Assessing Health Impacts Of Using Wastewater In Urban and Peri-Urban Agriculture- A Case Study of the Musi River, Hyderabad, Andhra Pradesh

IWMI-India
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• Mandate of IWMI South Asia under which the impact of WW reuse on health is being looked into
• Musi river – Hyderabad is of interest
• What is the rationale behind using waste water
• What are the negative effect of using WW
• What IWMI’s research intends to do.
Theme

Agriculture, Water and Cities

Making an asset out of wastewater
Maximizing the benefits and reducing the risks of waste water use in agriculture – A Research Initiative of IWMI
Goal

To Improve livelihoods of Urban and Peri-urban farmers through safe, productive and sustainable use of urban waste water for irrigation.
Objective

To develop pragmatic approaches for

- Wastewater using farmers
- Policy Makers
- Planners
- Local Authorities
- Consumers

in Urban and Peri-Urban areas that will optimize the overall benefits of wastewater irrigation and minimize the risks to Human health
Hyderabad

- Geographical Area: More than 500 sq km
- Population: 7 million
- Urban Population Growth Rate: 17.2%
- Percentage of city sewered: 62%
- Amount of wastewater released: 700 mld
- Amount of wastewater treated: 133 mld (113 & 20)
Musi River Water is Polluted

Industrial waste

Sewage
Hyderabad City
Periurban
Water Quality in the Musi River
Musi water and livelihoods

Vegetables

2500 ha Para grass for Livestock

10,000 ha Paddy Rice
Waste water use in agriculture – A need but Risky Business

- Untreated wastewater is a need - used by poor and low income group in for food security in the twin cities

- Threat to Health and Environment
Rationale behind using waste water

• Wastewater from Musi-a critical resource to semiarid drought prone zone -920 hectares of land under wastewater cultivation.
• Available year round for irrigation
• Most affordable source of Irrigation for poor and migrant farmers
• Water intensive crops like vegetable can be grown in dry season as well.
Benefits of Waste water

• Source of nutrition for crops
• Reduces the cost on use of artificial fertilizers
• Frees up high value freshwater (surface and ground) for other purposes.
Risk of Using Waste Water in Agriculture

• Health risk to the irrigators on prolonged contact with waste water
• Health risk to the consumers (Blumenthal: 2001 Shuval: 1989) 556-mg/kg for Zn and 281 mg/kg for Cu way above european standards
• Contamination of surface water and ground water: Zn and Cu levels 10 times higher
• Builds up chemical pollutant in the soil (heavy metal)
• A breeding ground for vectors and parasites
Public Health Implications

- Intestinal worm infections
- Diarrhea (Protozoa & Microbial Infections)
- Vector borne diseases
- Growth Retardation (Children)

Workdays and school days lost
Cost of Medication
Health Implications

• The WHO, has ranked the risk of pathogens found in untreated and partially treated wastewater in the following descending order:

helminth infections, protozoa/bacteria and viruses with viruses posing almost negligible risk

• Helminth infections are mainly due to: *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), *Ancylostoma duodenale* and *Nector americanus* (hookworms).
Rationale behind the study

• Non existence of any previous study on health impacts of waste water use along the Musi.
• There was great gap existing and study were required to find out which community is greater risk
• Study on the supply chain was also needed
• Some study by Sehgal and Mahajan (1991) looked into Giardia infection (study indicated very minute increase from regular farmers)
Shrivastva and Pandey (1986) found three fold increase in the hook worm infection among the barefoot farmers as compared to those wearing boots in the field.

Shuval’ s study shows 3.5 and 2.1 fold increase in the round worm and also hook worm in waste water using farmers
Problems identified during pilot study

• Skin rashes have been mentioned among the farmers during summer months, fever mosquito bites and joint pains are the other complaints.

• Health officer do not visit them and they rely on the local medical shop for treatment.
IWMI’s Research

• Large scale study began in 2003 after a pilot study was conducted in 2002.
• The pilot study indicated that the pathogen reduces as the river flows down to the Rural zones
• Pilot study done on farmers indicated little or no intestinal problem or Diarrhea
Current Research

• Ensuring Health and Food Safety from Rapidly Expanding Wastewater Irrigation in South Asia – BMZ project
BMZ Project

To propose a risk assessment framework for human health impacts along the wastewater use chain from source (field/producer) to end-user (market/consumer).
Health Risks - Transmission Pathways

Legend
- - - - Direct impacts
- - - - Indirect impacts

Nematodes
E. coli
Protozoa
POPsp
PTEs

Wastewater
Irrigation

Soil Quality
Fodder Quality

Groundwater Quality

Rice Quality
Vegetable Quality

Livestock health

Milk & Meat

Public Health

Farmer & Laborer

Improving water and land resources management for food, livelihoods and nature
BMZ Project

Attempt to implement interventions that would improve the well being of wastewater farmers and contribute towards improved livelihoods.
Water Quality Test taken up

- Pathogenic organisms (Intestinal nematode eggs and *E. coli*)
- Dissolved Oxygen (DO)
- Biochemical Oxygen Demand (BOD)
- Salinity
- Dissolved Nitrogen
- Other heavy metals like Cu and Zn
- Pesticide levels
Helminths of primary concern (WHO)

Hookworm: Why?

Source: CDC
Figure A. Prevalence of Helminth Infection (%) in farmers utilizing Musi River water for irrigation

Figure B. Total Helminth Egg Count in Musi River at selected sampling locations (Eggs/Litre)

WHO Guideline value for helminth eggs in wastewater for agriculture use is ≤1 Egg/Litre

Source: Jeroen Ensink (IWMI)
Mean egg load per 1 kg of sediment: 410,000 (SD: 240,000)
Key Conclusions

• Use of untreated wastewater for irrigation in urban and peri-urban agriculture is a reality in Hyderabad

• This practice has negative effects on the health and environment, but also makes significant contributions to the economy through employment opportunities for the urban poor

• The challenge is to identify options that minimize the negative effects of this practice without jeopardizing its benefits

• Action planning and policy design which engage multiple local stakeholders can help to identify and ensure the implementation of such options
Thank You