

Socio-Economics Consequences of Reusing Wastewater in Agriculture in Faisalabad

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Abstract

The cities are expanding rapidly and the gulf between the housing supply and demand is widening day by day. Consequently, the squatter settlements deprived of basic sanitation facilities are coming up in major urban centers. The wastewater generated is being disposed off either in open channels or in concealed sewers. The wastewater is being used for irrigation purpose for the agriculture land located in surroundings of the cities' pumping stations. The reuse of wastewater is affecting the natural environment as well as economic, social, and cultural conditions of community. Therefore, the present research was envisaged to explore the socio-economic impacts of reuse of wastewater on the users. The data was collected both from primary source as well as from primary sources. The results revealed that reuse of wastewater have many positive impacts on socio-economic aspects of the users. The data show that there is a major increase in price of agriculture land due to availability of wastewater and the average land value was Rs. 300000/acre before the reuse of wastewater while after the availability of wastewater as alternative irrigation source it has increased up to Rs. 4000000-6000000/acre. Similarly, monthly income of 87% households has increased and 77% respondents replied that employment opportunities have been generated. These are positive impacts on agriculture land values, households, monthly income and employment due to reuse of wastewater.

Key words: Wastewater, Pumping Station, Crop Intensity, brackish water, Squatter settlements, disposal, irrigation, shanty towns, agriculture land, property values.

Introduction

The metropolitan cities and towns are expanding rapidly due to natural population growth, about

1.90% annual (Govt. of Pakistan, 1998) and influx of rural migrants who are rushing towards urban areas in search of employment, education of their children and health facilities. The slums and squatter settlements-shanty towns are booming swiftly in the cities. These settlements are either deprived of basic facilities or under serviced. A research was conducted by Alimuddin, *et al* (2001:16) which revealed that in some of the squatter settlements there were 10 to 15 persons living in one house on three to five *marla* (one *marla* equal to 272.00 sft) plots having one to two rooms.

The issue of squatter settlements started getting attention of the government and other national and international agencies in 1960s. According to a UN report, in 1962 more than a billion people of developing countries were homeless. Their living conditions were described as "a menace to health and affront to human dignity" (Abrams, 1964:7).

According to Multiple Indicator Cluster Survey (MICS) conducted in Punjab-Pakistan overall, 70 percent population (urban 96 % and rural 58%) uses improved sanitation facilities with 67 percent using flush toilets connected to sewerage systems, septic tanks or pit latrines. This is a significant increase from Punjab MICS 2003-04, which reported 58 percent using improved sanitation facilities. Only 57 percent of household population disposed of wastewater properly including 96 percent in major cities, 88 percent in other urban areas but only 41 percent in rural areas (MICS, 2007-08).

In Faisalabad district overall about 84 percent population uses improved sanitation facilities and about 95 percent population in Jinah Town-local body constituency in Faisalabad (the catchments' area of wastewater) uses improved sanitation facilities with 59.9 percent using flush toilets connected to sewerage systems, septic tanks or pit latrines (MICS, 2007-08). The universe of the research study in hand is also located in Jinah Town.

The disposal of wastewater through collection and pumping at pumping stations in the surroundings of metropolitan cities and town has two fold effects on natural resources. On one hand it is a reliable source of nutrition-rich surface water for irrigation of

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agriculture land and on the other hand it is a threat to natural climate (land and air) by depositing toxic elements and microbes in the soils and nitrates in groundwater as well as leaving/emitting dangerous fumes in the air and are also breeding places for mosquitoes. It also contributes for spreading of malaria if stagnant in the form of ponds near settlements and dwellings.

International Water Management Institutions (IWMIs) has conducted many researches in Pakistan, Ghana, Vietnam and Mexico and examined both positive and negative impacts of wastewater reuse for agriculture. It has been found that many wastewater irrigators are not landowning farmers. But they are mostly landless people that got small holdings on rent to produce income generating crops such as vegetables, which thrive when irrigated with nutrient-rich sewage-wastewater. These wastewater micro-economies support countless poor people across Asia, Africa and Latin America. IWMI has further commented that stopping or over regulating these practices could remove the only income many landless people have (Feenstra, *et al* 2002).

In Faisalabad, due to brackish ground water the only feasible and appropriate irrigation source is canal water. The crop intensity has increased from 60-70% (designed one) to 120% at present. Moreover, there are some farmers who do not receive their allocated canal water share due to shortage of supply and breaches of canal water at different reaches. Therefore, among them whose land is situated near wastewater sources like pumping stations and wastewater channels etc. they seek for wastewater as alternate source of irrigation. The use of wastewater for irrigation could potentially impact on following areas:

1. Impact on land values (price) of agriculture land;
2. Impact on crop production;
3. Impact on monthly income of farmers' households;
4. Potential of Employment generation for the farmers' families and working class in the village;

In past very few studies have been conducted on this issue. Moreover, the previous empirical researches provide contradictory and inconclusive evidence on the different aspects of reusing wastewater and its socio-economic impact on society. Therefore, a study was conducted to assess the impact of wastewater reuse on the environment and user's life. The main objective of the study was to investigate the economic, social, and cultural, impacts of wastewater reuse in surroundings of Faisalabad city.

Materials and Methods

The pumping station of wastewater situated at Narwala Road was selected as main source of wastewater for this study. Afterwards many transect walks in the catchments area (Chak No. 217/RB-a village, major user of wastewater) were carried out. In addition four meeting with key informants were arranged in this village. The same technique was used in one of the studies conducted in rain-fed area (Pothohar-Chakwal) recently (Nousheen, 2009).

The list of all farmers of Chak No. 217/RB was collected from the concerned partwari that was used as sampling frame of this study. Fitzgibbon and Morris, (1987) stated a simple principle or rule of thumb that "*as the size of the population increases the sample size decreases*". This principle was the basis of sample selecting procedure for this study. A 10% sample (30 respondents) of farmers who were using wastewater since last forty years was selected by simple random sampling technique. The data from the selected respondents was ascertained through a survey by using a well conceived "Interview Schedule" in a face-to-face situation. Moreover, data from secondary sources was also collected. The Statistical Package for Social Sciences (SPSS) was used for data analysis.

Results and Discussion

Impact on Land Resources and Household Monthly Income

The reuse of wastewater for irrigation can change the value of land in two ways as placed below:

1. Rent and price of agriculture lands may change (increase) due to accessible of land to wastewater.
2. Productivity of agricultural land may change (increase) because of continuous use of nutritious-rich wastewater for irrigation.

The study of economic aspects of the respondents especially the farmers who are using the wastewater for irrigation purposes was essential to assess the impact of reusing the wastewater. A brief description of the change in land value-price, change in rent of agriculture land and change in productivity of agriculture land is presented as below:

Changes in Rent and Price of Agriculture Land

The area is located near the city and land is good for growing vegetables. Therefore, many owner farmers have given their land on rent for one year contract to landless contractors. Majority of the farmers replied that rent of agriculture land has increased from Rs. 4000/acre (before availability of wastewater for irrigation) to Rs. 30000/acre due to availability of

wastewater for irrigation purposes. This indicates that the availability of wastewater for irrigation has major positive impact on increasing rent of agriculture land. This might contribute for the increase in income of the households.

The average land value of agriculture land according to the data collected from secondary sources (district revenue office) was Rs. 300000/acre before the availability of wastewater for irrigation purposes and land of this village was not fertile, rather it had become unproductive due to salinity. Similarly, the price of land according to data collected through survey from the respondents (farmers) was about Rs. 400000-500000/acre before the availability of wastewater for irrigation and at present (after the availability of wastewater for irrigation) the land value is about Rs. 4000000-6000000/acre. This is a major increase in price of agriculture land due to availability of wastewater, a supplement source of irrigation. This has resulted in positive economic impact for this locality. It was also reported by Hussian (2002) that after Chenab River the only source of irrigation for Faisalabad is the wastewater and it has much positive impact on rent of agriculture land as well as land value.

Changes in Productivity of Agriculture Land

Major crops in Chak No. 217/RB (a village settlement), the major user of wastewater are wheat, vegetables and fodder. Wheat and vegetables are consumed by urban population while wheat straw and fodder is used for livestock presents in urban areas as drought animals (horses and donkeys) and milch cattle (cows and buffaloes). A survey of 30 mixed farmers (large, middle and small) was conducted. They were asked that whether the crop production per acre was decreased or increased after the use of wastewater for irrigation. The results are presented in Table 1.

Table 1 Change in Production of Crops after the Availability of Wastewater for Irrigation Purposes

Type of Crops	Response about Production			
	Increase		Decrease	
	Frequency	%age	Frequency	%age
Wheat	24	80.0	6	20.0
Vegetables	28	93.0	2	7.0
Fodder	26	87.0	4	13.0

Table 2 Distributions of Respondents According to Change in Households' Monthly Income

Description	Frequency	Percentage
Monthly income Increased	26	87.0
No change in monthly income	4	13.0
TOTAL	30	100.0

Table 4 Generation of New Employment Opportunities

Description	Frequency	Percentage
Yes, employment generated	23	77.0
No change in employment occurred	7	23.0
TOTAL	30	100.0

It is evident from the results of above table that a huge majority (more than 85%) of farmers replied that there was increase in the production of different crops per unit area due to use of wastewater for irrigation purpose. This proves that the wastewater (only domestic) is very much nutritious for agriculture purposes. The above mentioned results are positive economic impact of wastewater reuse for irrigation purposes for the farmers living in this locality. Younas (2004) concluded in a similar study since both natural and social conditions are changing and are subject to substantial uncertainty, therefore, alternative sources of irrigation like wastewater are essential to reduce the poverty in rural areas.

Change in Farmers' Household's Monthly Income

The household monthly income is one of the most important determinants for the level of poverty. The distribution of income among the households determines number of poor farmers' families and the extent of their poverty. It is revealed from Table 2: that the percentage of the respondents who replied that their monthly income was increased is 87.0 and remaining 13.0 percent who replied that their monthly income did not change, it may be due to the fact that they are not progressive farmers. This indicated that the reuse of wastewater for irrigation had very good positive impact to enhance the structural aspects (monthly household's income) of the farmers. This will alleviate the poverty and bring the prosperity in this locality.

Impact on Employment Generation for Poor Families

With provision of wastewater for irrigation there is a lot of land that became productive, providing employment not only casual labor and tenants but also to family members who otherwise remain unemployed like wife, mother, father and brother or sisters of farmers etc. They contribute in household income in two ways: as by reducing cost of food items and by earnings from food production. The growing of vegetables in this area due to availability of wastewater as supplement irrigation water created a lot of employment opportunities for the landless class as well. The vegetables crop needs lot of manpower right from land preparation, sapling, irrigation, plucking, loading, transporting, unloading, and again selling to the venders and to the

consumers. Similarly, wheat and fodder also demand more man power for harvesting, threshing, and storage etc. The intervention of wastewater has generated a lot of employment opportunities in the sector of agriculture and some new businesses were also generated. Table 3 shows that 77.0 percent of the respondents replied that new employment opportunities were generated due to use of wastewater in irrigation and 23.0 percent responded that there is no change in employment due to use of wastewater for irrigation purposes. This has been also confirmed from other studies as well. For example, although the share of agriculture in the economy has been slowly decreasing, it is still the backbone of the economy, employing more than 50 percent of the labour force and earning (directly or indirectly) 70 percent of export revenue (Govt. of Pakistan, 1994).

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