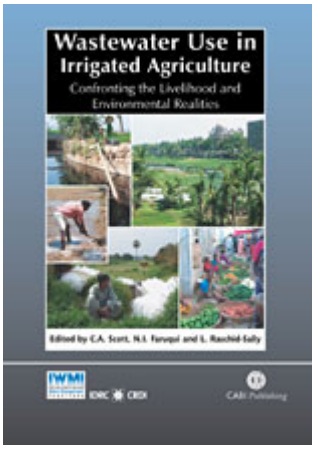
Global Approaches to Urban Wastewater Use in Irrigated Agriculture



2005-05-27

Liza Linklater

It is estimated that up to one-tenth of the world's population eats food produced using wastewater. As populations continue to grow and more freshwater is diverted to cities for domestic use — 70% of which later returns as wastewater — the use of wastewater is certain to increase, both in terms of the areas irrigated, and in the volumes applied.

-- From *Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities*, edited by Christopher Scott, Naser I. Faruqui, and Liqa Raschild-Sally, a joint CABI / IWMI / IDRC publication, 2004.

Although a common and often ancient practice, the use of urban wastewater — often untreated or inadequately treated — in irrigated agriculture is receiving fresh attention because of the increasing scarcity of clean water resources and the growing volumes of urban wastewater in developing countries. Some estimate that more than 20 million hectares in 50 countries are currently irrigated with urban wastewater.

Urban wastewater comes from domestic sewage (blackwater: from the toilet, i.e. human waste, and greywater: from kitchen and washroom sinks, showers, and laundry); from commercial establishments and institutions, including hospitals; from industry; and from stormwater and other urban runoff.

A new book, *Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities*, co-edited by Christopher Scott, Naser I. Faruqui, and Liqa Raschid-Sally, brings together a series of peer-reviewed papers to identify and expand on the issues at the centre of the debate around this practice. This publication grew out of a November 2002 workshop held in Hyderabad, India, co-sponsored by the International Water Management Institute (IWMI) and the International Development Research Centre (IDRC).

According to Naser Faruqui, Team Leader of the Urban Poverty and Environment Program Initiative at IDRC and one of the book's editors, the purpose of the book was to integrate work

addresssing different sectors — like water supply and sanitation, agriculture, and irrigation — to help confront the problems of food insecurity and water scarcity in the developing world.

The book's contributors describe the reality of wastewater use in agriculture in several developing countries. They suggest a classification of different types of wastewater (direct, indirect, treated, untreated, planned, and unplanned), stress the necessity of taking a livelihood-based approach focusing on farmers, emphasize the need for pragmatic public health guidelines, and present an analysis of the cost-effectiveness of treatment required to meet these guidelines.

It is unrealistic to insist that only conventionally treated wastewater be used in irrigation. Treatment technologies used in industrialized countries tend to be unsustainable in the South in part because of the high costs associated with them.

Effective, lower-cost, decentralized natural treatment systems do exist and have been developed in several countries. For example, wastewater stabilisation ponds are used in the Middle East to remove pathogens from wastewater. Natural ponds are used in Viet Nam. IDRC-supported aquatic treatment systems using water lettuce in Dakar, Senegal, and duckweed in Palestine that naturally remove impurities from the water have shown encouraging results.

As Faruqui points out, "You can't rely solely on treatment or guidelines; you have to concurrently apply a number of strategies that collectively will protect people's health and livelihoods. You may need to start with a lower standard in order to partially treat wastewater. You can then progressively phase-in better treatment. You can also reduce the risks associated with using wastewater for irrigation, by encouraging farmers to wear protective clothing and consumers to wash and cook vegetables thoroughly and to disinfect produce using a mild bleach solution. These approaches are already common in a number of countries, including Mexico for example.

There are also ways to minimize the threats posed by wastewater. Irrigating with watering cans or through flood irrigation increases the possibility of produce becoming infected or providing breeding habitat for intestinal parasites. But these threats can be minimized by applying wastewater directly to the root zone of the plant. Finally, restricting the types of crops to be grown can greatly reduce risks — for example fodder crops, fruit trees, and vegetables eaten cooked, can much more safely be irrigated using wastewater than salad crops that are eaten raw."

A major concern raised by all the book's contributors is the need to balance the public health impacts on consumers with that of poor farmers to earn their livelihoods by using wastewater to grow crops.

Field-based studies in Asia, Africa, the Middle East, and Latin America demonstrate the wide range of wastewater use practices, as well as societal/cultural differences, which confirm the ineffectiveness of recommending a single, rigid management approach to this issue.

Benefits — livelihoods and nutrients

The book illustrates in a definitive way that using wastewater in urban and peri-urban agriculture contributes more to farmers' livelihoods and food security than is commonly understood. "Some farmers would be unable to earn a living without using wastewater, while the increase in income for others has lifted them out of poverty," says Faruqui.

In a study of two Pakistani communities, results showed that wastewater farmers earned approximately US$330/year more than farmers using fresh water. Faruqui adds that "Rent for land used for irrigating with wastewater is six or seven times higher than for land using fresh water."

This is because three, as opposed to less than two, crops a year can be harvested from wastewater-irrigated fields as a result of the greater availability and high nutrient (natural fertilizer) value of wastewater. In Pakistan, 26% of the vegetables produced are grown using wastewater. In this country, the relative risks to consumers are lower than in other countries, because most of the vegetables irrigated, such as eggplant, are eaten cooked. In contrast, the risks to farmers are high — farmers using raw wastewater for irrigation are five times more likely than those using canal water to be infected by hookworms.

According to Faruqui, wastewater use in irrigation can have positive health impacts. “For example, a farmer who is able to afford more fresh fruits and vegetables with the income generated from the sale of his produce actually improves the nutrition of his children.” He cited a Tanzanian study wherein children of families involved in wastewater irrigation were better able to fight off malarial infections because they had better nutrition. The families also had more money to buy mosquito nets to protect themselves.

Health risks and environmental impacts

“While wastewater use in irrigation is a potential solution to the problem of scarcity and a bonus to the livelihood of farmers, it also carries potential health risks for farmers, crop-handlers, and consumers who eat the produce,“ says Faruqui. In fact, 60% of farmers using raw wastewater in Senegal are plagued with intestinal parasites. Farmers who use a combination of wastewater and groundwater have a lower infection rate of 40%.

The issue of insecure land tenure is also crucial in developing countries because it diminishes the likelihood that farmers or governments will invest in safer and more efficient wastewater irrigation technologies. Faruqui explains that “When poor farmers don’t have title to the land, they don’t invest in simple, safer irrigation methods like the drum-and-bucket drip or trickle methods where wastewater is applied directly to the root zone, or even in gloves or footwear to protect themselves from health risks.“

Health risks occur among those who consume raw vegetables irrigated with untreated wastewater (the risks are far less serious if vegetables are cooked) as well as to the farmers and irrigation workers exposed to untreated wastewater. Faruqui adds that “Risks to the public come from bacteria and viruses contracted after consuming produce that wasn’t washed properly.”

As for environmental impacts, water polluted with industrial effluents contaminates both soil and groundwater, weakening the sustainability of the natural resource base over the long-term. The book’s contributors state that in order to minimise health and environmental effects from toxic substances, “industrial wastes should be adequately pre-treated to remove chemicals, or should be treated separately from municipal wastewater and excreta.” And even if the wastewater is treated, there can be eventual damage to the soil itself.

Future focus

A debate is needed on the levels of risk that may be acceptable to producers and consumers of wastewater irrigated crops and their costs and benefits.

“We find that people are largely unaware of the magnitude of wastewater irrigation and a better estimate of the extent of its use is needed,” notes Faruqui. Moreover, increasing year-round demand for fresh produce in industrialized countries, as well as the growth of tourism in the South have made wastewater use an issue for more than developing countries.

Faruqui concludes by saying that the book has confronted the urban wastewater issue and “has already started to influence policy: a project is being developed to help revise the current strict 1989 World Health Organization (WHO) guidelines and standards. Emerging guidelines are recommending a holistic approach based on each country’s individual social, cultural, technical, economic, political, and environmental circumstances. They are also looking at the effects of other health interventions such as hygiene promotion, adequate drinking water, and sanitation. In so doing, they are aiming to make sure that each dollar spent on health protection is applied to the measure that will have the greatest impact.

Liza Linklater is an Ottawa-based writer and editor.

For more information:

Naser Faruqui, Team Leader, Urban Poverty and Environment Program Initiative, IDRC, PO Box 8500, Ottawa, Ontario, Canada K1G 3H9; Phone: (613) 236-6163, ext. 2321; Fax: (613) 567-7749; Email: nfaruqui@idrc.ca