8.1 Introduction

Pricing of canal irrigation by its very nature is beset with lots of ambiguities, limitations and complexities and has remained as an unresolved issue for economists, policy makers and administrators. The policy issues include the considerations of economic aspects, political aspects, biological aspects and social aspects. Although government intervention in the irrigation sector started prior to the pre-independence era, rapid progress in irrigation development was made after Independence. The irrigation potential created increased from 22.6 m ha in 1950-51 to over 87.2 m ha in 1992-93. Irrigation has made a significant contribution to India's agricultural development and has been instrumental in enabling India to attain self-sufficiency in foodgrains production.

Irrigation development has, however, brought in its wake numerous undesirable consequences such as wastage of precious water, waterlogging, soil salinity and recurring losses to irrigation authorities. In several studies, it has been pointed out that the benefits of irrigation development are due to the massive investments rather than efficient and optimal utilisation of water (Patel, 1990; Gulati, 1992). A widegap between the potential created and its actual utilisation, low productivity in the irrigation projects command areas as compared to the potential and the problems of adverse effects of waterlogging, salinity etc. have made the management of irrigation utmost important (GOI, 1972; Mitra, 1984).

One of the root causes of these problems lie in the irrational water pricing policy followed in India. The existing canal water rates are very low relative to both the cost of supplying water and the benefits from irrigation. They do not cover even the operation and maintenance costs of the projects (GOI, 1972; Patel, 1990; Gulati, 1992). Some past studies also show that underpricing
canal irrigation is one of the major causes of its low productivity. It leads to over-irrigation, wastage and misutilisation of water and hence low productivity (NCAER, 1959; GOI, 1972; Asopa, 1977; Patel, 1990). So, to improve the efficiency of canal irrigation, restructuring of the existing pricing policy is essential.

8.2 The problem

In India irrigation sector falls in the State List and so its management, administration and policies are governed by the state governments. Consequently, different states have differential water rates depending upon numerous considerations. In almost all the states of India, the existing water rates may be called 'administered prices', principally they are supposed to be fixed by the irrigation authorities and primarily on the basis of cost of supplying water. But the water rates are very low compared to both the cost of supplying water and the incremental benefits realised by the beneficiary farmers from irrigation. The revenue earned from the water rates of canal irrigation does not even cover the short run variable cost of supplying water for irrigation. This is one of the most important factors for the progressive deterioration in the financial performance of the irrigation projects in the country. This study was undertaken to examine some of the issues in pricing canal irrigation water and to propose a practicable pricing method. More specifically, the following broad objectives were set for the study:

1. To critically review various theories of input pricing and assess their suitability for pricing canal water;
2. To estimate critically the costs of supplying canal irrigation water and to compare the water rates with the costs;
3. To estimate the direct benefits of canal irrigation and to compare the water rates with the benefits;

4. To determine water rates using the Contingent Valuation Method (CVM);

5. To find out the costs of tube-well irrigation in the study areas and to compare those with the costs of canal irrigation; and

6. To suggest a suitable pricing policy for canal water.

8.3 Research Methodology

In pursuit of the above objectives, the following hypotheses were proposed.

1. There is a significant increase in the yield, net income, average return per rupee invested due to canal irrigation in the study areas;

2. The existing price of canal irrigation water is very low as compared to its: (a) productivity and (b) cost of supply.

3. The willingness to pay for is markedly higher than the existing water rates.

4. The cost of tube-well irrigation is very high compared to that of canal irrigation and hence farmers do not have any incentive to practise conjunctive use of ground water and surface water.

To carry out the study, two states, namely, Gujarat and Uttar Pradesh (UP) were selected purposively. In the two selected states, water rates for canal irrigation vary from crop to crop, from season to season depending upon many considerations like assuredness of supply of irrigation water, capacity of sources, paying capacity of the irrigators and timings of canal
schedules (CWC, 1993:13&15, 31&42). In both the states, there was an increasing stress on the use of groundwater and so, was the Government’s support in the form of subsidy and low interest loans. The progress of the minor irrigation projects in the two states was impressive. This was found advantageous to carry out the study to compare the benefit of canal irrigation with that of other sources of irrigation in the study areas.

Two districts, namely, Kheda from Gujarat and Hardoi from UP were selected purposively. Kheda was one of the most prosperous districts in central Gujarat having a large canal irrigated area with modern agriculture. The other district, Hardoi was situated in central UP. Agriculture was the mainstay of most of the population in Hardoi. The district was having a considerable area under canal irrigation. In both the districts, minor irrigation facilities supplemented the canal irrigation and/or provided irrigation in areas where canal network was not existing. The climate, soil condition, cropping pattern and the condition of the farmers of the two districts were not similar. This diversity was considered desirable to generate reliable estimates of the benefits of canal irrigation in both the study areas.

Then, from each of the districts, two talukas/blocks, Thasra & Kapadvanj from Kheda district and Harianaon & Tadiaon from Hardoi district were purposively selected for conducting the study. The talukas/blocks were chosen in such a way as to ensure that agriculture and its allied activities were the most important means of livelihood of the people in the selected talukas.

In the next step, one village from each selected taluka/blocks, namely, Pandvania from Thasra taluka and Motizaher from Kapadvanj taluka in Kheda district and Kachnari from Harianaon Block and Alishabad from Tadiawaon Block in Hardoi district were purposively selected. These villages were so selected that two of the four sample villages, Pandvania and Alishabad, were
having canal irrigation facility supplemented with a few tube-wells and the other two villages, Motizaher and Kachnari, did not have canal irrigation facility. The only source of irrigation in the latter was tube-wells. Water intensive crops like sugarcane, paddy, tobacco etc. and wheat were the main crops grown in the canal irrigated villages while relatively less water-intensive crops like wheat, bajra, groundnut etc. were the main crops cultivated in the tube-well irrigated villages. Of the two villages where canal irrigation facility was not available, one village, Motizaher had rich farmers who were quite familiar with tube-well irrigation practices and in contrast to that, the other village, Kachnari, had farmers, who by and large, were very poor and did not have the capacity to afford tube-well irrigated farming. In Kachnari, agriculture was of subsistence nature. The farmers were so poor that they even did not enough capacity to invest in agriculture to develop the required infrastructure to improve the subsistent conditions of farming. But in the other tube-well-irrigated village, Motizaher, the situation was totally opposite; farmers were rich and their investment in farming was quite high compared to the UP villages.

A sample of 200 farmers comprising 50 farmers from each of the four sample villages was taken randomly. Then, the sample farmers were grouped into four size groups, namely, marginal (less than 1 ha), small (in between 1 to 2 ha), medium (in between 2 to 4 ha) and large (greater than 4 ha). A sample of 37 tube-well owners was also selected randomly from amongst the 200 sample farmer households.

Necessary data for the study were collected from both primary and secondary sources. To collect the primary data, four sets of questionnaires were prepared. The first set of questionnaires consisted of questions relating to general profile of sample villages; the second set was about the sample households, the third set related to tube-well investment and costs and the fourth set dealt with information regarding crop-wise cost of cultivation and gross
returns. The required secondary data were collected from different sources from time to time in accordance with the need of the study.

The primary source of data consisted of 200 sample farmers chosen from the four sample villages. The data were collected from the sample farmers by the personal interview method using a structured questionnaire prepared for the purpose. Information regarding households, cost of cultivation and gross income, tube-well investments and costs etc. was collected from the heads of sample households or from other knowledgeable members of the households and recorded in the questionnaires. The primary data are related to the agricultural year, rabi 1992-93; summer 1993 and kharif 1993. All the costs and benefits were estimated on the basis of the information given by the farmers. Actual selling prices for different crops were taken from the sample farmers. The data about the costs of pumpsets, installation etc. were collected and subsequently extrapolated suitably. The data on different aspects of tube-well irrigation were also gathered at the time of survey. To cross-check the validity of the information given by the sample farmers at the time of interview, several questions were asked to other farmers and the same farmers in different ways.

The secondary sources of data consisted of different government office records and publications, census reports etc. Besides these sources, books, papers and other publications were also referred to.

8.4 Major Findings

The extensive and thorough review of the literature done revealed that the prevailing water rates of major and medium canal irrigation projects in different states of India varied from state to
state, from crop to crop, from season to season and even from project to project depending upon the variation in the considerations involved in determining them. The existing canal water rates in different states are too low to cover even the operation and maintenance costs of the projects. This underpricing of canal water is one of the most important causes for its huge wastage and poor water management systems followed in India.

The water rates for canal irrigation are fixed on the basis of some adhoc and arbitrary considerations rather than some rational, coherent and uniform criteria. The rates are very low compared to both the cost of supplying irrigation as well as the benefit realised from the use of it. It can be said that to prevent the increasing financial deterioration of irrigation projects and to rationalise canal water pricing policy, a thorough restructuring of the water rates is urgently required as has been recommended time and again by several scholars.

While dealing with the pricing problems, it has been felt by many scholars that the precise estimation of benefits and costs of irrigation projects is very difficult as some of the benefits and costs are diffused and not measurable by simple methods. The data gaps and lack of appropriate techniques for measuring those benefits and costs make the pricing of canal irrigation water a complex problem and hence, there is a lack of specific and clear-cut guidelines to fix uniform water rates. As a result of this, different state governments administer different water rates to suit their own purpose and depending upon varying considerations.

From the detailed analysis of the cost of cultivation it was found that the canal water rates were too low to meet the cost of supplying water. In most of the states, the water rates are not sufficient to meet even the short run variable costs (operation and maintenance costs). This is one of the main reasons of the progressively deteriorating financial performance of our irrigation
projects. To stop the process and to improve the efficiency of the irrigation projects, water rates must be raised up to a level where they cover at least the variable costs of supplying water.

From the analysis of different aspects of distribution and costs of tube-well irrigation, it came out that the cost of tube-well irrigation was much higher than the canal irrigation cost. Because of this, most often farmers find it less profitable or to grow crops with tube-well irrigation. So, it shows that there is substantial scope for canal irrigation authorities to raise and rationalise the canal water rates leaving sufficient incentives for the farmers to use canal irrigation. The analyses of the different aspects of tube-well irrigation reveal that the average return per rupee on irrigation cost was considerably higher for canal irrigated crops than the tube-well irrigated crops.

The analysis of the benefits of irrigation showed that the areas with timely and assured supply of irrigation water had the following features; (a) higher cropping intensity; (b) higher investment in the cropping practices; (c) raising of high-value, capital intensive crops; and (d) higher return per rupee invested.

The analysis also showed that uncertainty in the supply of timely and adequate irrigation water prevented the farmers from growing water-intensive and high-value, capital-intensive crops. Hence, farmers of those areas cultivate only those crops which can survive under the condition of water scarcity. In such areas, most of the times farmers cultivated their lands only once in a year, in kharif season. As a result of this the cropping intensity of those areas is very low as compared to the irrigated ones. Use of inputs was also found to be lowered in the cases of unirrigated crops due to uncertainty about the onset and duration of monsoon and distribution of rainfall. This eventually lowered the employment opportunity and the return per rupee invested.
From the comparative analysis of benefits of canal and tube-well irrigation it emerges that under canal irrigation, farmers enjoy considerably higher profit in raising different crops than under tube-well irrigation. One of the reasons for this is significantly lower charges of canal irrigation than tube-well sources. The high cost of tube-well irrigation, sometimes, consumes the whole or a major portion of the net additional income from irrigation. The canal irrigation costs constitute a very small proportion of the net additional income as compared to the tube-well irrigated crops. The analysis shows that canal irrigation charges are very low compared to both the benefits from irrigation and the charges of tube-well irrigation.

The marginal value productivity (MVP) analysis for irrigation water revealed that the MVPs of canal water were markedly higher than those of the irrigation water from tube-wells, it can be asserted that the water rates of canal irrigation can be sufficiently raised to meet the cost of supplying water.

While applying the Contingent Valuation Method (CVM), we found that Willingness To Pay (WTP) for irrigation water by the beneficiary farmers was quite high. This confirms our earlier conclusion that there is scope for raising the canal water rates. This CVM method helps in capturing the scarcity value of water in the form of higher WTP biddings of beneficiaries. Willingness of irrigators to pay for irrigation depends upon many factors including incremental benefits from irrigation, or their ability to pay, existing water rates, and scarcity of water.
8.5 Policy Implications

The findings of the study have following implications;

1. There is wide variation in the considerations for pricing of canal irrigation water in different states of India. Uniformity and rationality in the considerations are utterly lacking. Hence, there is an urgent need to rationalise the pricing policies for canal irrigation.

2. The existing canal water rates are very low compared to both the cost of supplying irrigation water and the benefits accruing to the farmers by using it. The cost of irrigation for tube-well irrigated crops is considerably higher than that of canal irrigated ones. There is quite high WTP on the part of the beneficiary as well as non-beneficiary farmers for irrigation. The bidding is higher in the areas where canal irrigation facility was absent. This reflects that there is substantial scope for canal water rates to be revised upward.

3. The study also substantiates a generally held view that the cost of supplying canal water is very high compared to the water rates charged to the irrigators. This situation creates a huge burden to the state exchequers and jeopardises the financial performance of the irrigation projects. To remove this defect in the pricing of canal irrigation, the water rates have to be revised upward periodically to meet the variable cost and a part of the fixed cost.

4. In the present pricing policies for canal irrigation the scarcity value of water is not considered. This has led to the colossal wastage of irrigation water at the head reaches and non-availability of water to the farmers at the tail ends.
5. The canal irrigation charges on the farmers are levied on the basis of the extent of area irrigated rather than on the basis of the volume of irrigation water consumed. Consequently, the farmers always show a tendency to over-irrigate their crops and follow poor crop-water management practices.

6. The existing pricing policies do not give any weightage to the quality aspects of irrigation, i.e., adequacy, timeliness of supply and quality of supply of irrigation water.

7. The existing pricing policies do provide any scope for enlisting farmers' participation in organising the schedules of delivery of water, to collecting water charges, in promoting the cultivation of certain crops in their area, maintaining irrigation channels and in improving overall quality of irrigation. There is need for facilitating through appropriate policy measures on farmers' participation in making decision that affect the quality of irrigation, cost of supplying water and distribution and management of water at the distributory level.