Livelihoods and Musi River in Hyderabad City, Andhra Pradesh, India

Wastewater Irrigated Agriculture

In the urban areas, water from the drains empty from spouts in the walls along the city roads into the fields below along the Musi. This drainage water, which is from both domestic and industrial sources, is channelled to several contiguous plots of land. It is sometimes supplemented by water pumped from the river or, less commonly, from shallow wells along the riverbanks. It is used by approximately 250 households for agriculture on a total of about 100 ha of land in the urban area along the Musi river. Most of the urban agriculture is practised along a 5 km-stretch of the river in the city from the Purana pul bridge to the Amberpet bridge (see Figure 1). It is a green area within a busy area of the Old City and helps to improve air quality.

SAMPLING AND DATA COLLECTION

Household interviews were conducted to collect information on types of livelihood activities based on wastewater. In the urban areas, 50 female and male respondents were interviewed from a random sample of 33 households. The respondents were classified according to their respective roles as beneficiaries: Landowners, 50%; Renters, 16%; Casual labourers, 12%; Permanent labourers, 10%; Caretakers, 8%; Grass market vendors, 4%. These percentages reflect total numbers in the urban area. Government officials were interviewed for information on the sanitation infrastructure and the legal and institutional environment of urban agriculture.

Water quality samples were taken at several points. In the urban area water quality was checked at the Chaderghat Bridge (4), where a sample was tested. More frequent monitoring needs to be conducted to get a better indication of water quality in each season.

SANITATION AND WATER QUALITY

The sewerage network covers only sixty-two per cent of the city. There is only one sewage treatment plant (STP) with primary and secondary treatment capabilities and a second STP with primary treatment capabilities only. In total, these plants treat 133 million litres per day (MLDs) of water. This treated sewage, and the untreated sewage estimated at 327 MLDs, is diverted to the Musi River. Plans for new and upgraded existing plants aim to treat 630 MLDs by 2006.

There are 12 industrial areas within 30 km of Hyderabad city which include electro-plating, lead extraction/battery units, pharmaceutical and jewelry industries. The Common Effluent Treatment Plants (CETPs) are not able to treat the varied effluents adequately. The CETP and industries that do not bring their effluents to the CETP discharge their effluents into the Musi and other water bodies.

The BOD and COD values are quite low in Hyderabad (see Table 2). MPN values indicate high levels of faecal contamination, which increases the health risks of the wastewater to farmers and agricultural labourers in direct contact with it. The risk to the consumer is expected to be lower since none of...
the vegetables grown are consumed raw. However, no quality-assurance tests were done on the vegetables. The EC and TDS values are higher than those recommended by the FAO guidelines. However, since the major crop is para grass which is able to withstand higher salinity conditions, this water may not have a detrimental effect. Total Nitrogen is higher than FAO guidelines but all heavy metals are within safe limits.

Wastewater UA provides livelihoods to the lowest income groups

TYPES OF CROPS GROWN
A variety of crops are grown in this area. The predominant crop is para grass, which is used for fodder, amounting to 65%. Green leafy vegetables are grown on small sections for subsistence and for sale. Other crops that make up only 1% include fruit trees as well as crosandra and jasmine flowers. These products are mainly used by household members.

LAND TENURE
In almost all urban locations surveyed, the land is owned by a single caste community of Hindus belonging to the kachi community now included in the category of Backward Caste (BC). This is in contrast to the periurban and rural areas where landowners belong to a multiplicity of caste groups.(5) The average landholding here is 0.4 ha of irrigated land. In the Indian context, these farmers are therefore categorised as small farmers.

LABOUR MARKET AND ROLES OF MEN AND OF WOMEN
Men and women involved in wastewater agriculture play different roles in urban agriculture depending on the beneficiary category they belong to. Only landowners who have sufficient household labour can cultivate vegetables, since labour is expensive. Most household labour for vegetable production is female. Female landowners carry out almost all of the fieldwork, including irrigation. The women who grow vegetables reserve a portion for household consumption and a portion for sale (see Table 3 for income data). Amongst the dairy producers, the men in the family usually do the fieldwork. Men and women tend and milk the buffaloes and sell the milk or yoghurt. They keep the livestock next to their houses in the city.

The casual labourers are male or female migrants from a drought-prone district. Some were squatters on the banks of the Musi and were relocated to an urban resettlement area. Most are BCs. Permanent labourers work year-round on one plot and are from drought-prone states. They get lodging with the landowner, and salary of approximately € 33/month (3). The caretakers are men or women who live with their families on the land in small huts or tents. They are either *lambadis* (ST) or from the BC. They sell the various tree products to customers who come to the plot. Some also work the land for pay equal to casual labour.

INCOME FROM WASTEWATER USE
Urban agriculture with wastewater benefits the landowners from crop income, from fodder grass for livestock, from rental income and from crops used by household members. For one hectare of land, the annual income is approximately € 2,812 for 1 ha of para grass, € 833 for 1 ha of leafy green vegetables, € 470 for one hundred banana plants, € 33 for 20 coconut palm trees, and € 625/ha/year in rental income from para grass. Table 3 summarizes the average annual incomes for the different crops grown.

Wages for casual and permanent labourers in urban areas are slightly higher than in the periurban and rural areas. There is, however, a wide wage gap

Laws Affecting Urban Farmers

- In 1986, the Andhra Pradesh Government banned wet cultivation in city premises and the power (electricity) supply to the farmers for irrigation was cut off.
- The value of the land in the Musi bed for compensation for the construction of bridges or other government project or activity has been declared as Rs. 800 per sq yard but according to one of our respondents, the actual value of the land should be Rs. 10,000 per sq yard.
- Before 1976, the loss of vegetables after flooding was being compensated (Rs.1,000 to 800) but after 1976 this compensation was terminated.
- Until 1995, a land tax was being collected (Rs. 480 per acre/year) considering all the land on the Musi bed as agricultural land. But after 1995, the Town Survey declared the land as Commercial land and is asking the farmers to pay a commercial tax on that land.
- The land cannot be legally sold.
- No person can build anything on this land.
- There is no legal procedure with the Town Survey regarding the transfer of ownership rights or title of the land.
- The width of the river channel is 100 meters and the rest of the land is supposed to be private, titled land (personal communication, Secretary to the Chief Commissioner of Land Administration).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Concentration</th>
<th>Irrigation water quality standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD (mg/l)</td>
<td>105</td>
<td>-</td>
</tr>
<tr>
<td>COD (mg/l)</td>
<td>352</td>
<td>-</td>
</tr>
<tr>
<td>MPN (total coliform)</td>
<td>4.6 × 10¹⁰</td>
<td>-</td>
</tr>
<tr>
<td>TN (mg/l)</td>
<td>25</td>
<td>5.0</td>
</tr>
<tr>
<td>EC (ds/m)</td>
<td>2.1</td>
<td>0.7</td>
</tr>
<tr>
<td>TDS</td>
<td>1012</td>
<td>450</td>
</tr>
<tr>
<td>Zn (ppm)</td>
<td>0.32</td>
<td>2.00</td>
</tr>
<tr>
<td>Cu (ppm)</td>
<td>0.13</td>
<td>0.2</td>
</tr>
<tr>
<td>Chloride (mg/l)</td>
<td>151</td>
<td>-</td>
</tr>
<tr>
<td>Cr (ppm)</td>
<td>0.04</td>
<td>0.1</td>
</tr>
<tr>
<td>Pb (ppm)</td>
<td>0.07</td>
<td>5.00</td>
</tr>
</tbody>
</table>
Table 2: Costs of production and income generated from main wastewater dependent activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost of production per hectare (Rs. and €)</th>
<th>Income (Rs. and €)</th>
<th>Average annual income (Rs. and €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leafy vegetables</td>
<td>Rs. 3,750/€ 78 per month</td>
<td>Rs. 5,000/€ 104 per month</td>
<td>Rs. 40,000/€ 833 per year</td>
</tr>
<tr>
<td>Banana</td>
<td>Rs. 7,200/€ 150 per year</td>
<td>Rs. 22,500/€ 470 per year</td>
<td>Rs. 22,500/€ 470 per year</td>
</tr>
<tr>
<td>Coconut</td>
<td>Rs. 7,200/€ 150 per year</td>
<td>Rs. 10,000/€ 208 per year</td>
<td>Rs. 10,000/€ 208 per year</td>
</tr>
<tr>
<td>Para grass per ha</td>
<td>Rs. 45,000/€ 937 per year</td>
<td>Rs. 90,000-180,000/€ 1,875-3,750 per year</td>
<td>Rs. 135,000/€ 2,812 per year</td>
</tr>
<tr>
<td>Para grass (rent collected)</td>
<td>NA</td>
<td>Rs. 2,500/€ 52 per month</td>
<td>Rs. 30,000/€ 625 per year</td>
</tr>
<tr>
<td>One milch buffalo</td>
<td>Rs. 500/€ 10.40 per month</td>
<td>Rs. 2,000/€ 42 per month</td>
<td>Rs. 16,000/€ 333 per year</td>
</tr>
</tbody>
</table>

This informal market operates through four salesmen who get a commission of 5% for each grass bundle. Daily, thirty mid-sized vehicles carrying 5 tonnes each transport the grass to the market. These vehicles when fully loaded, generate employment for 40 casual labourers as well as for one truck cleaner and one truck driver. Preliminary estimates indicate that 1,260 casual labourers, fodder-grass salesmen, truck drivers and truck cleaners are employed per day by the landowners and renters.

**SELECTED REFERENCES**

- Buechler, Stephanie J., Gayathri Devi M and Uma Maheshwar Reddy. 2002. In-depth interviews of landowners, renters, labourers (casual and permanent) and caretakers Hyderabad, Andhra Pradesh, India (May-October).

**WASTEWATER FODDER GRASS MARKET AS AN ECONOMIC HUB**

From Figure 2 it is clear that fodder grass cultivation is a very important activity in the area. It provides an economic hub around which a number of dependent beneficiaries revolve.

Much of the land dedicated to fodder production is rented to dairy producers. A few own the land. They save by cultivating much of the feed for their livestock. The renters with livestock do the cutting of the grass themselves. Buffaloes are the preferred consumers of this fodder because they provide more milk with a higher fat content, which receives a higher price than cow’s milk. Household members also consume this milk, thus saving on this expenditure.

The fodder grass market is located within 10 minutes of where most urban agriculture is practised. Approximately 50% of the fodder grass grown is sold in the market. The other half is used directly by farmers who produce it for their own livestock. The important role it plays economically is symbolised by the promise made recently by the home minister to donate 2,000 square yards of land for a new grass market, in the Kachiguda neighbourhood of the city where most of the urban farmer/landowners and livestock keepers live and keep their animals.

In the case of casual and permanent labourers, additional income is gained through other activities. Females tend to work as housemaids for several houses, earning approximately € 9.40 per month and also work as construction workers where they earn € 12.5 per day. Men, on the other hand, tend to work mainly as construction workers and earn € 167 per day.

**USERS’ PERCEPTIONS ON HEALTH ISSUES AND WASTEWATER USE**

The informants had mixed reactions on the health risks associated with using wastewater. Urban and periurban farmers are less exposed to wastewater than are rural farmers who grow paddy and therefore spend long hours standing in the wastewater during puddling, transplanting, weeding and harvesting.

There were mixed perceptions as to the health impacts. One 40 year-old female urban farmer told us: “I never had any health problems due to the use of this wastewater for irrigation”. However, in general, urban, periurban, as well as rural farmers complained of rashes and skin irritation when exposed to wastewater for long periods of time. The response of this 68 year-old permanent labourer in Hyderabad city was typical:

*I irrigate the field and am exposed to this water all the time. Skin irritations are a common problem with constant itching of the skin on the legs and arms. Mosquito bites and bites of other small insects in the water are also common. I get a fever at least once a month which I think is due to all of these insect bites. But I never had any major health problems due to this water.*

This aspect has not been studied in depth and further research will have to be conducted to shed more light on these issues.
LEGAL-INSTITUTIONAL ENVIRONMENT

Box A explains the institutional and legislative environment. Interestingly, all of the governmental institutions seem to deny that there are any benefits associated with this form of agriculture. Some, like the Department of Urban Agriculture within the Ministry of Agriculture, deny its very existence. The only exception is the urban farmers’ association. The laws affecting urban agriculture are described below in Box B. These are not proactive in supporting urban agriculture. The only law that favoured urban agriculture was repealed in 1976.

We are just able to fill our stomachs

The urban farmers’ association has worked as a pressure group in the past to stop a project to channel the river in the urban area through a covered canal and to establish parks along its banks. It is highly likely that this group could act as a pressure group that could work towards stimulating recognition by governmental agencies of the existence and of the positive impact of urban agriculture on livelihoods. From this might follow a gradual change towards the adoption of legislation that will support urban agriculture.

CONCLUSIONS

Wastewater agriculture in this urban area along the Musi river, provides livelihoods to a diverse group of people from different caste groups and represents a broad spectrum of social classes, ranging from the lower middle class to very low-income groups of urban dwellers, to temporary and permanent migrants from rural areas. These socio-economic characteristics determine the type of wastewater-related activity in which they will be involved.

The agriculture and livestock activities based mainly on a fodder grass market seem well-suited to the only type of water available (wastewater). While banana and coconut occupy a good proportion of the urban agricultural land area studied, the income from leafy vegetables, which occupy only 1% of the land, exceeds the income from the other two crops. Unlike the other crops, leafy vegetables pose a greater risk to the consumer but conclusive studies have not yet been conducted.

However, even though there is a flourishing business from urban agriculture with wastewater, it continues to be a hidden economy, existing in busy areas of an ever-growing megalopolis that will only produce more wastewater in the future. The agriculture is neither recognised nor supported as of yet by the government. Pressure groups like the urban farmers’ association have proven to be powerful in the past and could successfully wage campaigns to safeguard their livelihoods in the future.

NOTES

(2) The kachi community received land in repayment of favours to their rulers, some by late 17th century. The names on the land titles are rarely changed. Land disputes are resolved by a kachi association.
(3) 1 Euro (€) = approx. 1 USD

Institutions Regulating Urban Agriculture

- Bhagya Nagar Kisan Sangh (BNKS) farmers’ association was formed by urban farmers in response to the government initiative to ban cultivation on Musi bed in urban areas. It mainly functions as a platform where farmers gather to exchange information and consult one another on any legal issues related to their land.
- Revenue Department (Collectorate) is a government department that collected an annual land tax on all urban property until about 1999.
- Municipal Corporation of Hyderabad (MCH) coordinates solid waste collection, transportation and disposal. It does not permit buildings to be constructed in river flood plain (along riverbanks). It removes illegal settlements upon the recommendation of the Revenue Office.
- Commissioner of Land Administration enforces the Urban Land Ceiling Act of 1976 limiting urban plot size to 4,000 sq ft (370 m²) and outlawing sale of land along the Musi river. The main reason that they wish to enforce this Act, according to the Secretary to the Chief Commissioner of Land Administration, is so that farmers do not sell the land and hurt air quality due to loss of the green area (personal communication, August 27, 2002).
- Hyderabad Urban Development Agency (HUDA) plans and regulates city space. A master plan drafted for the projected population of 2011 for Hyderabad city covers residential plots, industry, transport, amenities and eco assets but the extent of agricultural land not projected. According to same master plan, sewage load is estimated at about 2560 MLD for the projected pop. for 2011 (ranging from 9.5 to 11.3 million). The master plan also suggests decentralised Sewage Treatment Plants (STP). In one section of draft master plan, this proposed: “in peripheral areas and in the No-Development Zones, urban agriculture should be encouraged.”
- Hyderabad Metropolitan Water Supply and Sewerage Board HMWS & SB are responsible for the provision of water to the city and for construction and maintenance of dams, pipelines and canals for surface water and wells for groundwater. They are also responsible for operation and maintenance of two STPs and the sewerage system. Three new treatment plants and upgrades of the two existing STPs have been proposed by HMWS & SB.
- Andhra Pradesh Pollution control Board (APPCCB) assesses the quantity of water consumed by private and public sources and methods for discharging water. They perform regular water-quality tests along Musi.
- National River Conservation Project is made up of various institutions (such as HMWS&B) that are currently planning measures to clean up Musi river.