

# Productive Sanitation: Increasing food security by reusing treated excreta and greywater in agriculture

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**Currently some estimated 854 million people worldwide are chronically hungry due to extreme poverty; and about 2 billion people lack food security intermittently due to varying degrees of poverty (FAO 2006). Despite the great efforts and promising attempts being made to decrease the number of people suffering from food insecurity, this number still remains high worldwide and will most likely intensify in the coming decades, due to the growing world population. A great deal of this population growth will take place in cities, causing a substantial increase in the volume of urban waste products, the over-exploitation of rural resources and a significant increase in urban food demand. Developing countries are particularly affected by the rampant urbanisation tendencies and face great difficulties in coping with this development.**

In terms of the natural resources needed, food production requires mainly water and arable land that steadily supplies nutrients and the organic substrate for plant growth. These vital resources are often distributed unevenly around the world and many soils have been depleted or damaged by inappropriate agricultural practices. Around 70 percent of the globally used water resources are used for agricultural irrigation purposes (Brown, 2006). In addition, agriculture has to compete increasingly for water resources with domestic demand, industry, tourism, commerce and infrastructural institutions. Already today, large parts of Asia, Africa and the Middle East face either physical or economic water scarcity. Within the next 50 years it is estimated that more than 50 percent of the world population will live in such countries (WHO, 2006). Considering this fact and the direct relation between ongoing population growth and its additional water demand, a new approach to water is needed that recognises the human wastewater load as an important resource for agricultural irrigation.



*Sustainable sanitation on maize explained to schoolchildren in Malawi*  
Photo: SuSanA

## Agriculture and sanitation

Domestic wastewater and human excreta (urine and faeces) are essentially the same as animal manure and can serve as important sources for soil amelioration, as they deliver all relevant nutrients, organic matter and water needed for plant growth. Indeed, growing food and achieving food security are historically strongly linked with the idea of reusing liquid and solid waste from households in agriculture. The idea that human residues including excreta are wastes with no useful purpose can be seen as a modern misconception, and this system has been copied blindly in developing countries. At present farmers worldwide use around 150 million tons of synthetically produced nutrients (N; P<sub>2</sub>O<sub>5</sub>; K<sub>2</sub>O) annually (IFA 2004), while at the same time conventional sanitation systems dump more than 50 million tons of fertiliser equivalents with a market value of around \$ 15 billion (Werner 2004) into water bodies. This value will even increase in the years to come due to rising fertiliser prices and the continuously growing global population.

## Productive sanitation

A paradigm shift in sanitation towards a recycling-oriented closed loop approach is imperatively needed to bring gravely limited nutrient resources back to the fields. This requires a new alliance between the agricultural and sanitation sectors, fostering resource recovery as a key requirement for sustainable sanitation concepts. Sustainable sanitation is a general term for all approaches that aim at improving the overall sustainability of sanitation systems, including a paradigm shift from purely disposal-oriented to reuse-oriented sanitation. In order to be sustainable, a sanitation system has to not only be economically viable, socially acceptable and technically and institutionally appropriate, but it should also protect the environment and recognise household excreta and wastewater as resources that should be productively reused. Sustainable sanitation systems should therefore allow for the almost complete recovery of nutri-

ents in household wastewater, minimise the consumption and pollution of water resources and support the conservation of soil structure as well as agricultural productivity. Sustainable sanitation applies the basic natural principle of closing the loop by using safe sanitation and reuse technologies (Werner 2004). Sustainable sanitation systems used so far comprise decentralised and locally adapted as well as large-scale centralised solutions that favour no specific technology and range from low-cost basic sanitation (e.g. urine separation dehydration toilets, arbo-loos, ponds, constructed wetlands, etc.) to high-end solutions (vacuum systems, biogas plants, membrane technology, etc.). The sanitary resources can be divided into different resource streams (urine, faeces, greywater, rainwater, organic solid waste) and should, due to their different characteristics, be collected separately with adapted treatment facilities and application methods.

### Urban agriculture

From the sanitation point of view, urban agriculture as well as wastewater aquaculture offer opportunities for win-win situations by turning urban waste products into productive resources (Drechsel and Kunze, 2001). Cities serve as both giant markets and a reliable and constant source of nutrients through the huge amount of urban wastewater. Today many cities are unable to ensure appropriate wastewater treatment, and they thus pollute the surrounding water bodies. Due to water scarcity and the lack of economical alternatives, many developing countries use untreated or partially treated wastewater as a source of nutrients and irrigation water, causing potential and often acute health risks. The sustainable sanitation approach can be seen as a promising integrated attempt to assure urban food security through the safe reuse of water and nutrient resources in urban wastewater.

Urban agriculture and urban aquaculture complement rural food supplies with often perishable and high-value food products, create jobs and safeguard the livelihoods of many urban dwellers. They also improve many people's macro- and micronutrient intake, particularly in vulnerable households and they can make important contributions to urban food security. One of the most apparent benefits of sustainable sanitation with respect to food security is the highly perceptible increase in agricultural yields, especially if directly compared with unfertilised crops.

Excreta and wastewater are low-cost fertiliser alternatives that can decrease farmers' dependence on commercial fertilisers. This is, especially relevant given the rise in the cost of fertiliser in recent years. The value of the nutrients that could be used in agriculture produced by each human being can be seen as a considerable quantity within the national economy. Recent estimations vary between 4 (KfW 2008) and 7 (Stravato & Dagerskog 2008) per person per year. Furthermore, efficient reuse would minimise the negative impact on surface and groundwater, resulting in less environmental follow-up costs. Recycling would also result in reduced water consumption on household level for non-drinking purposes, and thus enhance the availability of drinking water. In combination with the reuse in irrigation, it could lead to a more reasonable use of valuable potable water, which is especially important in arid regions. In terms of soil fertility, the nutrient loss through harvesting can be almost completely compensated with excreta products.

## The Sustainable Sanitation Alliance

Motivated by the UN's decision to declare 2008 as the International Year of Sanitation (IYS 2008) a number of organisations promoting sustainable sanitation systems took the initiative to form a task force to support the IYS 2008 and to contribute within and beyond the IYS 2008 to the promotion and up-scaling of sustainable sanitation.

In January 2007, a first meeting in Eschborn/ Germany resulted in a large number of commitments by the participants from various organisations, and in drawing up a first draft of a "joint road map for the promotion of sustainable sanitation in IYS 2008". Several working groups were established that are focusing on different sustainable sanitation related issues like "cost and economics of sustainable sanitation", "food security and productive sanitation", "sustainable sanitation in emergency and reconstruction situations" or "treatment options, hygiene and health". The intention of these working groups is to elaborate various deliverables and bring together relevant organisations with global competence in the respective areas and that are not yet fully involved in the sanitation discussions, in order to stimulate the joint work and help to convey the sustainable sanitation approach to new groups. In order to have a joint label for the planned activities, and to be able to align with other potential initiatives, the group formed the "Sustainable Sanitation Alliance (SuSanA)". During the years 2007/2008 regular quarterly meetings were, and will continue to be, held in different parts of the world in order to facilitate local actors' involvement. These meetings are often closely linked to other relevant water and sanitation related conferences or events. The meetings are intended to monitor progress of the various working groups and other activities of the SuSanA, and update and coordinate the commitments of the partners. The number of participating organisations grew steadily over the last meetings and resulted in the commitment of more than 80 multi- and bilateral organisations, NGOs, businesses, governmental and research institutions to be recognised as official partners of the SuSanA.

The overall goal of the SuSanA is to contribute to the achievement of the MDGs by promoting sanitation systems that take into consideration all aspects of sustainability. The MDGs and the UN's "International Year of Sanitation 2008" are highly appreciated by the SuSanA as they help push sanitation high up in the political agenda. The main focus of the work of the SuSanA is it to promote the implementation of sustainable sanitation systems in large-scale water and sanitation programmes. The objectives of the SuSanA relate to awareness raising, and sharing of experiences involving linkages, MDGs, project planning and specific technologies. SuSanA collects and compiles information to assist decision makers; gathers good practices; facilitates demonstrations of sanitation systems; identifies and describes mechanisms for up-scaling and appropriate financing for pro-poor sanitation; and develops global and regional visions of how sustainable approaches can contribute to reach the sanitation MDG and how to promote them in the IYS 2008 and beyond.

sustainable  
sanitation  
alliance

## Challenges

Attention for urban agriculture has increased considerably in the past years and an increasing number of city governments have or are now formulating policies and programmes on urban agriculture. This heightened awareness offers opportunities for integrated and decentralised efforts including sustainable sanitation.

Despite all the known and convincing benefits of reuse-oriented sustainable sanitation systems, there are still a number of challenges and problems to be overcome. These relate to a lack of awareness and knowledge on sustainable sanitation, and the still existing gap between actual and potential re-use. In most parts of the world the new closed loop sanitation paradigm has not yet reached the legal frameworks.

In addition there are a number of more practical considerations as well as organisational and infrastructural issues to be addressed, e.g. economic viability of sustainable sanitation and reuse systems, the use of market incentives for transport from source to farmers' fields over longer distances, and cost-efficient storage of urine in regions where there are short periods of cultivation. These challenges (and hence entry points for research) differ largely between regions, and between developed and developing countries.

### The SuSanA invites others to join in

*SuSanA is an informal network of organisations working towards a common goal. Participation is open to those who want to join and be active in the promotion of sustainable sanitation systems. The Sustainable Sanitation Alliance invites other international, regional and local organisations to join the network, contribute ideas, and become active partners in the thematic working groups. Feedback for the advancement of the joint road map is certainly appreciated, as it is a work in progress that will be continuously updated, and will include all joint activities leading towards increased implementation of sustainable sanitation systems.*

*The SuSanA plans to publish selected case studies of sustainable sanitation projects that demonstrate the wide range of possible fields of application for sustainable sanitation systems. The aim is to distribute this information to decision makers, planners, engineers and the interested public. For the collection of good practice case studies we are depending on your support and would there-*

*fore kindly invite sustainable sanitation experts, project managers and other informed persons to contribute to this collection by suggesting case studies and making use a case study template that can be found under the following link: <http://www.sustainable-sanitation-alliance.org/documents/case-studies/en-susana-case-study-template-2008-04-11.doc>.*

**homepage:** [www.susana.org](http://www.susana.org)

**contact:** [info@sustainable-sanitation-alliance.org](mailto:info@sustainable-sanitation-alliance.org)

**further info:** The SuSanA road map:

<http://www.sustainable-sanitation-alliance.org/pdf/en-susana-roadmap-version-1-2-feb-2008-01-24.pdf>

The SuSanA statement:

<http://www.sustainable-sanitation-alliance.org/pdf/en-susana-vision-statement-l-version-1-2-feb-2008.pdf>

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