



***Third edition of the Guidelines for the Safe Use of Wastewater,
Excreta and Greywater in Agriculture and Aquaculture***

Fact Sheet for Farmers and Extension Workers

Stakeholder Group and Relevance

The WHO Guidelines are intended to help farmers to choose best practice options for the use of different types of wastewater or excreta in their production systems. “Best practice” refers to the best way to minimize compromising their own health, the health of their families and the health of the consumers of their produce. Farmers and extension workers are therefore at the frontline for the successful implementation of the WHO Guidelines.

The Guidelines address two important groups of agricultural inputs which many farmers around the globe use for good reason: wastewater and excreta. In water-scarce areas they provide a reliable water source for irrigated crops. And in all areas they are an affordable alternative to fertilizers (crops) and fish feed (aquaculture). Wastewater refers to water that has been used in different settings for different household purposes: from kitchens, bathrooms, from a broken sewer pipe or taken from a river heavily polluted with the human waste from an upstream settlement.

The Guidelines consider farmers as an important group at risk from the use of wastewater. Besides farm owners this vulnerable group includes fieldworkers actively involved in using these resources, and members of their family. The Guidelines are not limited to any farm size, farming system or geographic location: They are as relevant to an urban vegetable farmer in Dakar, Senegal, irrigating his vegetables on half an acre, as they are to farmers in the 3800 ha wastewater-fed fish complex in Calcutta, India, to the thousands of farmers using human excreta in China and to the Swedish home gardener using kitchen water and urine for his crops. They apply to farmers in formally recognized wastewater irrigation schemes in, for example, the USA, Jordan, Israel and Tunisia, as well as to farmers involved in informal irrigation like in urban and peri-urban areas where watering cans are the main utensils.

The risk and your role

Although wastewater and excreta are important farm inputs as sources of water and/or nutrients, they also contain harmful contaminants, which are mostly invisible. These can be germs (pathogens) like viruses, bacteria and parasites, as well as eggs of intestinal parasitic worms or chemical contaminants such as heavy metals. Without proper management, wastewater and excreta can cause harm to the farmer, his/her family and community and those handling and consuming the irrigated crops or waste-fed fish, especially if these are eaten uncooked.. The resulting infections can range from simple diarrhoeal disease to typhoid, cholera or amoebic dysentery, to mention only a few important diseases. Farmers often get directly exposed to pathogens through contact with irrigation water or excreta. Worm infections, in particular, pose a large risk to farmers or children passing agricultural

fields where wastewater and excreta are used. Other groups whose health is at risk from such infections are those who handle, market and ultimately consume the produce.

The good news is that these health risks can be minimized or even eliminated. In industrialized countries, wastewater treatment is doing a large part of this job. In most developing countries, where functional wastewater treatment facilities are rare for economic and financial reasons, other or at least additional barriers for the pathogens have to be put in place to manage the health risks. Farmers have an important role to play as they can manage their irrigation water and adopt their cropping system in ways that reduce risks for them and others. Extension workers have an important role in bringing relevant information from the Guidelines to the farmer level, and in assisting farmers to implement them.

The Guidelines strongly support farmer action, if possible in combination with other locally appropriate risk reduction measures. Farm measures include simple on-farm treatment of wastewater and excreta to kill pathogens, the selection of crops which pose less risk for farmers and consumers and safer waste application techniques such as irrigation methods which direct the water to the roots but not to parts of the plants that are eaten. Simple methods that take advantage of the natural die-off of pathogens in the sun by withholding irrigation for some days before harvesting are also among recommended actions. The Guidelines make a case for a variety of measures allowing farmers to protect themselves like wearing gloves and rubber boots, immunization and hand washing, and other post-harvest measures like produce washing before consumption.

Each measure reduces health risks to some extent, but not completely. Thus, as many options as locally possible should be combined and their joint effect adds up to full protection! Not all measures are suitable under all conditions. There is a need for local screening and adaptation to the particular irrigation system, crop and land through field experimentation involving farmers, extension workers and researchers. Where possible, this should be done through Farmer Field School training. Cooperation between farmers and researchers is therefore a necessity in making the Guidelines work. Extension workers are critical in facilitating this cooperation, in creating awareness and in training farmers in safe practices. If well trained, farmers will soon know which safety options might probably fit on a certain farm.

Monitoring and assessment

The process of reducing health risks at the farm level needs constant testing and observations. At farm level, there is an important role for extension agents, assisted by the farmers and back-stopped by researchers with access to laboratories and computers. Monitoring and assessment of a programme of interventions is done in three steps

- 1. Identification of best practices (Validation step):** Although many good practices for risk reduction are known, they have to be validated in the local context. Validation means that measures or procedures are tested for their effectiveness in risk management before they are promoted or implemented. On-farm action research where farmers actively participate in developing (identifying and testing) risk management measures is encouraged. This is a more sustainable approach than prescribing any particular method or using controlled conditions in station experiments. On-farm testing allows early adjustments if farmers express strong concerns, for example, in terms of an unacceptable

additional burden or unacceptable economic implications. Possible risk reducing measures should be validated in different locations, production systems and farming seasons.

Three examples:

A) Stopping irrigation several days before harvest to allow natural pathogen die-off can be implemented in a cooler season or climate but makes leafy vegetables look unfit for sale under hotter conditions.

B) In some countries, like India or Kenya, drip kits are easily available while in others, they are rare.

C) Depending on local diets and market demand, some farmers have the option to change crops, while others are constrained in this respect.

For farm-based methods, validation can be done of the effectiveness of the treatment process or changed irrigation practice in terms of removing pathogens. Indicators of change can be analysed in the irrigation water or on the irrigated crop. The analysis requires a laboratory in the vicinity of the farm as the samples have to reach the laboratory in a short time under cool conditions.

On-farm, it is recommended to run a 'control' run in parallel, with farmers continuing to use their common practice, and not a "before vs. after" comparison as the quality of wastewater can change over the day and between days and seasons.

2. Operational Monitoring: This step also involves the farmer. It includes planned observations and measurements to assess whether the management measures introduced on-farm are adopted and working properly. It is important to first decide how often the monitoring will be done and which parameters should be used. This should be done in a way that is both easy and effective, avoiding an additional burden to farmers or extension officers.

The main monitoring practice is observation: for crop restrictions or protective clothing, for example, this can be done by reporting on the crops grown or the use of rubber boots. Whenever farmers do not comply with the agreed measures, extension officers should analyse with the farmer the reasons and move back to Step 1 to test modified or different risk reduction measures. When farmers use the introduced practices routinely, laboratory analyses are the preferred option to monitor the performance of the new measures. Where no laboratory is nearby or money for the tests not available, also local indicators for testing water quality, like smell and water appearance, are possible. These parameters need to be validated first, however. Generally, operational monitoring should be based on simple and rapid observations or tests. It should be done in such a way, however, that it provides statistically meaningful information, which requires regular observations.

3. Verification: This step aims to measure to what extent the introduced practices really protect health or reduce health risks, be it for farmers or consumers. For example, if the target was to reduce the frequency of diarrhoea in the farm community, the verification can be done by monitoring the cases of diarrhoea in selected farm families, compared with data from the previous month(s) or year, or with those of a control group. Generally, if the verification fails, then the system will need modification or revalidation (back to Step 1).

Farming with wastewater and excreta, and the environment

Wastewater and excreta are attractive farm inputs as they are easily available and can greatly improve productivity, be it in crop or fish production. This is partly due to their high nutrient levels. They are rich in organic matter which improves soil structure and fertility. In short, waste recycling in agriculture obviously reduces amounts of human waste discharged directly into the environment. In this sense, like irrigated rice fields, many forms of wastewater use may be considered as a productive land improvement and water treatment process, a win-win situation for all. However, improper management of nutrients by farmers can similarly lead to negative environmental impacts, reflected in less than good agricultural production. For instance, applying high concentrations of nitrogen on farms over longer periods can lead to reduced fruit size and quality, while making plants more prone to pest attacks and less resistant to diseases. Some nutrients and pathogens can be easily transported through soils and may contaminate aquifers, affecting the quality of groundwater. Depending on climate and wastewater source (domestic or industrial) continuous agricultural use of wastewater can also lead to accumulation of salts and heavy metals in soils. This can lead to reduced agricultural productivity. When such substances are taken up by edible plants (the uptake capacity varies from crop to crop) this can lead to negative health impacts. In such cases, farmers should use salinity control practices such as salt leaching and proper drainage. High levels of organic matter in irrigation water can also lead to clogging of soil pores (therefore affecting soil structure) or clogging in drip irrigation emitters or sprinklers, and this will need special attention.

Socio-economic considerations

It is important for farmers to explain to researchers and authorities their socio-cultural perceptions and understanding of health risks related to wastewater and excreta use, and their economic considerations related to any suggested change in their farming practices. Farmers should also try to understand the beliefs and perceptions of their clients in view of wastewater or excreta grown fish or crops. These beliefs, perceptions and economic implications can strongly vary from one place to another. For farmers the economic viability of their farming activities under the various possible risk management regimes is critical. Some practices do only involve a limited amount of more labour, while the return can be better options for “safer produce” marketing. Creating marketing channels for safer produce should be a lobbying objective for farmers and their extension officers in order to achieve higher market returns and enable more farmers to implement safer risk management practices.

Involvement in policy processes

In many developing countries, the productive use of wastewater and excreta is still regarded as an informal or illegal activity, although it may be common practice, like in those areas where nearly all peri-urban water bodies are heavily polluted. The reason for the low formal acceptance is often the lack of knowledge of risk-reducing measures like those promoted in the Guidelines or the lack of knowledge to implement them. Farmers using these resources are often without a lobby among government officials and hardly involved in policy formulation processes. To enhance their recognition farmers need to be better organized and, for example, form umbrella associations linking individual farmer associations in a city and across different cities. Farmers could then appeal to local authorities to provide safer irrigation water or to improve wastewater treatment or to e.g. FAO to support them with Farmer Field Schools on safer irrigation practices. Indeed, farmers should actively endeavour to participate in developing and implementing location-specific health protection measures. This can open new opportunities for marketing and at least reduce the risk of conflicts with authorities. Extension workers should assist farmers by promoting safer irrigation practices or on-farm water treatment and incorporate relevant issues in formal national training modules to reach more farmers. This should lead to institutionalization of health protection measures and review of existing policies to achieve a stronger support for the implementation of the Guidelines.

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