24th WEDC Conference Islamabad, Pakistan, 1998
SANITATION AND WATER FOR ALL

Domestic use of irrigation water in Punjab

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THE AIM OF this paper is to start a discussion regarding the unrecognized multiple uses of irrigation water, and future problems of accommodating basic water needs in irrigated areas. The paper is based on data from a field study currently being carried out, by the Health and Environment Program of the International Irrigation Management Institute, in the southern Punjab, Pakistan.

Background

Irrigation accounts for 69 per cent of all global fresh water use, while industry and domestic uses consume 23 per cent and 8 per cent respectively (UNEP, 1996). In Pakistan the situation is even more extreme with per capita water withdrawal in 1990 estimated at 1226 m^3 for irrigation, 26 m^3 for domestic use and 26 m^3 for industrial purposes (Seckler *et al.* 1998). There is increasing competition between these different sectors for the scarce global fresh water resources. While more water is needed in cities because of expanding populations and industries, the agricultural sector is under pressure to accommodate the populations need for increased food production. In Pakistan this problem is even more pronounced than in many other countries due to the rapid population growth, urbanization and economic development. Over half of the country receives less than 200mm of rainfall per year and of the total 20.7 million hectares suitable for cultivation, 16.2 million hectares depend upon irrigation (Ahmad and Chaudhry, 1988). The main institutions involved in the competition for water are the Government departments dealing with irrigation and water supply. Each has powerful stakeholders, the industry versus the agricultural sector. The agricultural sector is however bound to lose this battle for water, mainly due to its lower economic productivity [value per drop] than the industry. The irrigation sector will therefore have to make more efficient use of the water resources in order to meet the demand for increased agricultural production. Irrigation can be made more efficient by changes in management, for example by focusing on the specific crop water requirements rather than on landholding size in water allocation, or by infrastructural improvements, such as concrete lining of canals, to reduce seepage losses. In the period 1976-1977 it was estimated that 43 per cent of all irrigation canal water in Pakistan was lost due to seepage. (Ahmad and Chaudhry, 1988).

Multiple users of water

In large areas of the Punjab and Sindh, groundwater is brackish and cannot be used for domestic purposes, not even for washing. People in these areas rely completely upon irrigation water for all their requirements, including agriculture, domestic uses, and livestock water uses. The few water supply schemes that exist in these areas nearly always use irrigation water by exploitation of shallow seepage water. Changes in irrigation water management and more efficient irrigation can therefore have unintentional negative impacts by reducing the seepage and by extending canal closure times. This would reduce the availability of water for domestic purposes.

Health impacts

For people living in the irrigation systems interruptions of water supply are not new. There have always been periodic canal closures to enable maintenance, de-silting and repairs to take place. The population is therefore at times forced to find ways to store water for longer periods. However, when a family has to store water for an uncertain period of time, it will impose restrictions on the water uses. Water use for personal and household hygiene will be the first to be restricted, in order to maintain drinking water supplies.

While irrigation water might be of poor microbiological quality and pose the risk of water-borne diseases, it is well recognized that the availability of water for hygienic purposes is a key factor in the interruption of transmission of water related diseases, including diarrhoea. The large quantities of water that can be made available by irrigation systems could be an important advantage to health. So far, very few investigations have dealt in detail with the health problems and opportunities directly associated with the domestic uses of irrigation water (Ault, 1981). This urged IIMI to initiate case studies in two irrigation schemes in Sri Lanka and Pakistan to document the non-agricultural uses of irrigation water and to study the health impacts of such uses. This paper gives some preliminary results from the ongoing study in Pakistan.

Case study

The study area, Hakra 6R is the sixth biggest distributary in Pakistan, with a cultivable command area of 42,000 ha. It is located on reclaimed land from the Thar dessert, and has very limited natural water resources. Temperature ranges from 0°C in January to 46°C in July and the average annual precipitation is 196 mm. There are 78 villages in Hakra 6R with a population of approximately 136,000, mostly dependent on agriculture. Waterlogging and salinization are serious problems with the percentage of fields affected declining towards the tail end of the system.

Table 1. Main sources of water for domestic uses in Hakra 6R, Punjab, Pakistan

Ground water in the entire distributary is brackish and not fit for drinking or irrigation (Zaman and Bandaragoda, 1996).

From September to October 1997 a stratified random sample of 364 households in 24 villages was subjected to interviews to obtain information on the different water uses and water sources in the area. For domestic uses the most important source was the central located village water tank (*diggi*), which is filled weekly with water from the irrigation canal (Table 1). Only 12 per cent of the households had access to a public water supply scheme. These schemes have a direct intake from the canals. Drinking water was mainly obtained from hand pumps, electric pumps and wells that are located close to canals, village tanks, animal water ponds, or irrigated fields. All the water sources can be considered to originate from the irrigation canals, either directly or indirectly by exploiting seepage water. The effectiveness of the filtration and retention when seepage water is used is subject of ongoing studies.

The village water tanks were preferred by many due to the short walking distance from the households in contrast to the seepage from the fields and canals, which normally has to be drawn from the outskirts of the villages. The respondents were aware of the poor quality of this water and preferred seepage water for drinking and cooking. During canal closure periods it is likely that water consumption is minimized because of the extra burden of fetching the water.

In the study area all the inhabitants are 100 per cent depended on irrigation water and will therefore be affected by changes in irrigation water management. Only a few households have small in-house storage tanks, whereas the majority depends on outside storage. During canal closure periods the people are totally dependent on the water stored in the village water tanks and remaining seepage water in shallow aquifers.

The village water tanks are constructed as buffer tanks in case of canal closures, with a volume of approximately 1400 m^3. If it is assumed that the minimum daily requirement for domestic water is 50 liters per person per day, to avoid negative health impacts (Dahi, 1990). A village with 200 households and a household size of 8 (averages for the area) would the have enough domestic water for a 19 days period. This does not take seepage losses from the unlined tanks into account. In January 1997 the annual canal closure for maintenance lasted 38 days, forcing people to reduce water consumption or walk long distances to obtain water.

Discussion

Irrigation seepage water is the most important source of water to maintain health in the brackish water zones of the Punjab. It would still be a secure source under irregular irrigation water supply, if the quantities of seepage water already stored in the shallow aquifers were sufficient. But when new irrigation and water savings methods are implemented, this resource might diminish considerably. What is needed in future scenarios to maintain a sufficient minimum supply of domestic water is a recognition of the multiple users, as the people whose needs have to be taken into account when changing irrigation practices. This requires cooperation rather than competition between the irrigation and water supply sectors. Different sectors need to work with common objectives, and have to consider possible negative effects of their actions on other sectors. In many cases the drive of the irrigation sector to make irrigation more efficient and to reduce seepage losses has to be reconciled with the need of the water supply sector to exploit the seepage water.

Conclusion

The present water allocations to the different water use sectors, i.e. industrial agricultural and urban is likely to change in the nearby future. This will create a demand for the irrigation sector to optimize the efficiency of the water use. Instead of making more water available for domestic use, under this scenario the availability of domestic water might actually decrease. Much stronger institutional links between the irrigation and the water supply sectors are needed to avoid negative health implications for the multiple users of irrigation water. The perception of irrigation water has to be changed from being water to sustain agricultural production, to water that sustains the livelihood of people living in irrigation schemes.

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