if there is no reuse possible on site. However, as is pointed out in the text, local reuse is often possible and urban agriculture provides possibilities for recycling of human excreta.

Although there is a wealth of location specific information in this guideline, every location is unique and further translation and adaptation of the guidelines is required. The last chapter of the guideline gives recommendations on how local guidelines can be developed and reasonably structured. Existing local guidelines from Burkina Faso and the Philippines are provided as an annex.

References

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