Policy brief

Nutrient reuse as a solution multiplier

Key Findings

- Nutrient reuse is a "solution multiplier", addressing issues from the local to global scale. It can support livelihoods, contribute to food security, improve crop quantity, reduce pollution, minimize resource use, and reduce impacts on the global nitrogen cycle.
- Agriculture can be a driver for sanitation because access to free fertilizers such as sanitized urine and faeces can trigger sanitation uptake in areas with previous low sanitation coverage.
- It is crucial to involve farmers in productive sanitation to ensure its performance, i.e., to ensure that nutrients actually are reused in agriculture.
- It is important for local government to facilitate and regulate productive sanitation systems and nutrient reuse, and to find ways to promote innovation while holding service providers accountable and to protect public health and the environment.
- Policies and legislation that support nutrient reuse are necessary for larger scale development of productive sanitation and sustainable agriculture.

This policy brief aims to inform national and municipal policy-makers about the relevance and advantages of nutrient recycling, from the perspectives of both agriculture and sanitation .

Why include reuse of nutrients in policy development?

Sustainable sanitation systems protect and promote human health, minimize environmental degradation and depletion of the resource base, are technically and in the long-term institutionally appropriate, socially acceptable, and economically viable. Sustainable sanitation can be achieved through a number of different technical solutions. However, this policy brief focuses on so-called *productive or ecological sanitation systems*, which allow for the safe recycling of nutrients to crop production in such a way that the use of non-renewable resources is minimized. Productive sanitation systems have a strong potential to be sustainable if technical, institutional, social and economic aspects are managed appropriately.

Human society is putting increasing pressure on its supporting resources and ecosystems, and there is mounting evidence that the policies that govern our use of these resources need to change. Policies that encourage the reuse of nutrients in human excreta can support innovative ways to manage resources that protect both the environment and human health, as well as contribute to sustainable agriculture. Policy-makers need to be aware that implementing nutrient reuse involves more than a specific technology, it requires the development of the service delivery chain that stretches from the toilet through collection, treatment and reuse (see Figure 1). Thus, both agricultural and sanitation policy needs to be adapted to achieve nutrient reuse from sanitation systems.

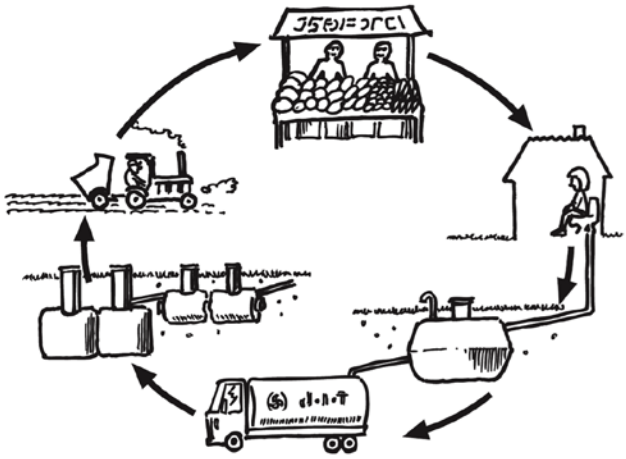

Figure 1. The nutrient cycle: from consumption, excretion, collection/storage and treatment, to agricultural reuse, and back to the consumer

On a local level, the reuse of treated and hygienic sanitation products, such as agricultural fertilizers, could bring significant economic benefits because it can reduce dependency on chemical fertilizers. It can also contribute to food security for those outside the chemical fertilizer market and, by keeping local nutrient

resources in the productive cycle, it can boost food production through improving both the quantity and quality of produce. On a regional or watershed scale, returning nutrients to the soil instead of releasing them into waterways also helps protect the environment and improves water quality. Reuse can be a very cost-effective way to reduce pollution of rivers, lakes and groundwater.

On a global scale, research on planetary boundaries shows that human interference with the natural nitrogen cycle is far above the limit proposed to avoid large scale irreversible ecological change. To stay within the proposed limit, humanity would need to reduce the rate at which it harvests nitrogen from the atmosphere by 75%. This would require minimal nitrogen losses in agriculture, which recycling of human excreta can help to achieve.[I]

In conclusion, nutrient recycling can be considered a "solution multiplier", and it is vital to include nutrient management in national policies, guidelines and legislation.

How to overcome barriers to integrating nutrient reuse into national and municipal policy

It is important to note that different countries have different barriers to adopting nutrient reuse in policy. Thus, country-specific strategies and approaches are required. Also, there is a need to make policy understandable if it is to be successfully implemented and enforced.

A major barrier can be the large number of stakeholders that need to be involved in order to implement nutrient reuse. Furthermore, a high level of trust is necessary between the different stakeholders. Figure 2 shows which stakeholders, and the relationships between them, that should be involved in nutrient reuse to implement it successfully.

Swedish Environmental Code supports nutrient recycling

Sweden's Environmental Code of 1999 promotes sustainable development and encourages reuse and recycling of natural resources. However, this legal support has not yet led to widespread adoption of nutrient reuse. Today, only about 20 of 290 municipalities are planning or implementing local reuse systems. On the other hand most municipalities are working actively to secure the quality of biosolids from centralized wastewater treatment plants.

To increase reuse of nutrients on the municipal level, in 2010 the Swedish Environmental Protection Agency circulated a revised action plan for recycling phosphorus from wastewater.[II] The plan emphasizes the need for reuse, partly to prevent eutrophication and partly in recognition of the fact that the world's phosphate reserves are dwindling, and that current practice for nutrient management is far from sustainable. However, there are strong actors in Sweden calling for the action plan to be broadened to also encompass the other nutrients in wastewater, since a one-sided focus on phosphorus may mean that efforts are less than optimal.

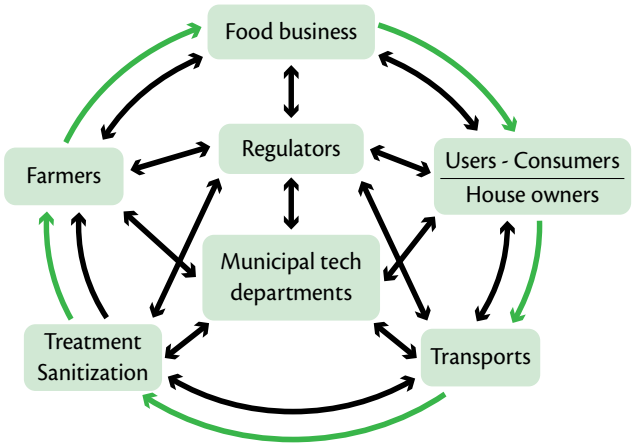

Figure 2. A diagram of stakeholder relationships necessary to implement nutrient reuse. The number of stakeholders can be reduced if municipalities organize reuse on their own land.

It is a challenge for policy and implementation to interact effectively over time. If important stakeholders are not involved, or there is a breakdown in trust between them, implementation of reuse can fail. However, if a municipality organizes reuse on land it owns (e.g. lawns or parks) it can reduce the number of stakeholders. In this way a municipality can act in the place of four or five of the actors shown in figure 2. Such a scenario would go some way to overcoming the barrier of there being large numbers of stakeholders, as well as addressing the issue of trust.

In countries that export agricultural products, implementing nutrient reuse may be hindered by regulations in countries to which they export. An exporting country is unlikely to use sanitized excreta in agriculture if an importing country prohibits its use. One example of such a regulation is the EU's legislation on organic farming, which does not allow the use of human urine as a fertilizer for organic crops produced within the EU.

Another obstacle is the widespread negative attitude towards excreta use in agriculture. In cultures where handling of excreta is considered taboo, there is likely to be resistance to incorporating reuse into policy. In this respect, consumer attitudes are very important, because a farmer won't apply nutrient reuse if doing so will make her/his produce less marketable. In Burkina Faso and Niger, one strategy to overcome the "disgust factor" has been to rename products after they are sanitized. Thus, after sanitization, urine and faeces are renamed as "liquid" and "solid" fertilizer in the local language.

Figure 3. Applying sanitized urine as fertilizer in Bornsjön, Sweden

Strategies to successfully implement nutrient reuse

Governments and local authorities may need to change existing policies or enact new ones to effectively incorporate nutrient reuse into policies on sanitation, the environment and agriculture. Legal impediments may also need to be removed or amended. [III]

Policy change is a necessary step towards scaling-up the reuse of sanitized excreta in agriculture. But policy change on its own is not enough to ensure implementation. To ensure that reuse actually happens, it is crucial to involve the agricultural sector, because farmers are the end users of the sanitation products. Sanitation products must be adapted to farmers' needs, and farmers must be trained to apply sanitized excreta to their fields safely and effectively. Newly developed or revised policies must be supported by implementation strategies or action plans. Such action plans should be developed in parallel at the appropriate levels of government, and should outline specific actions to be taken as well as the roles that will be played by the different stakeholders. The strategies must include issues such as training of farmers, public awareness campaigns, construction of sanitation systems that facilitate reuse, and operation and maintenance of the systems.

Burkina Faso: the need for fertilizer as a driver for productive sanitation

In Burkina Faso, there has been great success with pilot projects of urine-diverting toilets that provide urine and composted faeces for agricultural use. Local estimates show that one year's urine and faeces from one individual is roughly equivalent to ~10 kg of chemical fertilizer (5 kg urea/5 kg NPK),[IV] enough to fertilize 500–1000 m2 of cereals. This knowledge, together with results from participatory tests of sanitized urine and faeces on demonstration fields, have convinced many farmers to use these "new" fertilizers.

Burkina Faso's reuse policy has lagged behind, but the success of the pilot projects has led the government to accept urine-diverting toilets and subsequent use of their products as part of the national sanitation policy. A participative workshop was held in 2009 that outlined roles and responsibilities of all stakeholders within a possible "National EcoSan Initiative". In the proposed institutional set-up it was envisioned that the Ministry of Agriculture should monitor extension workers and train farmers, and the Ministry of Health should use its health workers for quality control, and to monitor and assess health risks associated with the system.

The city of Ouagadougou has also signed an official decree which outlines how the municipal ecological sanitation (EcoSan) task force should stimulate and monitor the EcoSan system in the city. The existing system comprises around 600 households with urine diverting dry toilets. Local associations collect and treat the excreta, then sell the resulting fertilizer to peri-urban farmers. The municipality has agreed to partly finance the collection system since the profits from selling the fertilizers are too low to run the whole system.

It is important to provide clear and concrete information to the public on the benefits of reuse. One way to do this is to distribute information leaflets that clearly explain the benefits in facts and figures, for example on how much chemical fertilizer can be saved through reuse.

Case studies from several countries have shown that a range of approaches, if executed effectively, can promote successful reuse. Municipal interventions such as those in Burkina Faso, as well as bottom-up approaches used in the Philippines, can both bring about the desired outcomes. Whichever process is followed, it must be tailored to the local institutional and cultural context. It is also important to recognize that to put in place organized reuse on a large scale is a complex and lengthy process that requires patience on the part of all stakeholders. Because change cannot hap-

WHO guidelines for excreta and greywater use in agriculture

The WHO has issued guidelines covering the agricultural reuse of wastewater, excreta and greywater. These guidelines describe a multi-barrier approach that can be used to inspire the formulation of local guidelines to reduce health risks in relation to excreta use in agriculture. The guidelines can be downloaded from: http://www.who.int/water_sanitation_health/wastewater/gsuweg4/en/index.html. However, it has also been argued that it is of utmost importance that guidelines should be based on local practices to be of real practical use in a given context.[V] It is therefore recommended that policy-makers use local reuse practices as the starting point for risk reduction recommendations, and to use WHO guidelines as a tool for inspiration and guidance in the given context.

Recommendations to support uptake of productive sanitation in Niger

In 2009, IFAD supported a productive sanitation project in Niger. A policy study from that project recommended work on three levels: (i) working with stakeholders, (ii) framing productive sanitation in existing strategies and programmes, and (iii) promoting "flexible productive sanitation", for widespread information on productive sanitation.

- On the local level, the study recommended that relevant bodies should make farm visits, and work with inter-village groups, women's groups and locally active NGOs.

- Regional level actors are important in Niger, where the decentralization process is not yet fully functional. Regional level stakeholders include the state technical services, other on-going projects and CREA, which is the coordinating body of water and sanitation actors at the regional level.

- Important stakeholders at the national level are (i) the National Committee for Water and Sanitation (CNEA) (ii) the Executive Secretary of the Strategy for Rural Development and (iii) research institutions.

pen without the necessary knowledge and capacity, any authority intending to adapt its sanitation systems for reuse should begin training all important stakeholders at the earliest opportunity. The reuse of nutrients can only become a mainstream practice through cooperation between different levels of stakeholders, and by understanding that a closed-loop approach offers advantages for all.

This text is partly based on the outcomes of the SEI/EcoSanRes2 workshop Sanitation Policies and Regulatory Frameworks for Reuse of Nutrients in Wastewater, Human Excreta and Greywater, 24–25 August, 2009 in Stockholm, Sweden.

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The Philippines: bottom-up process as a driver for legislation on nutrient reuse

In the Philippines, a bottom-up process facilitated the incorporation of reuse into national legislation. The 2004 Philippine Clean Water Act aims to protect the country's water bodies from pollution from land-based sources. Several studies show that domestic wastewater is the principal cause of organic pollution of water bodies in the Philippines. The Act was silent on nutrient recycling, but when public consultations on the Act's Implementing Rules and Regulations (IRR) were held, the Philippine Ecosan Network advocated the incorporation of the ecological sanitation concept into the IRR. Thus, reuse is now legally supported in the Philippines.

Recommendations

- Enable communication and cooperation between policy-makers in agriculture and sanitation; e.g. initiate working groups at the national or regional level.
- Analyze and amend the existing policy and legal frameworks to ensure that they allow for nutrient reuse as well as technologies that enable safe nutrient reuse.
- Initiate processes for policy change at the most suitable level (e.g. local, regional or national), and when there is a window of opportunity (such as institutional change) or where there are ongoing projects or processes which involve local "champions" and examples of good practice.
- Municipalities can reduce the number of stakeholders that need to be involved by organizing reuse on its own land, thus sidestepping issues of cooperation and trust.
- Overcome "the disgust factor" associated with nutrient reuse by, for example, renaming the treated faeces and urine as "solid" and "liquid" fertilizer after sanitization.
- Local reuse practices must be the starting point when developing guidelines for hygienic risk reduction, otherwise the recommendations may be of no practical use.

References

[I] Rockström J., Steffen W., Noone K., Persson Å., Chapin F. S. III, Lambin E., Lenton T. M., Scheffer M., Folke C., Schellnhuber H., Nykvist B., De Wit C. A., Hughes T., van der Leeuw S., Rodhe H., Sörlin S., Snyder P. K., Costanza R., Svedin U., Falkenmark M., Karlberg L., Corell R. W., Fabry V. J., Hansen J., Walker B., Liverman D., Richardson K., Crutzen P. and J. Foley (2009) Planetary boundaries: exploring the safe operating space for humanity. Ecology and Society 14(2): 32. Available at: http://www.ecologyandsociety.org/vol14/iss2/art32/

[II] Swedish Environmental Protection Agency (2010) Uppdatering av "Aktionsplan för återföring av fosfor ur avlopp". Available at: http://www.regeringen.se/content/1/c6/03/45/62/d33d7d61.pdf

[III] World Health Organization (2006) Guidelines for the safe use of wastewater, excreta and greywater. Volume 1: Policy and regulatory aspects. WHO, Geneva.

[IV] Dagerskog L. and Bonzi M. (2010) Opening minds and closing loops – productive sanitation initiatives in Burkina Faso and Niger. Sustainable Sanitation Practices no. 3 – Use of urine, pp 4-11 http://www.ecosan.at/ssp/issue-03-use-of-urine/issue-03

[V] Seidu, R. (2010) Disentangling the risk factors and health risks associated with faecal sludge and wastewater reuse in Ghana. PhD thesis 2010:17, Department of Mathematical Sciences and Technology, Norwegian University of Life Sciences, Ås, Norway.

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