

12. The way forward: Health risk management in low-income countries¹

This chapter describes various options of an integrated approach how health risks for consumers could be reduced in the context of low-income countries, like Ghana. It also concludes that the new WHO guidelines for wastewater use in agriculture have a higher application potential in the context of urban farming than the previous ones.

12.1 Applying international guidelines

In West Africa, the political recognition and sustainability of irrigated urban and peri-urban vegetable farming is mostly constrained by the use of polluted irrigation water (Drechsel et al., 2006a). Fragmented attempts have been made to improve the nexus among poor sanitation, urban farmers, and the potential health risk to consumers, mostly by relying on technical solutions (wastewater treatment) or regulatory measures (such as banning wastewater irrigation). Both approaches have failed like in other low-income countries. The best approach so far, to reducing health risks was provided by the WHO guidelines for wastewater use in agriculture (WHO, 1989). However, the application of the 1989 guidelines has been found to be difficult, especially in relation to urban agriculture:

- i. In many low-income countries, like Ghana, wastewater treatment as expected by the guidelines is not possible due to a variety of (mostly economic) reasons. The enforcement of the guidelines in such situations would stop hundreds or thousands of farmers irrigating along increasingly polluted streams and put their livelihoods at risk. Restrictions would affect also food traders and the general market supply with perishable crops, especially in cases where other water sources are (seasonally) unavailable.
- ii. It is similarly difficult to apply in market-oriented vegetable production the recommended additional/alternative health protection measures. Where highly specialized farmers cultivate cash crops according to market demand, crop restrictions would immediately threaten farmers' livelihoods. Also changes from vegetables cash crops to fruit tree cash crops appear unrealistic due to low tenure security in urban areas. Recommendations to change irrigation systems or cease irrigation before harvest

¹ This chapter was written at the same time as IWMI Policy Brief 17 (IWMI, 2006), thus both show overlap. <http://www.iwmi.cgiar.org/waterpolicybriefing/files/wpb17.pdf>

have equal limitations (see Chapter 8) or do ignore that e.g. lettuce would lose its fresh appearance and market value already after a few days without watering.

Based on these difficulties, it was suggested during a consultation in Hyderabad, India, in November 2002 that the WHO guidelines need adjustment for better application in wastewater exposed urban and peri-urban agriculture in resource-poor countries. The overall goal should be to find a better balance between safeguarding consumers' (and farmers') health and safeguarding farmers' livelihoods. The corresponding 'Hyderabad Declaration on Wastewater use in Agriculture' was signed by representatives of a number of institutions including the WHO and IWMI (<http://www.iwmi.cgiar.org/home/wastewater.htm>) and has been recognized in the new WHO guidelines (WHO, 2006) and by EPA-USAID (2004).

12.2 The new WHO guidelines

The new WHO (2006) guidelines are more flexible and develop further the concept, which considers wastewater treatment as only one component of an **integrated risk management strategy**. To reduce risk from pathogens, the components focus on health-based targets, and offer planners various combinations of locally possible risk management options for meeting them. These options go beyond those suggested in the previous guidelines and have to be used in combination as their impact, for example, on pathogen die-off varies (Table 12.1).

Table 12.1: The effectiveness of selected health-protection measures that can be used to remove pathogens from wastewater (irrigated crops) (WHO, 2006, modified)

Protection measure (examples)	Pathogen reduction (log units)
Wastewater treatment (to different degrees)	1-6
Localized (drip) irrigation (with 'low-growing' crops, e.g. lettuce)	2
Localized (drip) irrigation (with 'high-growing' crops, e.g. tomatoes)	4
Pathogen die-off on the surface of crops after the last irrigation	0.5-2 per day
Washing of produce with clean water	1
Disinfection of produce (using a weak disinfectant solution)	2
Disinfection of produce (using one part vinegar on two parts water)	5
Peeling of produce (fruits, root crops)	2
Cooking of produce	6-7

The guidelines themselves are based on the Stockholm Framework, which suggests that countries should adapt guidelines to their own social, technical, economic, and environmental circumstances. The Stockholm Framework also mentions the concept of “**relative risk**”, which requires that one considers all possible sources of risk and exposure when setting guidelines. These would include risks related to poor water supply, sanitation, and other sources of (e.g. post-harvest) food contamination. For example, if contaminated drinking water or lack of toilets causes high background levels of illness in the population, then a costly treatment of wastewater for crop application, is not likely to improve public health, and should not be the priority investment in countries where funds are limited. Wastewater use guidelines can be made more stringent when the relative risk factors change, i.e. when water supply and sanitation improve. Decision-makers are thus encouraged to look at the larger nexus of water-sanitation and health and their interconnections.

12.3 Prioritizing risk management strategies

The **long-term** goal of integrated wastewater management will always be to move from the unregulated use of untreated wastewater to the regulated use of treated wastewater. Depending on local possibilities, the level of treatment, however, can vary if a complementary health risk reduction strategy is in place as explained in the new WHO guidelines. This flexibility is appropriate, as long as in most low-income countries, provision of sanitation infrastructure continues to lag far behind the urbanization rates.

Thus even where no wastewater treatment is available, health risks can still be reduced. A simplified decision making process that can be used for identifying locally appropriate **intermediate** health protection measures and entry points for action along the “farm to fork” pathway is shown in Figure 12.1.

The different options have different timeframes for implementation (Table 12.2). The highest priority in the **short-term** should be to minimize the daily risk to consumers and the potential of epidemics, which is possible also with modest investments, like through awareness creation for appropriate vegetable washing and hygiene. In the supply of lettuce in Accra, for example, less than 1000 urban farmers produce salad consumed everyday by 200,000 urban dwellers. In other words, over a 2 to 3 day period, at least one of four urban citizens benefits from urban and peri-urban irrigation, but at the same time is at direct risk from crop contamination with pathogens.

The **medium-term** strategy should be to apply the most effective intermediate solutions while making gradual progression towards the long-term goal of wastewater treatment before use. Helping farmers reduce crop contamination or improve water quality before application through on-site treatment is a possible medium-term goal.

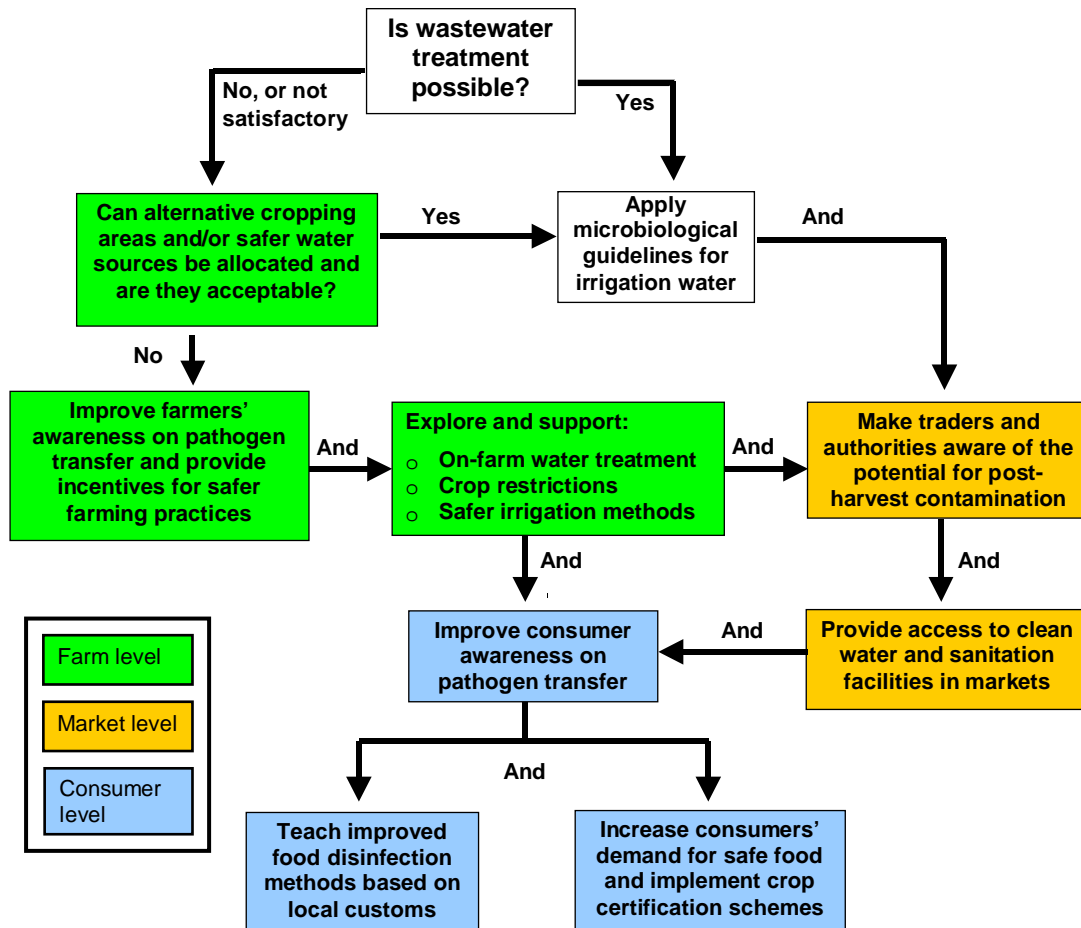


Figure 12.1: An example of a decision-making process that can be used to identify locally appropriate entry points to protect consumers' health, where municipal wastewater treatment is not a realistic option in the short or medium term, and polluted water is used to irrigate vegetables in and around cities (Adapted from Drechsel et al., 2002).

12.4 Intermediate options for risk management

The philosophy behind the intermediate options is that

- every degree of risk reduction saves lives and money, and is better than none where the desired technologies cannot (yet) be adopted;

- related costs are likely to be low in comparison with the construction and operation of conventional wastewater treatment plants, not to mention the costs of mitigating or recovering from any wastewater related epidemic; and
- water and food related health risks require in any case a comprehensive approach, as wastewater is **not** the only source of food contamination.

Table 12.2: Components of an integrated approach for health risk reduction for less developed countries and timeframes for implementation (Faruqui et al., 2004, modified)

Recommendation	Timeframe
1. Treat produced wastewater and control volumes and contaminants at source and monitor water quality	Long term
2. Develop local guidelines based on appropriate intermediate risk management options, if possible used in combination:	
§ Increase public awareness	Short to medium term
§ Promote hygiene and safer vegetable washing in the kitchen	Short term
§ Allocate farm areas with safer water sources	Short to medium term
§ Provide incentives for on-farm risk reduction	Short term
§ Use safer irrigation methods	Short to medium term
§ Restrict the types of crops grown	Short term
§ Reduce risk of post-harvest contamination	Short to medium term
§ Minimize farmers' exposure	Short to medium term
§ Prevent and treat infections (e.g. anti-worm campaigns)	Short to medium term
§ Improve institutional coordination	Medium to long term
§ Increase donor and state funding to support sanitation and introduce applied cost-sharing models	Short, medium and long term
3. Conduct accompanying research on local food safety and the relative and absolute risks of wastewater use, on related stakeholders perceptions, and identify opportunities and constraints to the adoption of locally applicable options.	Short to medium term

a) Explore alternative farmland and safer water sources

Authorities could reduce farmers' and consumers' health risks easily if they provide the concerned farmers in urban and peri-urban areas with safer water sources. In Cotonou, Benin, for example, the authorities recognized the contribution of urban agriculture and allocated new pieces of land to urban farmers outside the city with unpolluted shallow groundwater In

Accra, the Ministry of Food and Agriculture is exploring options for groundwater use in urban agriculture areas currently irrigating with water from city drains.

b) Promote safer irrigation methods

In many parts of the world and Sub-Saharan Africa in particular, most farmers use watering cans, which require only little investment. However, this method increases crop contamination, especially of leafy vegetables through spraying of droplets on the leaves. Irrigation techniques, which apply water to the root zone (such as a wastewater adapted drip irrigation) are much safer and use less water. Reducing crop contamination by ceasing irrigation a few days before harvest to allow for pathogen die-off is a recommendation that can be applied only to vegetables, which are less sensitive to water loss.

Ongoing research by KNUST and IWMI shows that with simple changes in shallow well construction, water collection and application, even using watering cans, the amount of suspended material and number of worm eggs in irrigation water can be reduced significantly (Keraita et al., forthcoming). Similar possibilities exist to address crop contamination from other sources, like fresh poultry manure or already contaminated soil. Participatory on-farm research targeting farmers' perception of such innovations and related changes in labor allocation is critical for understanding which 'best practices' with their corresponding risk reduction rates have the highest adoption potential in a given context. For the institutionalization of safer practices, the extension services have to be fully involved in any project and equally trained.

c) Influence the choice of crops grown

When irrigation projects are centrally managed, and when laws are strongly enforced, it is possible to introduce restrictions to ensure that wastewater is not used to irrigate high-risk crops, such as leafy vegetables that are eaten raw. Research in Mexico, Chile and Peru has shown that this is possible but it is only successful when the crops allowed under the restrictions are of similar profitability, i.e. in high demand. It is doubtful that such an approach would be successful in the context of Ghana. However, public awareness campaigns (e.g. through the media) might steer consumers' demand for safer crops, and influence farmers' decision making.

d) Avoid post-harvest contamination

Health risk reduction measures should not only focus on improving irrigation water quality. Post harvest contamination might occur during transport or in markets². This is due to poor sanitation facilities and lack of water supply for personal hygiene as well as washing and “refreshing” of vegetables. Displaying vegetables on the ground instead of on tables is an additional source of contamination. It is important that authorities do not overlook well established but often officially ignored informal vegetable markets in their effort to improve cleanliness in markets.

e) Promote incentives for adoption of on- farm risk reduction measures

Feeling secure about land allows farmers to invest in mitigation measures at the farm level. Most urban and peri-urban farmers in many countries occupy/squat on public lands or are tenants on lands owned by others and have no tenure security. Where policy reforms can provide greater (formal or informal) tenure security, farmers are more likely to invest labor and capital in irrigation infrastructure, such as drip or furrow irrigation, which reduces crop contact with wastewater. More tenure security would also allow simple water storage reservoirs to be built on farmers’ land. Storage reservoirs provide basic treatment by supporting pathogen die-off and help to balance irrigation water supply with demand. Credit systems could facilitate such investments.

A certification program for “safer crops” and awards for innovative farmers, etc. are other possible incentives. These efforts have to be strongly supported by the media to increase market demand for safer crops. Although it is unlikely that all farmers will change their practices, some will, which offers the consumer alternatives, and in average a general risk reduction. A bottleneck is wholesale, where vegetables from different sources are usually combined. To avoid that wholesaler sell all as “safer crops”, a monitoring program would be necessary.

f) Increase public awareness of vegetable washing at the point of consumption

An important option for complementary risk reduction is vegetable washing and disinfecting at home and at food outlets, which is a common practice in developed and developing countries. Well-designed awareness programs can have a significant impact on safeguarding public health where treatment technologies cannot be put in place. It does not require large

² In Ghana, post-harvest contamination was not identified as a major issue (Chapter 9).

financial outlays at the consumer level and has a high potential for large-scale risk reduction where pathogen contamination is likely, be it from wastewater irrigation or post-harvest handling. However, washing methods vary between households and countries, and can be very ineffective if not carried out properly (Amoah et al., forthcoming). Food hygiene campaigns could be linked to other hygiene campaigns (e.g. “WASH”) and have to be based on well-understood perceptions of risk and risk mitigation and (if necessary improved) local customs. Programs might involve the mass media, but also target school curricula.

g) Improve institutional coordination and develop integrated policies

Case studies from around the world show that sanitation, agricultural, environmental and health guidelines are usually vested in various agencies, and might overlap or conflict. This is especially the case of urban and peri-urban agriculture, which is most exposed to polluted water sources and often has no official standing in the agriculture sector. Multi-stakeholder platforms are vital to find mutually satisfactory solutions with a high potential for institutionalization.

h) Farmers’ exposure

Last but not least, reducing farmers’ exposure is important. Surveys in Asia and Africa, however, show that farmers do not perceive their own health risks as a priority issue. A reason could be that they face the same or other health risks also from other sources (e.g. lack of toilets and piped water) besides their exposure to wastewater. Protective clothing or other means to reduce exposure seldom finds users, thus more attention must be paid to perception studies to understand farmers’ health and needs and design interventions for awareness creation accordingly.

12.5 Need for further research

One so far uncharted area of research is a comprehensive assessment of the positive and negative *economic* impact of urban agriculture in general and irrigated open-space farming [with raw or diluted wastewater] in particular. The results of such and other analyses could potentially impact the way in which “wastewater agriculture” is viewed by those authorities with the power to support irrigated urban agriculture in Ghana and beyond.

Research is also needed to substantiate and quantify the contributions of open-space farming to other urban development objectives (see table 11.1 in the previous chapter) than food

supply and livelihood support. This could be a crucial step towards official recognition of urban open-space farming and its institutionalization.

In view of health risks related to the use of polluted water, research should continue to explore options for risk reduction at various entry points including safer irrigation practices with a high local adoption potential. This includes the analysis of perceptions of risks and risk mitigation of the concerned stakeholders, and a quantification of the relative and absolute risk of wastewater use in the local context of developing countries from both farmers' and consumers' perspective.

From the technical angle, simple technologies are needed to improve land and water productivity where water is scarce or labor in short supply. Emphasis should also be placed on options to treat chemically polluted wastewater before it enters the domestic wastewater stream used for irrigation as well as on low-cost options for farm-based systems, which conserve nutrients of value for agriculture while removing pathogens.

A final note of caution: Over the years, the “wastewater topic” has attracted the interest of many scientists and students working on sanitation and/or urban agriculture, including those affiliated to IWMI. Today, many urban farmers, especially in Accra, are experiencing what we might call ‘survey fatigue’ and are asking for less analysis but more concrete follow-up to improve their situation. Thus research has to move on from baseline surveys to concrete action for changes on the ground.