Economic challenges of wastewater treatment and use in agriculture

Javier Mateo-Sagasta, FAO
Pay Drechsel, IWMI
OUTLINE

• What a reuse project could be?

• Steps in an economic appraisal
  Economic justification
    Cost-benefit
    Cost-effectiveness
  Financial feasibility

• Reuse as business opportunity?
What a reuse project could be?

Wastewater generation |
Wastewater treatment |

Farmer/Producer |
Safe irrigation practices |

Traders/Retailers |
Hygienic handling practices |

Street food kitchens |
Safe food washing and preparation |

Consumer |
Awareness creation to create demand for safe produce |

Facilitating behavior change via education, market and nonmarket incentives, and regular inspections
Steps in an economic appraisal

- Economic justification
  Are Total Benefits higher than Total Costs?
  Is reuse the most cost-effective approach?

- Financial feasibility
  Who pays? And how?
Benefits

Farmers
- Water all year round
- Nutrients and organic matter
- Avoided costs of pumping

Cities
- Food Security
- Low-cost land treatment

Environment
- Reduced pollution
- Reduced freshwater abstraction
- Lower C footprint
Risks

Minimizing risks = Cost

- Wastewater generation
  - Wastewater treatment
- Farmer/Producer
  - Safe irrigation practices
- Traders/Retailers
  - Hygienic handling practices
- Street food kitchens
  - Safe food washing and preparation
- Consumer
  - Awareness creation to create demand for safe produce
Cost-Benefit analysis

Other costs

• New infrastructure
  Water pumping and conveyance

• Environmental costs
  Environmental impacts (e.g. Salinization)

• Health costs
  Illness due to infectious and chemical agents
If Total Benefits > Total Costs

Is the chosen reuse approach the most cost-effective approach?

Alternatives.

- Water Conservation
- Desalination
- Water transfer
- Others
Financial feasibility

Financial impact on stakeholders:
• Farmers
• City authorities
• Regional or national government

Who benefits 😊 and who loses 😞?
Financial instruments

• Subsidies

• Others
  • Soft loans
  • Payment for environmental services, carbon credits
  • Water charges
  • Pollution taxes
  • ...

— Food and Agriculture Organization of the United Nations
How much cost recovery can we expect? Could reuse be a business opportunity?

• What is the target? Higher revenues than (M&O) costs.

• In most cases only 20-90% recovery of additional treatment or distribution costs (MENA).

• Reasons:
  - expensive technology M&O
  - low fresh water tariffs → lower wastewater tariffs
  - free groundwater and low demand
But ..... 

• There are examples of 100% general O&M cost recovery (→ water, nutrients, energy) in Jordan, India, ...

• There are examples even of capital cost recovery after 6 years e.g. through duckweed fed aquaculture (low-cost pond systems in Bangladesh and Peru)
How much cost recovery can we expect? Could wastewater reuse be a business opportunity?

• What is the target? Higher revenues than (O&M) costs.
• In most cases only 20-90% recovery of additional treatment or water delivery costs (MENA).
• Reasons:
  ➢ expensive technology → expensive O&M
  ➢ low fresh water tariffs → lower wastewater tariffs
  ➢ free groundwater → low demand
But ..... 

• There are examples of up to 100% general O&M cost recovery (→ water, nutrients, energy) in Jordan, India, ...

• There are examples even of capital cost recovery after 6 years e.g. through duckweed fed aquaculture (low-cost pond systems in Bangladesh and Peru)
Four-point cost-saving strategy:

1. Plan early for reuse as a source of revenue
   a) Plan treatment sites in demand proximity
   b) Assess market demand, perceptions and willingness to pay.
   c) Explore additional finance options (e.g. carbon credits).

Normal status: retrofit
2. Keep energy requirements low:

- **Use gravity flow** instead of pumping; low-energy plants or pond-based systems (aeration accounts for about 50% of the overall energy costs).
- **Energy optimization** (cut 20% energy costs).
- **Energy generation** from anaerobic sludge digestion can cover 40 - >80% energy demand!
- **Fit for purpose**: Treat only to the level the reuse requires (e.g. nutrient removal costs much energy).
3. Avoid the common run-to-failure trajectory: Private sector performs much better in O&M, which saves money and sustains plants. 
Private sector can also facilitate innovative (win-win) reuse models (example: wastewater aquaculture, Ghana).

4. Invest in multiple barriers (not only conventional treatment): lower risk, less costly, and more cost-effective for health risk reduction.
Many reuse projects remain small or fail because economics have been disregarded. Smart economic planning will support project sustainability including cost recovery.

- **FAO Water Report 35** provides a sound methodology for the economic appraisal of reuse projects.

- **IWMI Working Paper 26** provides a useful framework for an economic assessment.

All reports are on the distributed CD.
→ Working group

- Are there success stories or failures of wastewater treatment and/or reuse which we could share to learn from each other?
- Which role did economics play?

Thanks