



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

IWMI-India  
Saba Ishaq

- 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 sewerage: 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





Hyderabad

+40 Km



Water Quality in the Musi River

# Musi River Wastewater Use Scenario 2002-2005

Urban

Peri-urban

Rural



Vegetables

Para grass  
Livestock

Paddy Rice



# 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

---

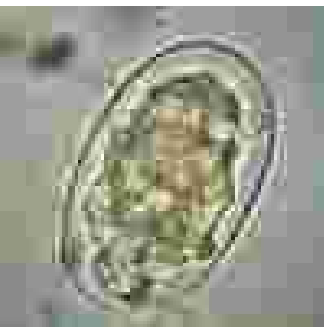
- Source of nutrition for crops
- Reduces the cost on use of artificial fertilizers
- Frees up high value freshwater ( surface and ground) for other purposes.

# 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.

- 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

---

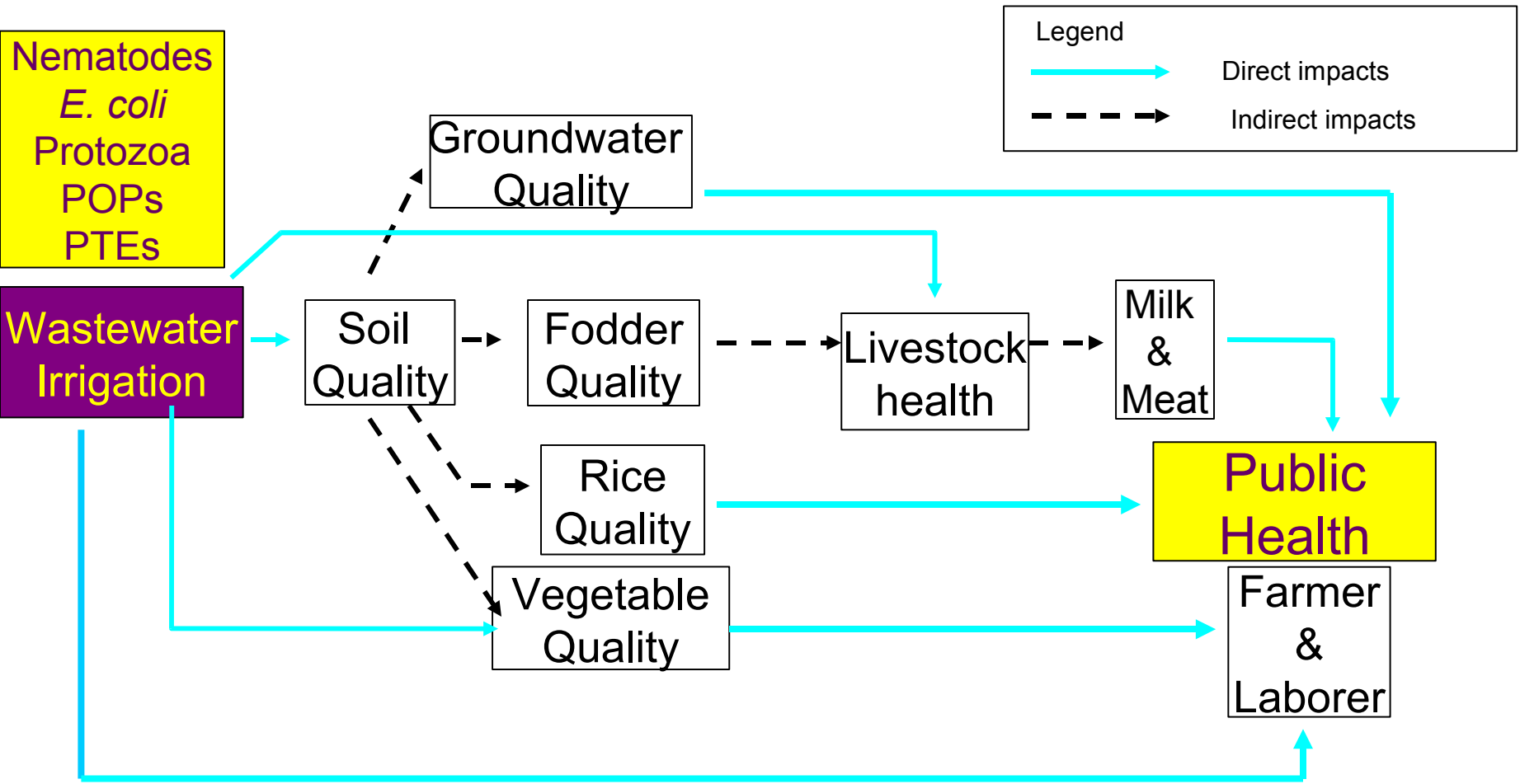
- Ensuring Health and Food Safety from Rapidly Expanding Wastewater Irrigation in South Asia – [BMZ project](#)

# 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



# BMZ Project

---

Attempt to implement interventions that would improve the well being of wastewater farmers and contribute towards improved livelihoods.

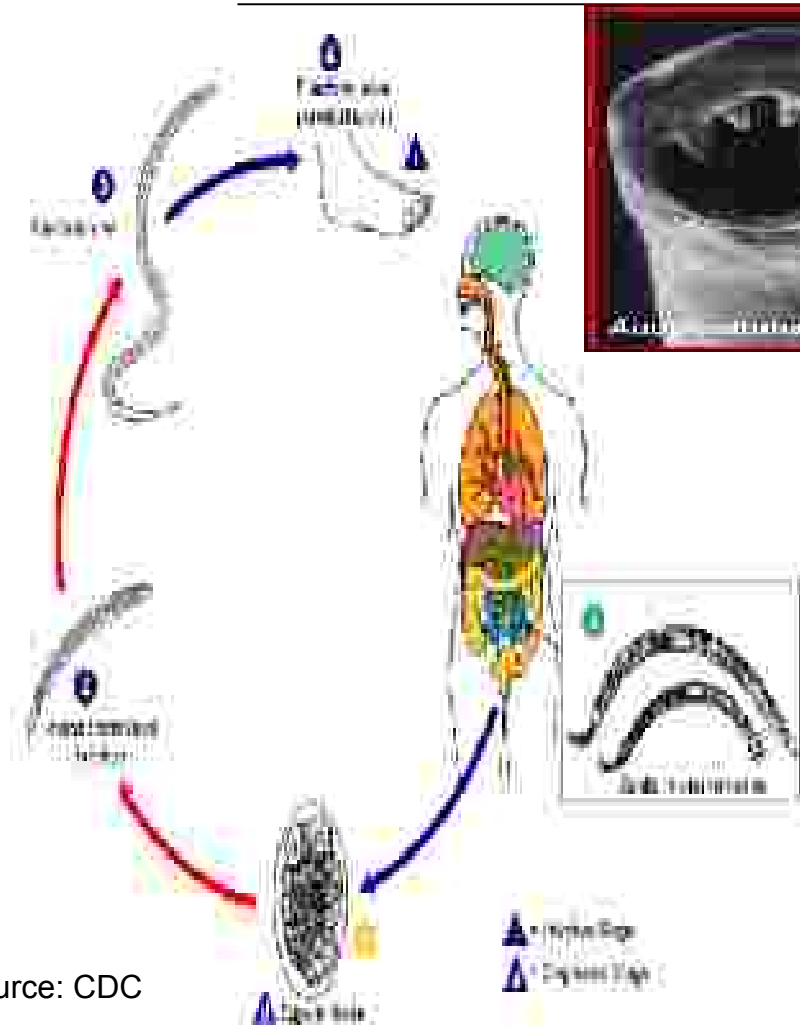
# Water Quality Test taken up

---

- 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)

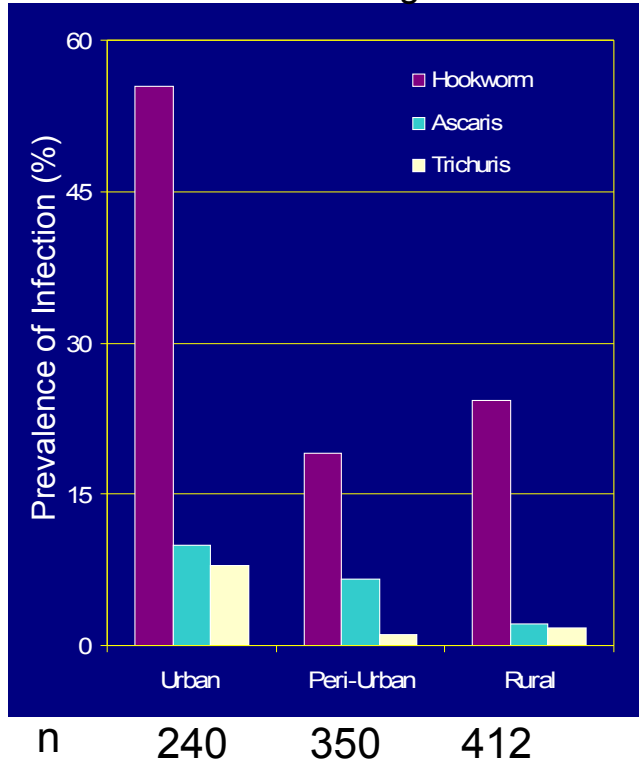
## Hookworm: Why?



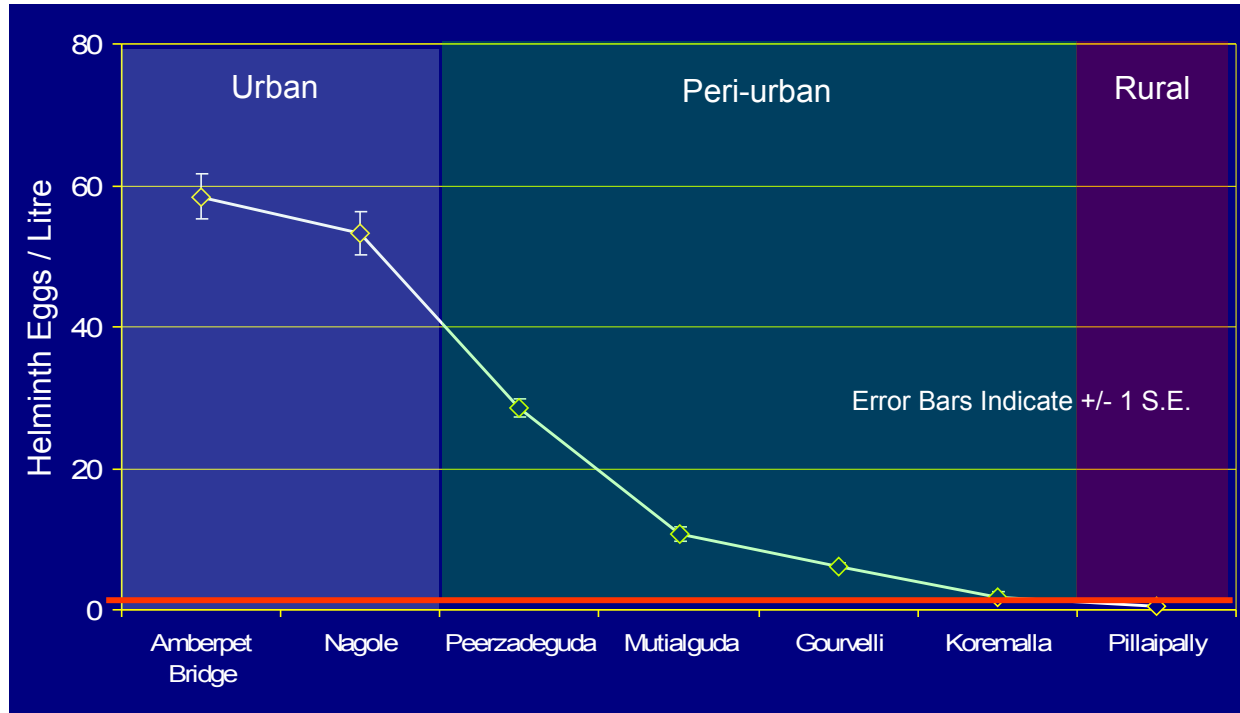
Source: CDC

# Prevalence of Helminth Infections (%) Vs Helminth Eggs in Musi River Water (Eggs / Litre)

**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  $\leq 1$  Egg/Litre

# Sediment Sampling

**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