



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

## **Fact Sheet for the Research Community**

### **Overview of the stakeholder group**

Researchers play a critical role not only in the conduct of primary research whose outcomes provide the basis for the Guidelines, but also in the search for feasible ways to implement the guidelines. Epidemiologists, public health scientists and (micro-)biologists play a critical role in identifying health hazards, pathways through which farmers, their families and consumers are exposed to these hazards, and the level of risk associated with these pathways.. Strong biophysical science needs to be corroborated, however, with social science – research conducted by geographers, anthropologists, economists and sociologists – in order to find acceptable ways to communicate research findings, as well as to understand drivers of change that would facilitate the implementation of solutions.

The third edition of the Guidelines offers the latest evidence for the development of policies and programmes, but also presents areas and issues for which renewed efforts in research are needed.

### **Synthesis of the problem**

Food production involving wastewater affects farmers, their families, marketers and consumers. Each of these stakeholder groups is exposed to some type and level of risks associated with wastewater use. Farmers use different types of irrigation that affect how much direct contact they have with contaminated water. Meanwhile, at the marketplace, food sellers and buyers may be exposed to pathogens at increased levels when handling food grown with wastewater. At the household level, risks can be reduced through simple washing techniques and good food handling practices.

The main challenge for researchers is to offer **evidence of the benefits and health risks associated with wastewater use** so that appropriate measures can be taken to enhance the former and mitigate the latter. This includes looking the food production – consumption chain with a view to identifying hazards and risks at different steps and finding effective barriers to minimize these risks. In short, a main research priority is to ask what are locally feasible exposure control strategies for farmers? Product handlers/vendors? And consumers?

The Guidelines necessarily address a global audience, yet they encourage a response that should be context/country specific. Waste use practices for agriculture and aquaculture are determined by the socio-economic context within which the practice takes place. Moreover, the capacity to respond to some of the challenges and risks posed by waste use are determined by the availability of human and financial resources. In countries where resources are limited, research must be tailored to find an adequate way to provide policy responses that are feasible, cost effective and can maximize the reduction of risk to different stakeholders.

The Guidelines outline the requirements to establish health-based targets for different country contexts by proposing the *Stockholm Framework*. The question that arises is how research conducted in resource-constrained environments can ensure an appropriate quantitative microbial risk assessment (QMRA) is carried out, rigorous enough to be used by policy makers. This requires capacity building efforts to focus on training students and researchers in improved data gathering methods; and: more effective partnerships between institutions with experience and access to resources and those with more limited access.

Where possible, technical research priorities need to be designed in collaboration with stakeholders who are intended to benefit from it. This means **consultation and partnership** should be worked into the research development process. This is particularly true in some developing countries where extractive research has led to communities rejecting well-intentioned researchers due to poor previous experiences.

The communication of research findings to policy audiences is difficult and frequently poorly done so the engagement of communications specialists is an important part of change-oriented research. One way of conceiving of how research can influence agendas is to build a “knowledge pyramid” (figure 1) whereby raw data is synthesized and improved through different levels of review. At the top of the pyramid are the products that are most likely to resonate with decision makers together with results that are based on a scientifically rigorous process.

Policymakers will be sensitive to the source of research information. Credibility is key to having an impact on policy, and partnering with the right research institution will help enhance credibility. Agricultural policymakers will be more easily convinced by information coming out of a well-reputed agricultural research centre than by information generated by a health research institute.

### **Monitoring and assessment**

Research plays a critical role in establishing the basic system of monitoring and assessment required to develop appropriate policy. Pilot project-based research is critical for the successful implementation of the Guidelines. Research should follow three steps:

1. Validation (testing a new process for its capacity to cope with risk management, treatment, non-treatment options)
2. Operational monitoring (the collection and treatment of data from pilot projects)
3. Verification (ensuring that the integrated risk management approach achieves the health-based target)

This kind of work should be carried out by national institutions, universities or other research centres. International backstopping can play a support role, but the primary research should be locally driven. One way to do this is by establishing pilot projects that are appropriate to the context of waste use in a particular country. For instance, in countries where raw wastewater use is common and treatment not feasible in the near term, pilot projects can be simple and focus on minimizing contact between farmers and contaminated water.

All research must be developed with policy change in mind. Evidence-based policy developed in countries where a management framework for wastewater use exists (e.g. Tunisia, Jordan) can serve as an example for other countries where it does not.

Research can support the development and management of monitoring frameworks based on the use of common typologies to identify different types of wastewater and their sources. A common language about the origins of wastewater and how it is used would serve to ensure that research is building on existing frameworks without being redundant.

The Guidelines offer a risk management plan (figure 1) whose different elements, from the hazard assessment through to how to document and communicate risk mitigation, entail the need for information. This risk management plan is the starting point for pilot research aimed at finding practical solutions for farmers, consumers and others to apply.

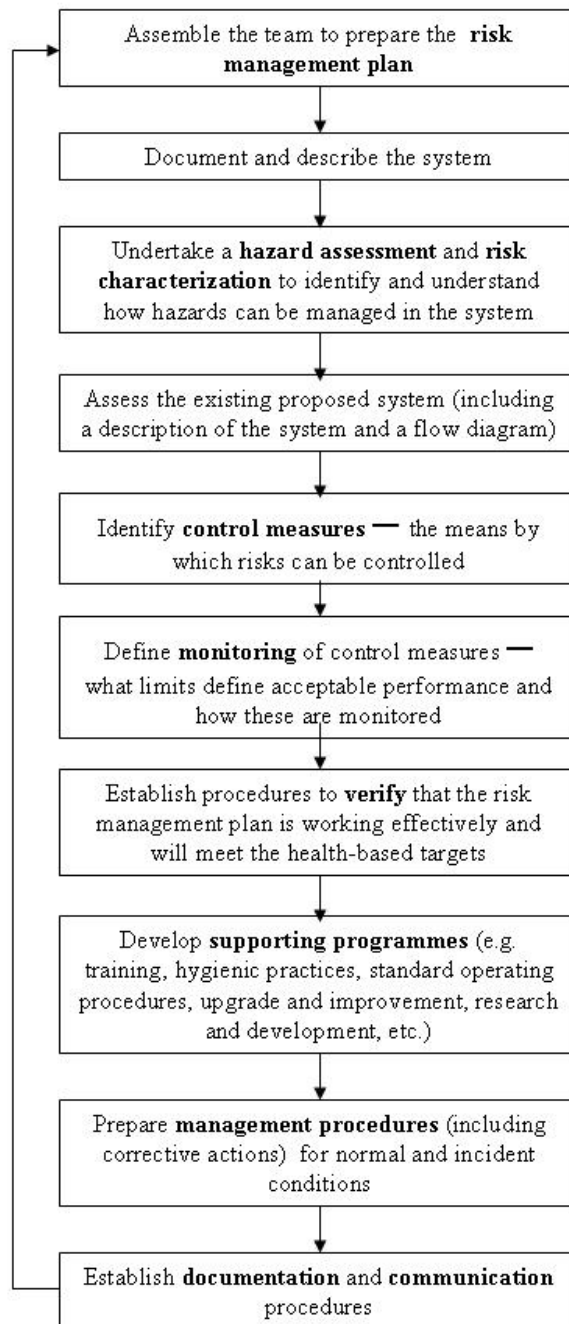
Coming up with a framework for policy and behavioural change is not always adequate since it can be trumped by entrenched political and social interests. An area of significant need in terms of research is to look at the application of the guidelines in complex multi-organizational policy environments. Human and organisational behaviour change is complex and fluid. Social science research can answer questions related to behavioural change and some monitoring systems exist to track change over time (“outcome mapping” is one such method).

Highly mechanized agriculture and labour intensive agriculture involve different irrigation scenarios requiring a different set of research. In the latter scenario, more typical of developing countries, farmers are faced with more frequent and direct contact with wastewater. This increases their risk of exposure. Current research in Ghana, Jordan and Senegal is exploring culturally feasible and appropriate ways to manage these risks through contact avoidance, simple irrigation schemes that minimize exposure (drip irrigation, bed and furrow), and the use of gloves and boots. Research cannot overemphasize the importance of farmer engagement when proposing solutions since many “obvious” solutions are frequently ignored by farmers.

### **Environmental considerations**

Wastewater is an important source of nutrients and water for farmers, especially so in semi-arid and arid climates. Excessive application can lead to nutrient overloading with negative environmental impacts. Many of these environmental impacts can be reduced through good agricultural practices; these are, however, highly dependent on the context.

Research into effective training (the FAO led Farmer Field Schools) can help to minimize the negative environmental impacts on farmers, soil and downstream water resources. One gap is the limited research that has been done on the impact of waste-fed aquaculture. The importance of this is amplified by the high returns associated with fish production in many lower-income countries.



**Figure 1**  
Development of a risk management plan (from WHO, 2006)

**Socio-economic considerations**

The costs and benefits of wastewater use have been insufficiently explored. In some contexts, a large amount of data exists. In many countries, the economic reasoning for why farmers use wastewater, what kind of markets exist for the sale and use of wastewater, and what are the costs of appropriate treatment have, however, not been sufficiently explored. This is especially so in countries where informal wastewater use is common (for example, Africa South of the Sahara).

Research should also play a role in helping to assess the cost-effectiveness of government responses designed to reduce health risks, as compared to NGO or private sector interventions. Low cost and socially acceptable sanitation is still an area that requires further effort notwithstanding a few successful experiences. At a higher managerial level, a better understanding of the role waste plays in agricultural production is needed: source separation of waste, an understanding of waste flows and management options that cover upstream to downstream issues associated with nutrient flows are all areas in need of further work.

**Involvement in policy processes**

All policy must be evidence-based and developed in appreciation of the context in which it will be applied. Researchers frequently do their work irrespective of policy priorities and/or needs. It is important for this problem to be transcended and for researchers to improve their communications with policy audiences since all too often good science is not properly communicated to policy audiences.

An effective long-term strategy for research is to consistently build capacity of younger scientists or those working in resource-constrained environments. Capacity building through doing research builds trust between researchers and the communities with whom they are working.