IWMI International Water Management Institute BRIEF SERIES

WATER ISSUE BRIEF

ISSUE 4 2010

Putting Research Knowledge into Action

1 Wastewater use in agriculture: Not only an issue where water is scarce!

Wastewater is increasingly considered a valuable asset where water is scarce. However, wastewater reuse is also high on the agenda in water-abundant regions.

The reason is that about 90% of the globally produced wastewater remains untreated causing widespread water pollution, especially in low-income countries. This problem will only get worse as long as urban populations grow and investments in water supply outpace those in wastewater treatment. As whole economies depend on these water sources, related health risks must be evaluated in conjunction with the potential benefits. Optimal treatment strategies will vary by country and situation. For agricultural reuse, non-treatment options have a high cost-effectiveness in risk reduction but require behavior change supporting incentives to find adoption.

Key messages

- Irrigation of food and fodder crops with urban wastewater is a widespread phenomenon in both arid and humid areas throughout Asia and Africa.
- The two main drivers are water scarcity and water pollution, resulting in wanted and unwanted reuse.
- In both scenarios whole cities and thousands of livelihoods depend on the resulting agricultural outputs.

There are viable options for health risk reduction even where untreated wastewater is used.

The context

Half of the world's people now live in towns and cities, a figure expected to reach two-thirds by 2050. In the areas surrounding urban centers, agriculture must compete with industry and municipal users for safe water supplies. Where wastewater collection and treatment are absent or inadequate, as in most low-income countries, natural rivers, streams and lakes are becoming polluted with urban wastewater. As cities offer the best markets for selling fresh produce, farmers are irrigating from traditional water sources now polluted with urban wastewater. Depending on how developed a city's wastewater collection and treatment is, there can be significant health hazards related to the use of this water.

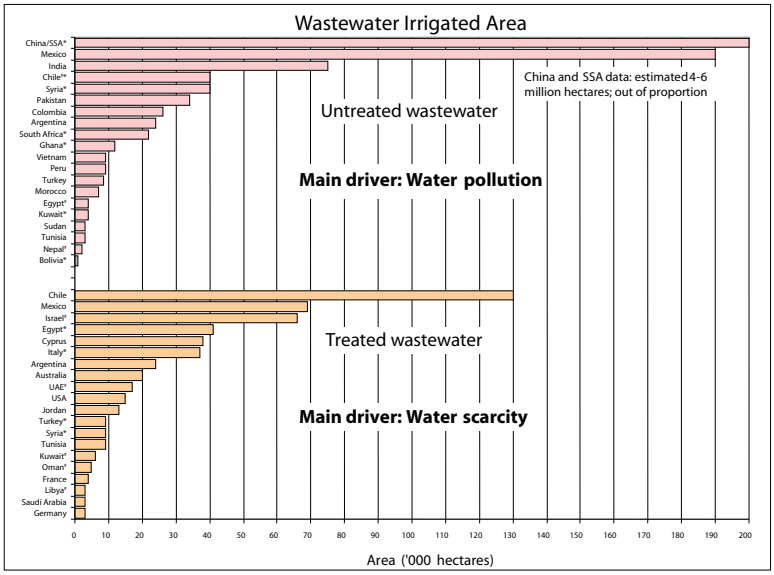
Wastewater from cities can contain a mixture of chemical and biological pollutants depending on its sources. "In low-income countries down the 'sanitation ladder', like in most African cities, the pathogen risk from excreta in the wastewater is the most alarming," says Pay Drechsel, IWMI's Theme Leader for Water Quality, Health and Environment. "Meanwhile, high concentrations of inorganic and organic chemicals are an increasing risk where industrial development is gaining ground and outpacing the enforcement of environmental laws and regulations. This is the case in many emerging economies."

IWMI's position on wastewater use in agriculture

IWMI takes the health risks seriously. But it also knows that recommendations which cannot be implemented will not reduce any risk. This means that any intervention has to match local economic, institutional and technical capacities. The most appropriate technology in many conditions is waste stabilization ponds. But, as long as, for whatever reason, wastewater collection will only cover a small part of the urban population, untreated wastewater will continue to pollute the environment. In this situation, alternative risk reduction measures are needed. In line with the current World Health Organization (WHO) guidelines for the safe use of wastewater, excreta and greywater in agriculture, IWMI is exploring low-cost options which can be implemented all the way along the food chain, from farms to markets to consumers. To make appropriate recommendations, scientists assess risks by sampling the locally available water and irrigated crops. They then identify the most effective ways to remove pathogens by making changes in common practices. "Best practices, be it on the farm, in the market or at the street food sales point, can reduce the overall risk by a factor of 10 to 1,000," says Alexandra Evans, Strategic Science Uptake Coordinator at IWMI. "This is, however, not enough, so different practices have to be combined to help safeguard public health." This is what the WHO calls a multi-barrier approach.

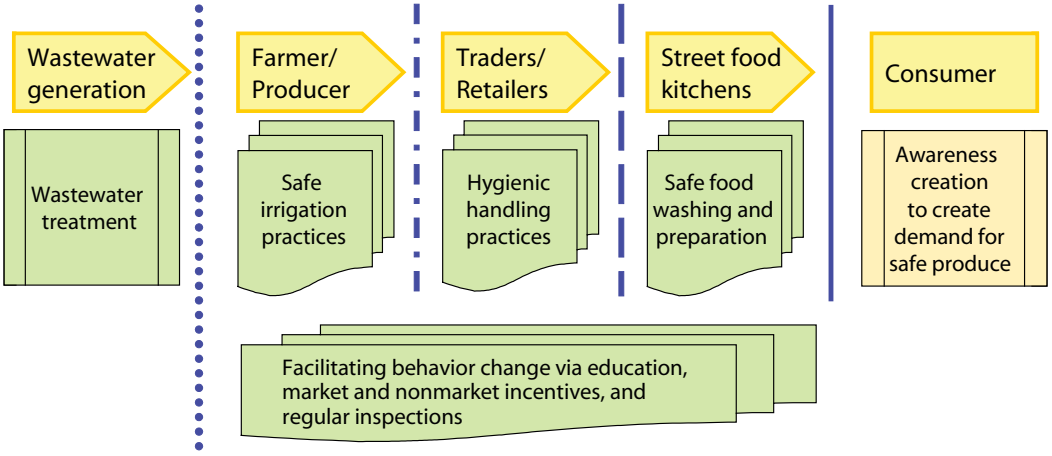
To give some examples: Further up the sanitation ladder, in developed nations like in Europe and North America, wastewater treatment plants take care of the pathogens. Where there is no treatment, farmers can reduce the contact between water and crops, support the die-off of bacteria, and also reduce the amount of pathogens in the irrigation water through improved water fetching and application practices. But as the consumer never knows the source of the vegetables purchased on markets, cooking them is the best safety measure. Where this is not appropriate and a raw salad is desired, these can be safe to eat if they are cleaned with an appropriate food disinfectant. In short, there are many ways to protect us from pathogens even where water polluted with excreta is used for irrigation.

Sometimes farmers already use practices which safeguard consumers. In Northern Ghana, for example, raw fecal sludge is used for farming, a practice which appears very risky. However, as long as farmers allow the sludge to dry and plant only cereals, a risk to the consumer could not be established. The sludge is mostly distributed at the start of the dry season, which takes several months; enough time for the human manure to dry.



Wastewater irrigation in urban farming is a 'fact of life' in most cities in the developing world. *Source*: Modified from Scott et al. 2010[1]. *Notes:* * Data uncertain; # Practice reported (including forestry), data missing; SSA = sub-Saharan Africa; UAE = United Arab Emirates; USA = United States of America.

[1]Scott, C. A.; Drechsel, P.; Raschid-Sally, L.; Bahri, A.; Mara, D.; Redwood, M.; Jiménez, B. 2010. Wastewater irrigation and health: challenges and outlook for mitigating risks in low-income countries. In: Drechsel, P.; Scott, C. A.; Raschid-Sally, L.; Redwood, M.; Bahri, A. (ed.), *Wastewater irrigation and health: Assessing and mitigating risks in low-income countries*. Earthscan-IDRC-IWMI, UK, p. 381-394.



In collaboration with the World Health Organization (WHO), IWMI has been testing a 'multi-barrier approach' to reducing the overall risk of pathogens in wastewater irrigation.

How IWMI can help

For more than 10 years, IWMI has been working in India, Pakistan, Vietnam, Ghana, Ethiopia, Mexico and other countries on a variety of projects aimed at assessing and reducing risks of wastewater irrigation. In Accra, approximately 200,000 people eat fried rice with chicken and raw salad bought from street vendors everyday. The salad leaves are invariably irrigated with contaminated water. This contamination pathway is highly dangerous, given the annual cholera alerts in town. Local conditions determine which barriers work most effectively in different locations. Because of the hot climate, Ghana's lettuce farmers have to irrigate frequently, usually twice a day, which results in particularly high contamination levels. In cooler places, such as Addis Ababa, Ethiopia, farmers can cease irrigating for a few days before harvesting. The result is that large numbers of pathogens die-off from exposure to sunlight.

The research challenge

If farmers were able to charge more for safer vegetables, they would have an incentive to reduce contamination. However, this is only possible where customers understand the risk and the value of reduced health risks, and are willing to pay more for the privilege. In many developing countries, people are unlikely to pay more for uncontaminated crops. They usually know little about invisible risks and their priority is to provide sufficient food for their families. IWMI researchers, therefore, explore social marketing tools to identify appropriate incentives that will trigger the behavioral changes needed to reduce contamination of raw vegetables. As Pay explains, "Our research does not end with IWMI recommending an effective risk-reducing practice; we also aim to identify the drivers and constraints that determine whether or not people will use them and, most importantly, change their habits." A recent hand washing campaign in Ghana exemplifies how lateral thinking is required when trying to bring about lasting behavioral changes. The campaign did not mention germs or bacteria, but simply drew on the 'yuk factor' that makes people feel uncomfortable when their hands, or other people's hands, are dirty. Other incentives for farmers can also include more tangible benefits, such as credit access or improved land tenure.

Another research challenge is that people get ill from eating raw vegetables, from swimming in polluted water and using dirty toilet facilities. For this reason, IWMI also invests in more holistic multiple-hazard projects that analyze and compare risks from various sources and assess the cost-effectiveness of taking different actions. Ultimately, the aim is to advise authorities on how they can best prevent most people from dying or becoming sick at the lowest cost. "If an authority has one million dollars to invest in diarrhea reduction, we want to be able to tell them whether they will be better-off spending their money on controlling beach access, repairing the drinking water supply system, or implementing one or more barriers to improve food safety," says Alexandra.

Source

This Water Issue Brief is based on:

Drechsel, P.; Scott, C. A.; Raschid-Sally, L.; Redwood, M.; Bahri, A. (eds.). 2010. *Wastewater irrigation and health: Assessing and mitigating risks in low-income countries*. Earthscan-IDRC-IWMI, UK, 404 pp. www.idrc.ca/openebooks/475-8/

Related IWMI Publications

Open access (electronic version freely accessible via the internet)

Drechsel, P.; Scott, C. A.; Raschid-Sally, L.; Redwood, M.; Bahri, A. (eds.). 2010. *Wastewater irrigation and health: assessing and mitigating risk in low-income countries*. Colombo, Sri Lanka: International Water Management Institute (IWMI); London, UK: Earthscan; Ottawa, Canada: International Development Research Centre (IDRC). 404p.

Hussain, I.; Raschid, L.; Hanjra, M. A.; Marikar, F.; van der Hoek, W. 2002. *Wastewater use in agriculture: review of impacts and methodological issues in valuing impacts*. Colombo, Sri Lanka: International Water Management Institute (IWMI). 60p. (IWMI Working Paper 037)

IWMI (International Water Management Institute). 2003. *Confronting the realities of wastewater use in agriculture*. Colombo, Sri Lanka: International Water Management Institute (IWMI). 6p. (IWMI Water Policy Briefing 009)

Raschid-Sally, L.; Jayakody, P. 2008. *Drivers and characteristics of wastewater agriculture in developing countries: results from a global assessment*. Colombo, Sri Lanka: International Water Management Institute (IWMI). 29p. (IWMI Research Report 127)

Citation:
International Water Management Institute (IWMI). 2010. *Wastewater use in agriculture: not only an issue where water is scarce!* Colombo, Sri Lanka: International Water Management Institute (IWMI). 4p. (IWMI Water Issue Brief 4). doi: 10.5337/2010.217

Keywords: urban areas / wastewater irrigation / health hazards / best practices

Content Contributors: Pay Drechsel, Theme Leader, Water Quality, Health and Environment; and Alexandra Evans, Strategic Science Uptake Coordinator

Credits: Managing Editor: Terry Clayton; *Editing*: Mahen Chandrasoma; *Layout*: Sumith Fernando

International Water Management Institute

All IWMI Publications are available online free of charge at www.iwmi.org/Publications
Comments and questions are welcome. Please contact us at: IWMI-Publications@cgiar.org
Publications Unit, International Water Management Institute, PO Box 2075, Colombo, Sri Lanka
Tel: +94 11 2880000 Fax: +94 11 2786854

www.iwmi.org

Improving the management of land and water resources for food, livelihoods and the environment

IWMI Celebrating 25 years 1985-2010