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## **Welcome Address**

### **International Expert Consultation on Wastewater Irrigation Consumer health risk assessment, on-farm and off-farm options for health risk mitigation, and wastewater governance in low-income countries**

**Accra, October 6, 2008**

**Organized by IWMI, IDRC and WHO and supported by IDRC and Google.org**

**Dear friends and colleagues,**

It is with great pleasure that I welcome you on behalf of the International Water Management Institute and on my own behalf to this International Expert Consultation on Wastewater Irrigation on “Consumer health risk assessment, on-farm and off-farm options for health risk mitigation, and wastewater governance in low-income countries”. This expert consultation is organized by IWMI, IDRC and WHO and supported by IDRC and the Google Foundation.

#### **The International Water Management Institute**

The International Water Management Institute (IWMI) is one of 15 research centers of the Consultative Group on International Agricultural Research. The overarching mission of the Institute is to improve the management of land and water resources for food, livelihoods and environment. The research adopts a multi-disciplinary, multi-scale approach, and balances efficiency and productivity objectives with equity and sustainability concerns. To carry out its mission, IWMI works with a range of partners from universities and research agencies in the North and South, local and international NGOs and national governments.

IWMI is organized around four key themes that focus on key water and poverty alleviation issues. The themes are strongly interrelated and work together in solving complex multidisciplinary issues. The theme on “Water Quality, Agriculture and the Environment” is looking at water quality and related health risks associated with wastewater irrigation in particular.

IWMI is headquartered in Sri Lanka, and maintains offices, programs and projects in Africa, in Western Africa (Ghana), Nile Basin & Eastern Africa (Ethiopia), and Southern Africa (South Africa) and in Asia, in South Asia (India, Pakistan, Uzbekistan, Nepal, and Sri Lanka), and South East Asia (Malaysia, Cambodia, Vietnam, and Laos).

#### **Wastewater Reuse**

The topic of this expert consultation is very important given that wastewater irrigation is a common reality in the urban fringes of virtually all cities in Africa where all the farmers use untreated, or very partially treated, urban wastewater to irrigate the cities’ own food and fodder. There are an estimated 20 million urban and peri-urban farmers in Africa that produce some 70-90% of the perishable vegetables consumed in African cities. Exotic vegetables, like lettuce, are not part of the traditional Ghanaian diet. However, more than 200,000 urban dwellers eat them daily on Accra’s streets and in canteens and restaurants. About 90% of the

perishable vegetables are produced in closest market proximity due to their fragile nature and the common lack of cold transport and storage. These vegetables are a preferred cash crop. On the other hand, farmers have huge problems finding in and around cities unpolluted water sources for irrigation. This dilemma is directly linked to uncontrolled urbanization and poor sanitation.

Use of wastewater has many advantages for farmers as it conserves nutrients and reduces the need for chemical fertilizers; it increases crop yields; and it is a very reliable water supply. It also has considerable environmental benefits as it provides low-cost sanitary disposal of municipal wastewater, it conserves water; and it reduces pollution of rivers, canals and other surface water.

However, use of untreated wastewater also does carry serious health risks, for producers and consumers, as well as environmental risks. It affects people's life, health, growth and development. It increases the emergence of diseases and illnesses and has a huge impact on human suffering and productivity. It is a barrier to economic development through (1) the labor hours lost due to disease and (2) the human capital lost when sick children miss school. At any given time, one-half of the African population is suffering from one or more water-related diseases (diarrhea, intestinal worms, schistosomiasis, cholera and trachoma). Africa has the worst statistics for cholera and child diarrhea. Recently, several cholera outbreaks were reported in different African countries: Zimbabwe, Tanzania, Rwanda, Kenya, Angola, Republic of Congo and Ghana. In sub-Saharan Africa, the annual global burden of water-related diseases is estimated at 82 million *Disability Adjusted Life Years* (DALYs). Diarrheal diseases form the bulk of the health risk and kill more Africans every year than HIV/AIDS. There are an estimated 1.2 billion cases of diarrhea in sub-Saharan Africa every year (25 million DALYs) that lead to the deaths of 770,000 children under 5. This places an average health burden on every African of 21.7 years of ill health.

In spite of the health risks, policies prohibiting wastewater reuse have been ineffective and wastewater continues to be frequently used. Effective solutions must be incremental and will take time to implement. The opportunity and challenge is to provide solutions that can be linked with sustainable agriculture and to set platforms through which appropriate blending of knowledge systems and requirements can occur.

### **The 2006 WHO guidelines for wastewater use in agriculture**

To address these concerns, WHO released in 2006 the revised wastewater use guidelines. The new WHO guidelines are based on analysis by the *quantitative microbial risk assessment* (QMRA) method. The development of the QMRA methodology has enabled analysis of health risks associated with wastewater use in agriculture. QMRA can estimate risks from a variety of different exposures and/or pathogens that would be difficult to measure through conventional epidemiological investigations due to the high cost and necessity of studying large populations.

Professor Duncan Mara and others used a combination of standard QMRA techniques and Monte Carlo simulations to provide information as a basis to evaluate the infection risks associated with the exposure to crops irrigated by wastewater as well as exposure of irrigation workers.

The performance target for unrestricted irrigation to achieve the tolerable additional disease burden of  $\leq 10^{-6}$  DALY per person per year is a pathogen reduction of 6–7 log units that may be achieved by the application of appropriate health protection measures, each of which has its own associated log unit reduction or range of reductions. A combination of these measures is used, such that, for all combinations, the sum of the individual log unit reductions for each health protection measure adopted is equal to the required overall reduction of 6–7 log units".

These new 2006 WHO Reuse Guidelines need to be carefully studied and evaluated by the community of water scientists, engineers and policy makers as to their possible implications for various national wastewater reuse guidelines. This expert conference will discuss how the guidelines can be tailored to low income countries.

### **IWMI's research on use of wastewater and health risks**

IWMI has a long tradition in research on wastewater and health risks, especially in Mexico, Pakistan, India, Vietnam, Thailand, Ghana, and Ethiopia. Extensive work in the southern Punjab (Pakistan) showed that by utilizing wastewater farmers could get high incomes because of savings in fertilizer and higher yields, allowing many to escape the poverty trap.

IWMI contributed to the Hyderabad Declaration on Wastewater Use in Agriculture, an outcome of the joint IDRC-IWMI workshop held in November 2002 in Hyderabad, India. This stirred further interest in the health impacts of wastewater irrigation and to practical and affordable safeguards to health. IWMI has contributed both to the knowledge base on the significant use of wastewater, and to disseminating information on how to curb health risks addressing entry points for health risk decrease such as education and awareness creation. The more positive health aspects of wastewater use that contribute to household food security, better nutrition and increased household incomes have been highlighted and it was demonstrated that there are significant trade-offs associated with irrigation using untreated urban sewage. IWMI has suggested the incorporation of livelihood considerations and alternative entry points for risk reduction in the WHO guidelines.

Following the WHO guidelines, different non-treatment options at farm, market and kitchen level were field tested for health risk reduction with special consideration to efficiency and adoption potential. As most households are used to vegetable washing (although ineffectively), an important entry point for risk reduction is the increased emphasis of the new guidelines on food preparation measures. A combination of safer irrigation practices (water fetching, on-farm treatment and application), the allocation of farmland with better water sources, and improved vegetable washing in kitchens appear to be able to reduce the potential risk of infections significantly, although it might not be possible to reach in any situation the ideal thresholds. The on-farm trials carried out in Ghana also explored the limitation of other risk reduction measures, such as drip irrigation, choice of crops and cessation of irrigation under local circumstances and discusses possible incentives for behavior changes. Health risks for farmers and consumers need to be effectively reduced while supporting safe farming practices.

### **Uncertainties and research needs**

Additional research is needed to reduce persistent uncertainty about the potential for adverse human health effects from exposure to wastewater. To protect the public health, there is a need to ensure that the chemical and pathogen standards are supported by current scientific

data and risk assessment methods and to validate the effectiveness of wastewater management practices.

More surveys on the microbiological quality of raw and treated wastewater, using relevant sampling programs, statistical and analytical methods, should be carried out. More knowledge is needed on the elimination of pathogens through extensive low cost techniques, on-farm options, and combined treatment and non-treatment options. Monitoring programs of water quality, together with the control of the quality of irrigated agricultural products should be undertaken. Carefully well-designed epidemiological investigations that examine exposure and health impacts to exposed populations (workers, wastewater users, farmers, communities near land application sites, etc.) would help assessing the risks related to wastewater reuse.

In order to fill knowledge gaps and address public health concerns and uncertainties, other scientific and technical bases are still required. There is a need to study more rigorously the exposure and health risks, gather epidemiological data and investigate allegations of health incidents. Surveys of chemicals and pathogens in raw and treated wastewater should be carried out as well as studies on the effectiveness of management practices. Risk-assessment studies for chemicals and pathogens should be conducted to update the scientific basis of the chemical and microbiological limits, and to support further updating of regulatory criteria. More research should be performed in order to increase the effectiveness of QMRA. Several issues should be particularly considered: dose-response relationships, environmental persistence of pathogens on soil and crops after application of wastewater, exposure assessment and relationships between pathogen and microbial indicators.

### **The expert consultation**

The program of the expert consultation is quite rich and exciting with various presentations covering a broad range of topics addressing the challenges of health risk assessment, in particular for farmers and consumers, and how to move from QMRA to "usable" guidelines for municipal decision support, considering options for health risk mitigation at various entry points between treatment plants (looking at the effectiveness of natural and low-cost treatment systems and on-farm options) and kitchens using the multiple barrier approach. The institutional and economic challenges of implementing multiple barriers for different risk reducing scenarios including food safety campaigns for farmers and caterers will then be addressed. And case studies from different parts of the world will illustrate these approaches. During the field trip, you will have the opportunity to see some of the challenges Accra is facing in matter of sanitation and wastewater irrigation, and I hope you all will join. You will see very exciting sites!

I hope that this meeting will help promote the productive sanitation concept and bridge the gap between sanitation and agriculture. Most of the people do not see the link between the two. In this 2008 declared International Year of Sanitation, if the wastewater challenge - collection and treatment of wastewater, and reuse & recycling of treated effluent and its products - is not tackled, there is a danger that the potential health and other benefits from the investments being made to meet the MDGs will be negated by the pollution that follows. I also hope that this expert consultation will favor productive exchanges of knowledge and information, strengthen partnerships, and lead to a consensus on identified research challenges and to the drafting of joint research ideas for follow up.

In conclusion, I would like to thank IDRC and the Google Foundation for their financial support to this Expert Consultation.

I would like to add that several of the resulting publications are here available in the room as well as a new report in print on the “Assessment of wastewater irrigation practices in 53 selected cities of less developed regions”. And that you will get more new information and data during the week.

On behalf of IWMI, I would like to thank you all for coming to Ghana. I look forward for a fruitful and rewarding meeting and wish you a pleasant stay in Accra.

Thank you

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