

# Assessment of Wastewater Irrigation Practices in Selected Cities of Less Developed Regions

## SUMMARY

Project manager :	Liqa Raschid (IWMI)
Collaborators and partners :	IWMI Regional Offices, ICARDA, HR Wallingford for specific inputs, other NRS and NGO partners for country assessments
Total cost of the project:	USD 100,000
Duration of the project:	12 months
Date of submission:	Feb 2004
Location:	Sri Lanka

## BACKGROUND

Agriculture is the largest consumer of freshwater resources, currently accounting for about 70 percent of global water diversions. With increasing demand from municipal and industrial sectors, competition for water will increase and it is expected that water now used for agriculture will be diverted to the urban and industrial sectors. One response to this squeeze on agricultural water supply is to promote greater use of treated urban wastewater for irrigation. Against this it is argued that the total volume of *treated* wastewater available is insignificant in terms of the overall freshwater balance and the volumes that will need to be transferred from agriculture to municipal use. Whilst this may be true in the general case, in the water-short arid and semi-arid zones as with the Middle Eastern and Southern and Northern African regions, Australia and parts of USA, substitution of freshwater by treated wastewater is already seen as an important 'conservation' strategy contributing to the maintenance of agricultural production.

Furthermore, wastewater generation from cities will reach unprecedented proportions in the coming decade with 50% of the population living in urban areas. Annual growth rates in some cities are predicted to be around 5 %. Rural urban migration is contributing to this phenomenon. Disposal of wastewater is becoming an insurmountable issue and one of the goals of the Millenium Development Goals Program is to address the question of lack of access to sanitation facilities and poor environmental sanitation. In seeking solutions it is important to understand the current practices of wastewater disposal and the significance of volumes generated and patterns of disposal. The extent to which such water can be put to productive use in a global context is not clearly understood. It is clear, however, from current knowledge that the significance of its use will be relative to conditions in a country or region, and will be influenced by factors such as availability of water, general economic status of the country (which influences levels of treatment), and socio-economic and cultural parameters at a more local level.

It is also becoming more widely recognised that the use of *untreated* wastewater for the irrigation of high-value cash crops close to urban centres is a widespread practice, that has until recently gone unreported and undocumented. Published information to date from IWMI, IDRC, and DFID case studies on the informal or unauthorised use of wastewater for irrigation suggest that for thousands of poor households in urban and peri-urban areas, untreated wastewater is a highly important productive resource, used in production systems that contribute significantly to the supply of fresh fruit and vegetables to urban markets. (For these poor growers wastewater irrigation is a substantial and sometimes even primary source of cash income. The same studies regularly raise concern over the potential health impacts of uncontrolled wastewater use on both the growers and consumers of their crops<sup>1</sup>. Despite the growing number of individual studies there are no comprehensive data sets that provide an understanding of wastewater agriculture practices around cities, the drivers of this process

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<sup>1</sup> The DFID KAR project R 7132, based in Nairobi and Kumasi is among those case studies

and the role that wastewater plays in reducing demand for freshwater resources, in contributing to urban food supplies and its importance as a livelihood strategy.

The background is therefore one of increasing urbanisation, increasing water scarcity and a growing awareness of the potential for treated and untreated wastewater to substitute, to some degree, for reduced freshwater supplies to the agricultural sector. Such use is seen potentially to provide a means of recycling nutrients and as a sanitary means of wastewater disposal. It is clear that in the rapidly expanding urban centres of LDCs the provision of sanitation infrastructure has not kept pace with population growth rates, leading to increasing volumes of wastewater being discharged directly to the environment. This absence of wastewater treatment plants is unlikely to be addressed even in the medium term. Against this background there is growing realisation that wastewater irrigation sustains the livelihoods of many thousands of the urban and peri-urban poor but may also bring with it important risks both to human health and the wider environment. With urban population set to grow to the point where two thirds of the global population will be urban by 2025, the lack of even first estimates of the extent of different types of wastewater use and their characteristics is lamentable. More importantly, it makes it difficult to place the issue on policy agendas or justify research into the management or improvement of current practices, not because there is no demonstrable need, but because information is lacking. This proposal aims to address this knowledge gap.

## **GOAL**

In line with the Hyderabad Declaration on wastewater use in agriculture (see Annex 4) the project will contribute to safeguarding and strengthening livelihoods, mitigating health and environmental risks and conserving water resources by providing a deeper understanding of the realities of wastewater use in irrigation.

## **PROJECT PURPOSE**

The project purpose is to quantify the extent and significance including the livelihoods dimension of wastewater irrigation and the range of conditions and factors that influence such use.

This will directly contribute to the ‘Comprehensive Assessment of Water Management in Agriculture’, which aims to strengthen the knowledge base on water-agriculture-environment interactions. This knowledge can, in turn, be used to develop consensus on investment strategies, urban planning and appropriate research to develop new approaches to wastewater management that may offer more sustainable wastewater food production.

## **OUTPUTS**

*Output 1. A 30 city assessment and a global database on the extent of wastewater irrigation, the practices underlying it and its impact on livelihoods of the poor in less developed countries around the world. This will take the form of a CA research report*

Wastewater irrigation in urban and peri-urban areas of less developed countries in particular often takes place informally and sometimes illegally (this is particularly true for untreated wastewater use) and thus the extent of the practice is not recorded in official statistics. The 30 city assessment will provide first estimates of the volumes of wastewater generated, treatment and disposal practices, extents of agriculture (and aquaculture), its significance as a livelihood strategy, its health implications and its contribution towards national food production and economic value, in selected cities around the world. An extensive survey using questionnaires and key stakeholder interviews, will be the source of information supplemented by information from existing databases and published data sets. This assessment will allow us to identify the drivers of wastewater irrigation and agriculture, and provide us with a wastewater use footprint for each of the cities. This survey will be linked to the study on the implications of wastewater in a basin context and the water supply and demand work of IWMI and IFPRI, and provide inputs for setting up a global database on wastewater use.

*Output 2. . A journal paper on “Using Typology as a tool for comprehensive national assessments of wastewater at a country level” A comprehensive approach/methodology for carrying out national*

assessments building on the typology tested in the survey, which can be used to gain an in-depth picture of the possibilities of wastewater agriculture at a country level

The typology will capture the various conditions under which wastewater irrigation takes place and provide unambiguous definitions of terms used in relation to wastewater irrigation. The typology of wastewater irrigation is a prerequisite to the comprehensive assessment of wastewater irrigation in a national context, defining what is included in the assessment. It provides a framework to describe different practices and identify the conditions under which wastewater irrigation/agriculture occurs, Policy decisions and technical interventions are context specific for which typology is critical. A simple but complete approach/methodology for carrying out national assessments to gain an in-depth picture of the possibilities of wastewater agriculture will be developed.

*Output 3. A policy brief with recommendations on the way forward and a portfolio of researchable issues as concept notes.*

It is anticipated that based on prior IWMI experience and the assessment, researchable issues will be identified by partners which, when addressed, will lead to better management and optimal use of wastewater, more realistic assessment of risks to human health and the environment and clearer recommendations for policy and technical interventions. An important output of this project will therefore be an appraisal of the researchable issues that bear upon current wastewater irrigation practices.

These issues will be prioritised to focus research and resources on the most pressing needs faced by the poor who are reliant on wastewater irrigation practices. These could address improving farmer health through participatory approaches, alternate management options for risk minimisation, Testing and applying methods for risk minimisation from farm gate to consumer products, testing low-cost treatment and other engineering options, options for integrated wastewater management linked to agricultural end use etc.

## **METHODOLOGY**

### *Output 1*

The 30 city survey will provide comprehensive information on the selected cities covering as many countries as possible. A prior understanding of the questions, and familiarity with the multidisciplinary issues addressed in the questionnaire is a key factor of success. For this reason the assessment will focus on regions where there is an IWMI presence or there are partners selected who have worked closely with the IWMI, and are familiar with the issues. The survey will require some degree of field work by the partners/consultants, combined with discussions with key persons in the different cities/countries, and desk studies by the partners to elucidate some of the information already documented.

In parallel, a wider desk study and internet search will be conducted by IWMI to get a perspective of the global directions of wastewater recycling and use to date, from documented evidence. Wastewater use practices are well documented in certain parts of the world and will be collected and compiled through internet searches. China and Latin America are important users of wastewater but have gone largely undocumented and they will be included in this internet search. In addition, synergies will be established with the FAO project on assessing the extents of informal irrigation in Latin America and the Caribbeans, and other existing in-country partners in China working on related issues to maximise the impact of this research. India is expected to be one of the largest users of wastewater. One or two cities will be studied through this survey but supplementary information will be gathered through synergies with a separate research study that has been initiated by Winrock India. It is expected that the current project will contribute toward overall guidance on methodology to be used. IWMI has also widely studied wastewater use in Hyderabad India which information will be used in this study. Preliminary work in the Katmandu valley will be built upon. Prior national assessments conducted in Pakistan and Vietnam and Ghana as pioneer studies will provide feedback on the drivers in these countries complemented by a detailed city surveys using one or two selected cities in these countries.

The 30 cities will be selected after a preliminary sorting of cities using the following criteria: Size (population and area), potential water scarcity, climate/rainfall, GDP, location of the city within a basin.

#### *Output 2*

The development of a typology of wastewater irrigation for more comprehensive understanding at a national level, will build upon earlier thinking that was initiated at the IWMI Water Week in Sri Lanka in November 2001 and which was further developed during the in-house IWMI workshop at Hyderabad in March 2002 and the RUAF e-conference on wastewater in July 2002. Past and ongoing IWMI research and the DFID R7132 KAR research have also contributed to this. This typology is being tested through the questionnaire. A working paper/journal paper will draw together these findings and conclude these discussions by presenting a pragmatic structure and a simple but complete approach/methodology for carrying out national assessments. This will draw upon the extensive experience gained and lessons learned by IWMI in undertaking 2 national assessments in Vietnam and Pakistan respectively.

#### *Output 3*

Based on current knowledge and findings from previous outputs and the survey, the researchable issues identified will be prioritised with participating stakeholders and partners and recommendations for future actions will be made. These recommendations would contribute towards effecting policy changes and improvements in health and livelihoods of urban poor using wastewater irrigation. Some of these recommendations will be developed into a portfolio of Concept Notes for action research projects

### **ACTIVITIES:**

#### **Output 1**

##### **1. *Activities (IWMI Regional offices, and national/regional partners)***

- 1.1. Implement an internet search for information on areas, livelihood strategies linked to wastewater agriculture (IWMI)
- 1.2. Questionnaire survey : (IWMI offices and partners)  
Develop detailed questionnaire/checklist addressing required information  
Review of information available for the cities and countries selected  
Interviews with key persons at national level in selected countries  
Field visits to wastewater use sites and interviews with key local stakeholders etc  
Develop Simple database format
- 1.3. Data analysis and interpretation  
Develop simple database format  
Analyse questionnaire responses, and compile city estimates
- 1.4. Preparation of research report

#### **Output 2**

##### **2. *Activities : (IWMI + specialist input from HR Wallingford)***

- 2.1. Review past and present IWMI work and existing typologies on wastewater irrigation and agriculture.
- 2.2. Develop a simple but complete methodology, for carrying out comprehensive national assessments using test experience from 30 cities
- 2.3. Prepare a working paper/journal article on “*Using Typology as a tool for comprehensive national assessments of wastewater at a country level*”
- 2.4. Send for review and incorporate comments in final paper.

### **Output 3**

#### **3. Activities (IWMI regional offices + partners)**

- 3.1. Hold working meeting of IWMI regional offices + partners to discuss researchable issues emerging from the survey
- 3.2. Prepare a portfolio of follow-up Concept notes

### **BENEFICIARIES AND IMPACT**

The immediate target group/beneficiaries are the policy makers, implementers, various authorities concerned with health, sanitation, urban planning and agriculture and decision makers in relevant international agencies, who must be engaged as stakeholders if policies are to change and resources are to be made available to manage and improve the existing, ad hoc environment in which wastewater irrigation often occurs. Quantifying the extent and importance of different wastewater irrigation practices is an essential first step to raise awareness and gain commitment and bring the issue onto national and international agendas. The ultimate beneficiaries will be the urban and peri-urban poor and in some cases the rural poor, who are subject to poor hygiene and sanitation conditions, whose livelihoods are dependent on irrigated agriculture and who rely on wastewater as their main or only source of water for irrigation. This group will benefit from better policies and strategies which will improve their livelihoods and living environment. The larger group of consumers who, knowingly or not, are reliant on wastewater irrigated agriculture for the supply of vegetables will also benefit from the allocation of resources to the understanding and management of wastewater irrigation. These stakeholders

### **IMPLEMENTATION AND MANAGEMENT**

IWMI SL will manage and coordinate the work in close collaboration with IWMI offices in the regions.

For each city, IWMI with selected national/regional partners or consultants where necessary will undertake the studies.

For the CWANA region, IWMI in collaboration with ICARDA will share the management.

Gez Cornish of HR Wallingford will lead the preparation of output 2 and will be responsible for it. IWMI will be co-author on the paper. He will also provide special inputs on an as needed basis which will include intellectual support in developing and reviewing proposal and questionnaire, analytical methods, database development and data analysis; facilitating data collection; and provide external review and feedback on publications.

#### Policy and institutional environment

Although researchers and practitioners have begun to recognise the role of wastewater irrigation as a livelihood strategy, with its attendant risks and benefits to growers, consumers and the wider environment, the topic has yet to be effectively addressed by policy-makers and urban authorities. Government agencies often pass over the issue, regarding it as someone else's responsibility. Urban planners see it as an agricultural concern, to be discouraged or ignored; ministries of agriculture see it as an urban phenomenon and not a priority; departments of health may be aware of the issues raised but without more information they are slow to intervene and practical interventions may not be obvious. There are few examples of an integrated or co-ordinated approach to wastewater irrigation practice.

Formal quantification of the extent of different practices and the risks and opportunities that they present to urban and peri-urban populations, is essential to any effort to understand the true significance of wastewater irrigation. By drawing together such information, this project will make an important contribution to the policy debate that must take place regarding the management of the ever increasing volumes of untreated wastewater generated by urban populations in the developing world.

### Milestones review

- Questionnaires and Assessment methodology designed (IWMI and partners, month 1)
- Planning meetings with partners when necessary +partners trained in survey methodology ( Finalised by month 3)
- Working paper on wastewater irrigation typology for national assessments finalised (month 3)
- Internet information search completed (month 4)
- Database format designed (month 6)
- Data entry and First assessment results completed (month 7)
- Research report written (month 11) with recommendations on way forward
- Portfolio of CNs on researchable issues (month 12)

### **DISSEMINATION STRATEGY**

Dissemination of the results is done through the publication of the research result in the form of a research report. In a later stage the results will be incorporated in a comprehensive book on use of wastewater in agriculture to be published under the Comprehensive Assessment Programme.

This assessment of the significance of wastewater irrigation and its drivers will be linked to various databases such as that IWMI-IFPRI modelling effort, FAO aquastat, and others, the Dialogue's Knowledge Base, These will be readily accessible for wide use. Further journal and workshop papers will be prepared to inform the wider international irrigation community, and articles in magazines like the RUAF's Urban Agriculture Magazine will ensure that people interested in the wider issues of urban and peri-urban agriculture will be informed about the research results.

Result of the global assessment will also be made available to FAO to be incorporated in the Aquastat database.

### **MONITORING**

Based on the milestones formulated in the the project manager shall monitor project progress and verify implementation of the work-plan and achievement of outputs.