WASPA ASIA
Wastewater Agriculture and Sanitation for Poverty Alleviation

Summary Assessment

Wastewater Agriculture in Rajshahi City, Bangladesh

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Introduction

This summary in one in a series of summaries written by the Wastewater Agriculture and Sanitation for Poverty in Asia Alleviation (WASPA Asia) project. The project aims to develop and test solutions for sanitation and wastewater management, to reduce the risks form wastewater use in agriculture. The approach involves the development of stakeholder coalitions at town and national level, called Learning Alliances, which will bring together the main stakeholders into a participatory process through which actions will be planned and implemented.

The WASPA Asia project is funded primarily under the EU Asia Pro Eco II Programme of the European Commission. It is being undertaken in Sri Lanka and Bangladesh by the International Water Management Institute (IWMI) and COSI in Sri Lanka; the International Water and Sanitation Centre in the Netherlands; NGO Forum for Drinking Water Supply and Sanitation in Bangladesh; and the Stockholm Environment Institute (SEI) in Sweden.

Conclusions and Recommendations

As revealed during focus group discussions (FGDs) farmers tend to say that the wastewater affects the yield as they generally prefer clean water to wastewater and try to emphasizes the negative effects of wastewater. This is not really surprising but it does contradict the notion often quoted that farmers like wastewater because of its nutrient benefits. This may be the case for some wastewater streams but in many instances farmers use wastewater because they do not have access to other water sources, and certainly not other sources that are as reliable and freely available.

Fertilizer application appears to be very variable. Better fertilizer management could improve yields and make better use of nutrients in wastewater, but further analysis is required to make this feasible. Improved extension services from DAE could also be beneficial.

Main Findings

This section summarises the findings of an agriculture assessment that was carried out in the peri-urban area of Rajshahi City. Transect walks, interviews with key informants, and a questionnaire were conducted and in total 120 farmers were interviewed of which 90 used wastewater from two different drainage channels and 40 used clean water.

The main objectives of this assessment were:

- To understand the activities and practices of the farmers.
- To explore the differences between the practices of farmers using wastewater and clean water.

- To understand the problems of nutrient management when nutrient concentrations in wastewater used for irrigation are highly variable.
- To investigate whether current agricultural practices are optimal.

Agriculture in Rajshahi

Rajshahi City has an extensive drainage network. There are three main drains passing through the city which flow to the Barnai River in the north. The drains are called Keshobpur Drain, Circuit House Drain and Dargapara Drain. They were designed to receive storm water run-off but studies undertaken as part of this project have revealed that they also contain domestic waste including septic tank over flow and waste from small scale industries and commercial units, as well as being used to dispose of solid waste.

To the north of the city intensive agriculture is practiced using water from these main drains, on an area covering approximately 98 ha and cultivated by 247 farmers. This was selected as the project area of the WASPA project.

Farming Families

All the household heads who cultivate in the wastewater irrigated area and the clean water area are male. Most of their families have more than five members, and although this might lead to problems when the land has to be further divided it also forms an important source of cheap labour.

A majority of the farmers have been farming the land for more than 20 years; hence, they have observed many changes in their land and water quality.

Average Statistics	Waste water	Clean water
Plot size	0.67 ha	0.45 ha
Main crops	Leafy vegetables, sugar cane	Paddy, potoes, jute
Water intensity	High	Low
Soil	Loamy (75%), clay (25%)	Clay
Ownership	50% ownership	93% ownership

The low land ownership of waste water farmers might be explained by their closer proximity to the city as land in the urban periphery is often bought for long-term investment purposes by land-brokers and wealthy individuals. Lack of ownership and uncertainty over tenure could negatively affect the willingness of farmers to invest in the improvement of their land.

Rice

Several paddy varieties are grown in both clean water areas and wastewater areas. The results show that average yields in wastewater areas are significantly lower than in clean water areas; 3.9 tons/ha in the wastewater area and 4.7 tons/ha in the clean water area. This difference in yield could be attributed to a number of factors such as: plot size, rice varieties, soil type, salinity, nutrient availability, and farming practices; however, the exact cause could not be established.

Most of the farmers in the wastewater agriculture area use their whole paddy yield for home consumption, whereas clean water area farmers have comparatively larger lands and are able to sell a portion of their yield.

With a few exceptions, farmers under-apply urea, but by contrast application of Muriate of

Potash (MOP, which contains potassium) and Triple Super Phosphate (TSP) was well above the recommended level in all areas by the majority of farmers. The quantities of MOP applied in the wastewater area appear to be higher than in the canal water area. There is however no statistically significant difference between the application of urea and TSP in the three areas. Farmers hardly use organic fertilisers.

The use of pesticides in one waste water area was particularly high as compared to the other two areas, with insecticide and fungicide applications by 46% and 55% of farmers respectively. Farmers were asked about pest and disease in the area during the and most of the responses revealed that stem bore attack is very high in all three agriculture areas. Rice Hispa attack is prominent (41%) only in Dargapara Drain area.

Wheat

Only 36 farmers grow wheat on a total of approximately 12 ha of lands. No significant deference was found between the yields in wastewater areas and clean water areas; not in fertilizer application. Urea tended to be under-applied according to government recommendations, which is appropriate in the wastewater area where nitrate levels were found to be high (Dissanayake, 2007). MOP and TSP were generally over-applied, which may not be necessary in either area.

Pesticide application in both areas was similar except that wastewater farmers did not apply any weedicide as they remove weeds manually. Stem stem bore attack is very high in both areas.

As with rice, most of the farmers in the wastewater area use the majority of their production for home consumption while clean water area farmers gain an income from it.

Potatoes

Only 37 farmers grow potatoes on around 10 ha of lands. There was a significant difference between clean water and wastewater yields with the average yield in the wastewater area being 14736 kg/ha compared to 20374 kg/ha in the clean water area. Clean water farmers applied significantly more fertiliser, which may be linked to the yield, but this is not confirmed.

Cabbage

There were only 10 farmers growing cabbage, all of whom cultivate in the wastewater area. The average yield was 20532 kg/ha. Fertilizer application rates were high compared to government recommendations, with average application rates of 340 kg/ha for urea, 208 kg/ha for TSP and 63 kg/ha for MOP, compared to recommendations of 305 kg/ha, 37.5 kg/ha and 20kg/ha respectively.

Indian Spinach, Spinach and Red Amaranths

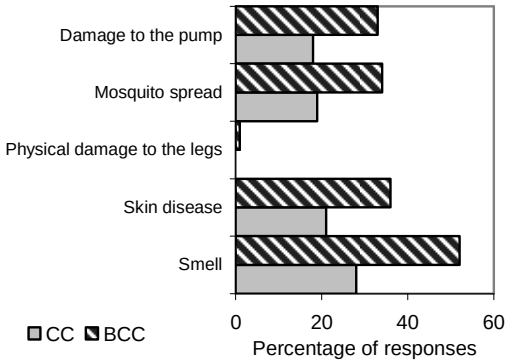
Leafy vegetables are grown in wastewater areas only. It was found that fertilizer use was highly varied among the farmers – some farmers did not apply any fertilizer while others applied more than is recommended.

Wastewater Issues

Farmers were asked about the benefits of the use of wastewater. The most important benefits that were mentioned were: the high nutrient content of waste water; the lack of any other water source; the low cost of usng wastewater, as the only cost is pumping; and the good crop yields that they feel it gives.

However, farmers were also asked about problems that they experienced, for which they cited: smells, skin diseases, mosquito nuisance and damage to pumps.

Farmers' opinions on problems they faced due to wastewater irrigation



Although, the water quality monitoring confirmed the presence of parasitic protozoa, hook worms, round worms and cestodes indicating feacal contamination, none of the farmes mentioned related health issues.

The farmers were also asked whether they perceived: oil and grease; solid waste; fecal matter; or harmful chemicals to be present in the wastewater, and what they considered the impact to be. The table below shows their perceptions.

Farmers' perceptions of water quality

	Percentage of farmers		
Perceived pollutant	**Dargapara Drain**	**Circuit House Drain**	**Perceived impact**
Oil and Grease	93	85	Coating over soil; Itching
Solid waste	96	92	Pump base blocked
Fecal matter	100	85	Smell; Itching
Harmful chemicals	20	48	Skin disease; Itching

In addition, most farmers mentioned that the waste water affects the vegetative phase of the crop and also it increases the pest attacks (IRRI 2003). Some farmers (13%) also said that it reduces the yield; but this is not substantiated by the yield figures.

Implications for WASPA

- Fertilizer application is highly variable and does not reflect either government recommendations or nutrient levels in wastewater.
- Extension services need to be improved to optimize fertilizer use to improve yield and reduce costs, as fertilizer is often over applied.
- Further analysis of nutrients in wastewater and soil are needed.
- Oil, grease and solid waste are clearly problems and need to be addressed thorugh interventions upstream.

References

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