Chapter 4

Literature Review: Aspects of Canal Irrigation Sector
4.1 Introduction

Having discussed the nature of canal irrigation as a quasi-public, non-merit good in chapter three, it is appropriate that a review of literature about various issues like pricing, costing, funding, cost recovery and aspects of management, which are responsible for plaguing the functioning of the state-run irrigation sector in India is made.

After independence, the need for expansion of irrigation facilities was fully recognised for increasing food grains production to meet the growing requirements of the population. Despite this, the expansion of irrigation facilities, operation and maintenance of irrigation systems and equitable distribution of canal water have not been achieved satisfactorily. Irrigation sector today faces the twin issues of sub-optimal sector planning and financial management on the one hand and inadequate water management and system maintenance on the other.

As already mentioned in chapter two, the publicly owned and managed canal irrigation sector in India is fraught with many ills like huge implicit subsidies, dearth of resources for investment in new projects, poor operation and maintenance, inequity in canal water distribution and consequent user dissatisfaction etc. All these and other factors give rise to a general apathy among the farmers regarding paying their irrigation dues. Thus, a vicious circle envelops the functioning of this sector, which is very difficult to break. In the following pages, a review of studies made by various independent researchers about the various issues and aspects of this vicious circle has been presented.

4.2 Pricing

As mentioned in chapter one, canal irrigation is a concurrent issue under the constitution of India. Every state of the Republic of India is free to devise pricing policy for canal irrigation. Thus, a lot of ad hocism and disuniformity prevails in the fixation of canal irrigation rates. There is no fixed time period by which the rates once fixed are expected to be revised. Mitra (1996) and Patel Himmat (1990) found that irrigation being a state subject in India; there is no uniform policy or set of principles for determining pricing for canal
irrigation in India. The variation in water rates is due to the fact that the various states give different weightage to factors affecting the water rates namely, recovery of operation and maintenance costs, ability to pay of irrigators, water requirement of the crop, assurance of irrigation facility, classification by land and linkage with land revenue etc. the Vaidyanathan Committee (Gol, 1992) observed that there is a scope of rationalisation of irrigation rates structure in India. Policy makers in India have long debated the issue of water charges. Over the past thirty years, expert groups including Nijalingappa Committee (1964), Irrigation Commission (1972), National Commission for Agriculture (1976) and successive Finance Commissions have discussed both the level of irrigation charges as well as the method of assigning them (Gol, 1988).

4.2.1 Non-revision of water rates

Most of the States have, at present, very low irrigation water rates that have not revised periodically. Most of the North Eastern States (except Assam and Manipur) do not even charge for irrigation water. Maharashtra was the only State where irrigation water rates were announced for a 5-year period at a time with a provision for 10% increase per anum so as to recover the full O&M cost as well as interest payable on the public deposits raised through irrigation bonds. The State Governments of Andhra Pradesh, Maharashtra, Haryana and Orissa and Gujarat revised irrigation water rates in recent years.

According to the White Paper on water in Gujarat (GoG, 2001), the irrigation water rates were not revised in Gujarat for a long period from 1981 to 2001. As a result, the escalation of cost of providing irrigation at the farm level was not reflected in the canal water charges. The Irrigation Department of the Government of Gujarat then appointed an expert group in 1985, which had recommended a gradual increase in water rates such that by 1991-92, the revised rates would cover about 33% of the annual Operation and Maintenance costs (Parthasarthy, 2004). It was only as late as in January 2001 that the government of Gujarat passed the resolution to raise the water rates for agricultural use. The rates were increased to two and a half times the rates in 1981 rates on an average. The GR for this purpose also provided for an automatic yearly rise in the rates by about 15-25% for the next five years.
(GoG, 2001). This was to take care of inflation as well as part of the past losses accumulated due to non-revision of rates in the past years. With the upward revision of water rates according to the GR, the revenue from the agricultural sector was expected to double in the next four years to reach a figure of Rs.120 crores by 2005 (Dholakia, Archana, 2003). Thus with proper implementation of the GR and cost reduction efforts, around 2004-05, the state could expect to achieve the target of 1% return on capital expenditure plus O&M from the agricultural sector. However, under pressure from the farm lobby, the water rates were again revised and brought at a lower level in 2004 (GoG, 2004). Also, according to this GR, the yearly increase in water rates would now be to the extent of 15% only instead of 25% as decided earlier. The new water rates came to effect from 16/06/2001, with retrospective effect. The farmers, who had already paid their water dues with respect to the earlier rates, would get their future payments adjusted against the same, according to the new rates.

4.2.2 Need for price Reforms

Price reforms in the irrigation sector are necessary so that the irrigation agency becomes financially self-sustaining. But price-reforms are closely linked to quality of service. In other words, providing efficient service is a pre-condition for price-reforms in this sector. This requires fundamental institutional changes, which promote good agricultural practice, efficient water-use technologies that prevent wastage of water.

The National Water Policy, 1987, says that water rates should be such that they convey the scarcity value of the resource to the users and foster the motivation for economy in water use, and that the rates should be adequate to cover the annual maintenance and operation charges of irrigation schemes as well as a part of the fixed cost (Gol, 1988).

Low Prices in the irrigation sector have so far been advocated and justified (Champati and Patnaik, 1984) on the grounds that lower water rates are conducive to fuller utilisation of irrigation potential. Also, cultivators whose income is far less than urban dwellers should get some relief and subsidy on irrigation cess. Social benefits accruing from irrigation are high; therefore, the entire burden of cost of providing irrigation should not be imposed on farmers.
only. The prices of non-agricultural products especially agricultural inputs continue to rise much faster than agricultural products, and therefore, it is necessary to give some relief to the farmers in the form of subsidy. Champati and Patnaik have further argued that the scope of improving financial performance of the irrigation projects can come from a fuller utilisation of irrigation potential, reducing cost of construction of projects, and implementing a better effort for water rates collection. However, a contrary argument is presented by Kartar Singh (Singh, Kartar, 1978), where he says that there is no basis for subsidising irrigation water if it has already become profitable and popular.

A. Vaidyanathan (2001) observed that water rates have become a focus of competitive populism. The Committee on Pricing of Irrigation Water (Gol, 1972) noted that “revision of water rates has been infrequent, hesitant and very much less than the increase in costs”. Mitra (1996) felt that price reforms are the most important issue in irrigation sector reforms. Jaynarayan Vyas laid down the guiding principles of water pricing as being capable of serving as a signal for efficient and economical water use. Pandya (2002) concluded that water prices should be fixed in such a manner that they generate enough resources, which cover at least the Operation and Maintenance costs of irrigation structures. Patel (Patel. Himmat, 1990) concluded that water prices should be such that would bring inter-regional and inter-personal equity among water users, bring about an environmentally sustainable use of water resources in the current period as well as in the long term and at the same time discourage wasteful use of water thereby preventing environmental degradation in the form of water logging & salinity which are known to occur due to excessive use of water. An independent regulatory authority for irrigation is the need of the day, so that adequate rise can be made in water prices which would encourage projects of co-operative or private participation in this sector (Dholakia, Archana, 2001). The Vaidyanathan Committee (1992) emphasized the need to move from area based to volume-based water rates.
4.2.3 Reflecting scarcity value of water through appropriate pricing

The current prices of canal irrigation do not really reflect the scarcity value of water. Some experts believe that canal water pricing strategy should give clear signals in this regard to user farmers.

Gujarat has about 65 lakh hectares of potentially irrigable land out of which only 35 lakh hectares (less than 50%) are irrigated. In this also, the effectively irrigated areas is only 30% of the potential area. In spite of a perennial scarcity of water, its pricing has not been reflective of its scarcity. Reviewing the literature on water, one finds that a lot of wisdom has gone into the analysis of the problem, but due to lack of political will, the implementation of the suggestions was slow and inefficient.

According to Perry et al (1997), a faulty water pricing policy causes excess demand from some groups and consequent shortages faced by others, deterioration of water quality due to inadequate funds for operation and maintenance, over-exploitation of groundwater aquifers, theft of water from public tube wells and so on. They believed that appropriate pricing of user charges is very crucial because it links use benefits to service delivery costs. This contributes to cost recovery and may also provide incentives for improved irrigation services with attendant effects on productivity, equity, and efficiency of resource use etc.

The National Conference of Irrigation and Water Resources Ministers in 1986 argued that water rates should be such as to provide signals to the beneficiaries regarding the precious value of scarce water supplied and wanted the rates to be increased gradually. Taking into consideration the rising cost of irrigation projects, with regard to both capital outlays and Operation and Maintenance costs (Gol, 1988).

The idea of volumetric pricing of water is favourable according to many experts because it will not only help conservation of water but also improve assessment and collection of water dues (Patel Himmat, 1990).

4.2.4 Relating water price and cost of delivery

Many studies have concluded that the canal water prices reflect neither the scarcity value of water, nor its opportunity cost nor the share of benefits
accruing to different groups. According to Kumar et al (2004), value of water is the price that the users are willing to pay for the use of this resource. Economic value of a resource is the incremental economic output that could be realised through the use of the resource. Many researchers over the years have concluded that the cost of providing irrigation at the farm level is rising, with the overall rate of inflation and increasing demand for goods and services in all sectors. Therefore, they advocated that the escalation in cost should be reflected in the price of canal water as well. Patel (1990) also felt that the existing irrigation water rates were very low in relation to the capital expenditure that has gone into the construction of the irrigation projects. This was not a good sign for the long-term sustainability and feasibility of the system. This is because, in case of very low cost recovery, the government was likely to find it unable to finance new projects, in absence of sufficient returns from the existing projects, which would facilitate the turn over of capital, used for creating social infrastructure. The water rates as per the logic of cost of service approach should be such that at least the total revenue realized should be adequate to cover the O&M cost in the present, and in the long run, must also generate some surplus sp as to earn reasonable return, (of say about one percent) on the cost of capital.

Iyer (2001) concluded that the cost of providing irrigation at the farm level has been steadily rising. It was just Rs. 1,200 per hectare in the First Plan, which increased to Rs. 66, 570 per hectare in 1990-92 at current prices. Shah, Hussein and Reheman (2000) observed that according to a report of India's Central Water Commission, during 1991-92, gross receipts of irrigation charges per hectare were just Rs. 82/- against an expenditure on Operation and Maintenance of Rs. 1, 032. Parthasarthy (2004) observed that in the early 1980s, the average annual revenue from the water rates covered only about 8% of the annual Operation and Maintenance costs in Gujarat. Water rates could be related to the cost of providing irrigation or to the benefits to be derived from irrigation or to some value judgement on the beneficiary's ability to pay the rates. Several Finance Commissions have been recommending water rates to be linked with annual Operation and Maintenance costs and some percentage of capital cost. The
Vaidyanathan Committee recommended water rates, which lead to full cost recovery on volumetric basis, improvement of existing systems, and creation of autonomous and financially self-reliant entities at the system level with participatory management by users. The Government of India forwarded the Vaidyanathan Committee's recommendations to the state governments for implementation, but none of the state governments revised the water rates accordingly at that point of time. A. Vaidyanathan (2001) opined that so long as the revenue budget is in deficit and public investments cannot be maintained at the levels needed to sustain reasonable rate of overall growth, the principle of full cost recovery must apply to irrigation and indeed to many other goods and services provided by the public sector.

Neetha N. (Neetha N. 2003) concluded that an unduly subsidised price of water does not capture or transmit the scarcity value to the farmers. Therefore, farmers are encouraged to maximize not the output per unit of water but water per unit of output. This leads to wastage, misuse and over irrigation.

According to Perry, cost recovery requires a politically sensitive choice as to the extent of cost recovery, full cost recovery of capital and O&M costs at realistic interest rates, or partial recovery at subsidized rates (Perry, C. J., 2001). Patel Himmat (1990) studied the financial performance of four irrigation projects in Gujarat and concluded that a huge gap existed between revenue and expenditure in these projects. He recommended an upward scaling of water charges based on volumetric pricing. Shishodia (Shishodia, Anil, 1994) found that the price of canal water is pathetically low and totally unrelated to the productivity or scarcity value of water, or the cost of delivering it. It accounted for just 8% of cropping expenses and is equal to barely 5% of the average incremental production of irrigated areas over rain fed areas. Moreover, water charges were fixed in nominal terms that remain unchanged for years so that, they have been falling in real terms. In most states, the agency levying the water charges and those responsible for its collection (usually the revenue department) were different. The overall loss amounted to about 7% of total plan expenditure on all irrigation schemes. The inability to recover costs has led to growing state revenue deficit so that currently,
irrigation alone was responsible for about a third of the revenue deficits of states in India. He felt that this had a further impact of cutting down on state expenditure on irrigation. The cost of canal irrigation is substantially lower than tube well irrigation mainly because canal water rates are highly subsidised due to political reasons.

Distortions of cost and price in groundwater extraction were brought out in a study (Kumar Dinesh M., Lokesh Singhal, Pabitra Rath, 2004) made about ground water use in Banaskantha in Gujarat. It was found that the tube well owners extracting ground water and selling it to farmers, found it cheaper to extract than canal water due to subsidised electricity being available. The tube well owners found it more profitable to sell at rates higher than canal water rates. On the other hand, the farmers, who purchased water from tube well companies (private tube well owners), did not mind paying a higher price than canal water rates, due to the increased surety of water delivery by these tube well companies. The study further observed that ground water extraction was found to be done at less than economic value. The price at which groundwater is traded in Banaskantha was high, reflecting the scarcity and value of this resource. The farmers who owned tube wells enjoyed unlimited access to the resource and were not fully confronted with the opportunity cost of using water due to heavily subsidised electricity. They diverted precious ground water for growing crops that were economically inefficient. The analysis shows that irrigation cost, as a percentage of total input cost is quite significant for all the crops and varies from village to village. However, there were significant variations found in the cost of irrigation for the same crop across villages, which led to a difference in net private returns for the same crop as well. Thus, due to subsidised electricity provided to North Gujarat farmers, they actually incurred just half of the actual economic cost of electricity. The economic cost per hour of irrigation varied from Rs. 64.1 for Khasa to Rs. 21.2 for Vansol, whereas the private cost of irrigation per hour was almost half of this, i.e. it varied between Rs. 30.70 paise for Kumbhalmer and Rs. 9.80 paise for Thana.

On similar lines, a study by Avinash Kishore and Shilp Verma (2003) found that the flat tariff system for electricity leads to inefficiency and wastage in
water and energy use in irrigation because it makes incremental cost of pumping negligible. Since the market rate of water is much higher than the energy cost, the farmer keeps on extracting ground water and selling it, till there is a demand from other farmers. The flat tariff system of electricity in Gujarat has not been revised for over a decade, while the real cost of energy supply has gone up manifold. There is an urgent need to transform the present dysfunctional power supply and pricing system to ensure a viable power industry and sustainable irrigated agriculture.

4.2.5 Relating price with Operation and Maintenance costs:
The existing water rates of canal irrigation in India are not even sufficient to meet the Operation and Maintenance expenses of the system. According to economic theory, in order to continue to remain operational, any firm is expected to cover at least the short run average variable costs from the revenue earned. In canal irrigation, this refers to operation and maintenance costs incurred every year. Therefore, many researchers have argued that pricing policy of canal irrigation should be fixed, keeping in view at least the Operation and Maintenance expenses of the projects. The studies made in this regard are reviewed as under:

The Irrigation Commission (1972) recommended that the water rates should be so fixed that irrigation works do not become a burden on the state exchequer. The National Water Policy adopted in 1987 recognized that the prevailing water rates were too low to meet even Operation & Maintenance costs of the canal irrigation structures. Considering the rising costs of irrigation projects, both on account of capital and Operation & Maintenance, the policy recommended a revision of water rates in such a way that they should be adequate to cover the annual Operation and Maintenance charges and part of the fixed cost. Efforts should be made to reach this ideal over a period, while ensuring the assured and timely supply of irrigation water. According to a study made by the Ministry of Water Resources, the water rates for surface and ground water should be rationalized with due regard to the interests of small and marginal farmers (GoI, Ministry of Water Resources, 1999). Further, the study observed that the past Operation and Maintenance expenses have been found to be very low because of inadequate budget
allocations. It was suggested in the report that realistic Operation and Maintenance costs per hectare should be worked out by each state on pilot representative systems by allotting adequate funds. These figures should be used for fixing up water rates. However, in working out the cost, ceiling percentage on establishment should invariably be followed. Perry (2001) advocated the increase of water charges to generate sufficient resources for Operation and Maintenance and at the same time, also reduce the aggregate demand for irrigation water.

Vaidyanathan (2001) concluded that the revenue from water charges from major and medium irrigation projects fell short of working expenses since 1977-78 and the situation has deteriorated ever since then. He further concluded that Operation and Maintenance cost has increased due to a steep rise in salaries, due to which there is deterioration of systems and quality of service. The Vaidyanathan Committee (1992) emphasized the need to recover the full cost i.e. Operation and Maintenance cost plus one percent each of capital cost and depreciation allowance. On the issue of cost recovery in irrigation systems, the Vaidyanathan Committee recommends that total O&M cost of the project should be recovered from the revenue generated from water rates itself. According to Patel (Patel Himmat, 1990) provision of O&M cost below desired level leaves a part of maintenance and repairs (M&R) work incomplete or unattended which in turn inbreeds operational inefficiency with the result that revenue realized from the sale of water remains not only below O&M cost but in the long run, gap between O&M cost and revenue receipts goes on widening. Establishment cost being a committed liability, it has claim on whatever limited funds are put for this purpose. The M & R branch has to contend with whatever is left over after meeting establishment cost. Leaving lesser funds for M&R directly affects the efficiency of irrigation services in terms of area served and reliability of supply of water. He further concluded that reduction in wastage of water would also reduce the per hectare cost of operation and maintenance.

Pandya (2002) found that the aggregate amount of revenue account deficit, i.e. the deficit incurred on operation and maintenance costs of five major and
medium irrigation projects in Gujarat was Rs. 4,113 lakhs in the period between 1987-88 to 1999-2000.

4.2.6 Relating water price to the benefit received

Patel Himmat (1990) observed that for years, the user charges of water in Gujarat had been fixed without using even the basic principles of public finance like "benefit taxation". Thus, the water prices reflected neither the scarcity value of water, nor the opportunity cost, nor the share of benefits accruing to different groups.

A study made by Sangal (1991) observed that the criteria to measure benefits from irrigation projects was evolved and finalised by a Select Committee of the British House of Commons in 1872 which provided that irrigation projects should be able to yield, after a gestation period of ten years, a specified rate of return in the capital cost of the project and should also cover arrears of interest during the gestation period. This rate of return varied over time. Till 1919, it was 4%, between 1919 and 1921; it was 5%, after 1921, 6%. During 1949, it was lowered to 3.7%. Thereafter, based on the studies conducted between 1958 and 1961, the concept of rate of return was changed to Benefit Cost Ratio lowering the stress on financial returns to the government. The procedures for Benefit Cost Ratio analysis of irrigation projects were reviewed in 1983 by Nitin Desai Committee constituted by the Planning Commission. The Committee recommended replacing the Benefit Cost Ratio by the norm of Internal Rate of Return (IRR) and suggested that projects should normally earn a minimum IRR of 9%. A lower rate of 7% was prescribed for drought prone areas (GoI, 1988). At present, irrigation projects with Benefit Cost Ratio of less than 1.5 are not generally accepted unless it is proposed in a drought prone area.

A. Vaidyanathan (2001) concludes that the indirect benefits of irrigation on the rural economy in terms of increased agricultural production, due to which investment in irrigation is justified. So, the requirement regarding minimum financial return has been correctly dropped.

The returns from irrigation can be classified as direct financial returns to government, benefits to farmers, and benefit to society. In his study, Tripathy
(1984) found that there was a considerable upward change in the productivity of water and consequently in the incremental farm income and return per rupee invested after launching of the command area development programme in 1975. Dhawan (1986 pages 271-281) argues that irrigation enhances rain fed or unirrigated crop yield by 3.5 quintals per hectare. Various studies made by experts indicate that the benefit criterion is either not considered by state governments while fixing water rates or they are not followed. In response to a query by the Eighth Finance Commission, only two states, viz. Gujarat and Maharashtra, had indicated in their memorandum that benefits received by the farmers was one of the criteria for determining the water rates in their states. However, how these benefits were measured and in what way the benefits were related to the water rates was not specified (Patel Himmat, 1990). According to the Irrigation Commission 1972, the water rates in vogue in many states were a mere fraction of the value of the produce in the areas that received irrigation.

The Vaidyanathan Committee (1992) observed that in no state do the gross receipts by way of water charges per hectare account for more than 3% of gross productivity per hectare of irrigated area.

The Second Irrigation Commission (1972) had recommended a water rates structure linked with value of gross product of irrigation per hectare irrespective of working expenses incurred. The Commission spelt out the need to fix up optimum level of water rates so that 5% of gross income for food crops and 12% of gross income for cash crops was recovered. However, the actual receipts vary from less than 1% to a maximum of 2.9% of gross income (Mitra, 1996).

Vaidyanathan Committee (1992) has tied up the rates with Operation and Maintenance cost and a part of the capital cost (up to 1%) without reference to the value of the product. However, the Committee observed that the question of recovery cannot be completely divorced from economic conditions of beneficiaries, i.e. benefit criterion should also be a part of cost recovery analysis.
A.Vaidyanathan (2001) concluded that most states had also passed a legislation requiring beneficiaries to pay a betterment levy to capture a part of the increase in productivity and capital value of the land due to provision of irrigation. The betterment levies did not yield much, mainly because the law was not enforced.

A view, different from the above, was expressed by Champati and Patnaik (Champati, M. and S.C. Patnaik, 1984) that while considering the benefit derived from irrigated agriculture, all the increase in income accruing to the cultivators on account of irrigation should not be usurped in the form of higher irrigation charges, because, irrigation has other incidental advantages as well. Increased income of farmers in irrigated areas may tend to change the magnitude and pattern of consumption, contributing to the aggregate demand. It may also result in higher capital investment and greater savings compared to the farmers in rain fed lands. Therefore, it would not be proper to charge the total Net Additional Benefit as Irrigation cess. Again, the exercise based on net benefit principle is alone not sufficient for illuminating the complex pricing problems of irrigation. The question of recovering cost cannot be neglected, as funds are required for further investment either in irrigation or in any other development projects. On similar lines, Thomas and Ballabh (2004) argued that larger social benefits as well as costs needed to be considered while considering the economic viability or pricing policy of an irrigation project.

A study showed that water rates for rice varied between as low as 1.2% to 4.4% of the value of the produce in U. P. and about 7% in Bihar. For wheat it varied between 0.9% to 2.4% in U. P. and 4.4% in Gujarat (Gol, 1972). Another study done in Gujarat revealed that canal water charges as a percentage of total farm income ranged from 2.1% for vegetables to 3.04% for banana (Brahmbhatt, D. M, 1988).

Bhattarai and Narayanmoorthy (2003) found that between 1970 and 1994, data from 14 states of India shows that improvement in irrigation and rural literacy rate were the two most important factors for agricultural growth and rural poverty reduction in India.
Isha Ray (Ray, Isha, 2002) concluded in her study that if water prices are heavily subsidised, they become insignificant in relation to the per hectare income from the crops. A study in India concluded that irrigation water price for sun-flower was as insignificant as just 0.77% of average net profit per hectare, 0.59% for winter wheat, 1% for summer groundnut and 1.12% for sugarcane. She further opined that whereas significant price increases were politically infeasible, feasible price increases were economically insignificant. Parthasarthy (2004) made a similar observation that political factors often counted more than economic rationality in irrigation water pricing.

Parthasarthy R., 2000) found that for crop cultivation, when the timeliness criterion was not met, the marginal utility of additional waterings may sometimes be negative, which adversely affects the benefit received from canal irrigation.

Landes Rip and Ashok Gulati (2004) studied the rising income levels and improving relative prices of agricultural commodities in Indian agriculture and concluded that higher water rates in canal irrigation are justified, on account of their influence on rising income levels among agriculturists.

Patel and Patel (1992) were of the opinion that the fixation of rates of canal irrigation water should be on the basis of both the benefit derived by irrigators and the marginal productivity of water. They also presented the rates of canal irrigation water prevailing in different states of India and showed that the rates were very low as compared to the benefits obtained by the farmers from the water supplied.

The under pricing of irrigation is done thinking that farmers will not be able to pay for it. But in reality, a study in Uttar Pradesh (Ray Isha, 2002), concluded that farmers have been found to be willing to pay a price higher than the tariff of irrigation because the incremental benefits of irrigation are much higher.

A study undertaken in Kerela (Neetha N., 2003) concluded that farmers are willing to pay higher irrigation charges because the incremental benefits of irrigation are high. Parthasarthy (2004) also observed that farmers can and are willing to pay significantly higher than government water rates for irrigation water, under a good system of water delivery. However, the characterization
of water as a public good and subsequent under-pricing is largely based on the assumption that farmers will not be able to pay for Irrigation services if they are competitively prices.

Ray (Ray Isha, 2002) further concluded that price cannot be equated with the willingness of the farmers to pay in all cases. According to her, a study using Census of agricultural output data for certain crops had obtained a downward sloping, but price inelastic demand curve for irrigation water. In other words, a higher price of irrigation water did not reduce its demand by the farmers, because, irrigation is a necessary service for continuing their farming operations. However, she felt that even if the farmers pay the high water rate, they might not be paying it willingly, but out of desperation.

Relating price of water to the benefit received, a study by Singh and Ghatak described a new approach the Contingent Valuation Method (Singh, Katar and Ram Narayan Ghatak, 1995) that can be used for pricing of canal irrigation water. This approach takes into account the revealed willingness of the farmers to pay for irrigation service of a specified quality and hence is more acceptable socially and politically. In the CVM, people are asked as to what they are willing to pay for a benefit and/or what they are willing to accept by way of compensation to tolerate a cost (Munasinghe, Mohan, 1992, "Environmental Economics And Valuation Of Economics Decision Making, Environment Working Paper No. 51, The World Bank, Washington, quoted in Singh and Ghatak, 1995). It is based on personal interviews with the beneficiaries. In using the CVM, it is assumed that willingness to pay is a function of the ability of the irrigators to pay for irrigation, which is constrained by the total income of the family, the scarcity of irrigation water, and the existing rates of irrigation or the amount of expenditure incurred on irrigation. Based on the above assumptions, they have proposed the hypothesis that the higher the income, higher will be the willingness to pay, in areas of greater scarcity of irrigation water, willingness to pay will be higher and the higher the existing water rates, lower will be the willingness to pay. The authors warned that even though the CVM technique seems deceptively simple, it is not so. It is very difficult to elicit from people, the correct information about their willingness to pay for goods and services, particularly environmental
amenities. Three types of bias may creep into the use of CVM. Strategic bias may arise when the respondent thinks that he may influence a policy decision by underestimating or overstating i.e. not answering the interviewer's questions truthfully. The biases, which may crop in this analysis are, the starting point bias crops up if the initial price of water is high, the hypothetical bias may arise from two different reasons. One, the respondent may not correctly perceive the quality of service being described by the interviewer. Two, the respondent may not take the questions seriously and may respond by giving whatever answer first comes to his mind.

Thus, from the above discussion, it is clear that determination of correct strategy for pricing of canal irrigation is a very complex issue, which has no unique solution. Both the cost considerations, i.e. supply side considerations, as well as benefit considerations, i.e. demand side considerations, should be applied in fixing price of canal irrigation, albeit, in varying degrees, depending upon agro-climatic conditions, socio-political situation, cropping pattern, management and financing of the particular irrigation system etc. Further, it is felt that both the cost and benefit approaches should be combined so that the rates are adequate to cover annual Operation and Maintenance costs and also capture a part of the productivity gains of the farmers. Agricultural productivity per unit of water needs to be progressively increased in order to be able to compete with higher value uses of water.

4.2.7 Differential Pricing

Differential prices for thee uses of water namely domestic use, agricultural use and non-agricultural use is needed and implemented in many countries. But this differential pricing should be based on sound economic rationale and principles.

Neetha N. (2003) observed that, uniform water price for up-end and tail-end users was not fair because the cost of providing water to both the categories of users is not the same. Thus, differential pricing of canal water is also essential for the long-term sustainability of the canal irrigation system. According to her, the tenet of uniform pricing could be economically non-viable as the cost of delivering irrigation water differs across users
depending on their positions in the canal command. The study showed that fixing uniform irrigation cess would mean discriminatory pricing in favour of tail enders, because marginal cost of providing water to the head reaches of the canal may be much lower. Thus, differential pricing is necessary in canal irrigation.

Ray Isha (2002) opined that low prices of water and high cost of its provision implies that a huge implicit subsidy given to irrigation. She also, found that highly subsidized and uniform pricing of irrigation across users is neither efficient nor sustainable in the long run.

The Ministry of Water Resources, Government of India (Gol, Ministry of Water Resources, 1999) has recommended that the revised water pricing structures should be such that the rates are substantially lower for those farmers who accept group volumetric supply than for individual farmers. Also, water users associations should be allowed to collect a little more than the prescribed water rates to encourage them to improve the system under their charge. The Committee also suggested that in the case of industrial water supply, the principle of "user pays, polluter pays" has to be applied and water rates fixed accordingly, adding a premium in water scarce regions. For domestic supply, a certain fixed quantity per connection may be provided free of cost, in addition to the public taps, and charges for subsequent larger use may be progressively higher. The principle of seasonal water rates could also be tried.

The Vaidyanathan Committee (1992) observes that the distinction in prices in terms of head and tail reaches should be approached with caution, as it is difficult to apply and add to the complexity of water pricing. However, the Committee supports a two-part tariff system where a flat rate is charged for use of canal water up to a specified amount, and thereafter, additional water is supplied at a higher rate, for high value crops that are water intensive.

4.2.8 Faulty pricing leading to wastage of water

Surface water use efficiency in India is estimated to be as low as 40%. Farmers tended to waste 27% through excessive irrigation, and only 29% was actually used by crops. As against this, in the advanced systems of the West, as much as 60-70% of water diverted in large surface systems is available for
plant use. This enormous wastage of water during conveyance and on the field arises as much due to poor design of structures as due to lack of incentives to conserve water. In absence of financial accountability and operational autonomy, project authorities do not have interest in conserving water.

The current pricing policy of canal irrigation in Gujarat is based on crop area basis. That is to say, the farmer is not supposed to pay according to the number of waterings he applies on his farm, but according to the total area irrigated by him on which any number of waterings could be applied during the season, depending on the availability of water, whether the crop requires it or not. This system of not charging for canal water on a volumetric basis, coupled with uncertainty in supply of canal water, leads to over irrigation by farmers and results in wastage of canal water (Patel Himmat, 1990). The sources of inefficiency in canal irrigation could be attributed to the characterization of irrigation as a public good due to which canal water becomes non-excludable at the outlet level. A study conducted in Kerela (Neetha N., 2003) observed that the farmers' perception of excessively subsidized canal water as a public good induces them to maximize not the output per unit of water but water per unit of output. This leads to wastage and misuse of water in the canal command.

Patel (1995) further observed that over irrigation by farmers results due to excessive use of water released into the field per watering or due to more waterings applied to a particular crop during the season. This results in the wastage of scarce water and non-availability or lesser availability in the tail end areas of the canal command, while on the other hand; it adversely affects the fertility of the over-irrigated land in the long run. He further observes that because of the poor quality and dependability of the irrigation system, the farmers would resist paying even the abysmally low water rates, making cost recovery, further poor. Due to poor maintenance of capital assets, there are heavy seepage losses, which decrease the availability of water to the tail ender of the canal network and brings rise to conflicts and tensions between tail end & upend farmers. Seepage losses due to poor or no lining, result in the damage or surrounding fertile land and problems like water-logging and
salinity. He summarised the main reasons for over-irrigation as low water rates levied on per hectare basis, lack of awareness among farmers about the harmful effects of excessive use of water, lack of assured water supply in terms of timeliness, quality and quantity. Thomas and Ballabh (2004) observed that faulty pricing and implicit subsidy on water rates favours the cultivation of water intensive crops, even in an otherwise water scarce area. They further sounded a warning that the emphasis on cost recovery alone without relationship to environmental considerations may not provide sufficient incentives for proper water use.

Patel (Patel Himmat, 1995) concluded that it is desirable that the water rate structure should be designed in terms of volumetric system of pricing in such a way that additional number of waterings imposes an additional burden on the farmer, which acts as an effective deterrent against over irrigation. Perry (Perry C. J. 2001), also believed that in order to achieve efficient water use, the price of water must be directly related to the volume delivered.

According to Mitra (1996) the rationale for fixing water rates was spelt out in the Report of the Second Irrigation Commission (1972). It was recommended that while determining the water rates, factors namely, the quantity of water consumed by particular crop, paying capacity of the farmer, assurance of water supply and the need to cover the annual costs incurred in providing irrigation should be considered.

However, incorrect system of pricing canal irrigation brings large-scale losses to this sector. Suryavanshi (1986) in his study conducted in Maharashtra found that faulty pricing and lack of water management in the command areas has led to large-scale wastage of water. The major problems encountered by farmers in the command areas, which gave rise to wastage of water were uncertain water supply, lack of information about appropriate crop rotations, inequality in the distribution of water, and unreliable water supplies. He suggests that conjunctive use of ground water and surface water should be promoted in the command areas to optimise the use of water resources. Parthasarthy (2004) concluded that a good canal water delivery system was
one that ensured that water was not overly extracted from the underground aquifers and conservation and judicious use of water was achieved.

Taylor (1971), in his study about major irrigation projects in India, concluded that raising the level of water rates from its present subsidised structure and shifting its assessment to a volumetric basis in major irrigation projects would provide important economic incentives and less wastage of water.

Iyer (Iyer Ramaswamy, 2001), concluded in his analysis that there is a huge gap between created and utilised irrigation potential of about 4.75 million hectares in India at the end of 1995-96, which gives rise to wastage of scarce irrigation water.

According to Patel (1990), present method of charging for water on area or crop basis instead of volumetric basis gives rise to substantial wastage of water through over irrigation because farmers would like to irrigate their land to the maximum possible extent as and when water is available since they are not sure as to when would the next watering be available to them, or whether it would be available in sufficient quantity. Champati and Patnaik (1984) have argued that higher water rates would induce farmers to use water thriftily and reduce wastage of water.

Patel (Patel Himmat, 1990) finds that there is a lack of economic incentives to farmers for saving water, because the water rates are on per hectare basis and not levied on the actual quantity of water utilised by the farmer. If water saving by farmers is encouraged, the same amount of water can be utilized to serve a larger land area. He further concludes that if over irrigation is reduced, revenue from water charges could be increased because the same amount of water could be used to bring more area under irrigation. He observes that over irrigation and wastage of scarce water by a few farmers results in a conflict of interest between up-end and tail end farmers. Over irrigation by farmers can be termed as excessive water released in the field at the time of every watering. In Gujarat, this practice is widespread in the command areas of Ukai- Kakrapar and Mahi-Kadana. It results in an increase in wastage of water and reduction of fertility of land. If over irrigation is reduced, more water can be made available to the tail – end users and more command area can be
irrigated with the same amount of water. With higher rate of utilization of
created potential, the per hectare cost of O&M can also be reduced which
may contribute to improvement in financial working in the long run. According
to Patel, the chief reason for over irrigation are 1) low water rates based on
hectare, 2) lack at assured water supply in terms of time and quantity. He
strongly advocates rotational water supply system, enforced through water
users' association, which would introduce an element of dependability in the
supply of water.

Patel (Patel Himmat, 1990) believes that wastage of water has been observed
to be less in areas where water is scarce. The ideal way of making water
scarce is to charge it on volumetric basis. Alagh Y. K. (2003) also concurred
to this view and opined that efficiency pricing based on volumetric supply of
water should be enforced in irrigation.

Dhawan (1986, pages 271-281) argues that irrigation did not lead to very
intensive farming but extended irrigated farming to as much area as possible.
He recommends that for equal distribution of canal water throughout its total
command area, proper measures should be taken so that farmers of the same
command area get equal benefits from the supply of irrigation water. In water
scarce areas, water should be supplied in quantities less than the
recommended ones. This would make it possible to cover more area under
irrigation and force farmers to use ground water and increase efficiency of
irrigation use, preventing wastage of water.

According to D. Narasimha Reddy, (www.indiatogether.org, accessed on 19th
November, 2003) even though it is said that mega irrigation has increased
crop yields by over 200 percent and is responsible for one third of the world's
total crop production, it is increasingly becoming costly, inefficient and low
performing. Water prices in the irrigation sector are artificially low and promote
wastage.

The Vaidyanathan Committee (1992) observed that volumetric assessment of
water rates at the level of individual farmers is expensive and impractical.
However, it could be practised in case of water delivery through WUAs.
Tushaar Shah (2003) observed that volumetric pricing and formation of WUAs
below the outlet level would be an important part of the pricing strategy of Sardar Sarovar Project.

4.2.9 Higher prices related to better institutional management

The policy of canal water pricing also has, and rightly so, a relationship with the institutional framework selected for distribution. According to Mitra (1996) a pertinent question while arguing over price policy is that why should the users bear the burden of inefficiency and corruption in the irrigation sector that escalates the cost of services? Jairath (1998), observed that the inclination and incentive to pay is aligned to what he is getting for the money. The reluctance to pay even the abysmally low water rates is rooted in the mistrust between the farmer and the agency. The farmers feel that they have no control over the rigid and uncertain irrigation schedules. Besides, there is little operational flexibility and sensitivity towards user needs among the authorities in the state run irrigation systems. Raising water rates without corresponding improvement in quality may give further impetus to switching away from canals, reinforcing the existing under utilisation of canal irrigation potential; thus, disincentive to use canals may lead to lower utilisation and still lower returns.

A.Vaidyanathan (2001) opined that users must not be required to bear the costs of over-capitalisation due to poor design, inefficiencies and leakages in construction. Alagh Y. K. (2003) believed that the increased cost of canal irrigation due to inefficiency in the state run system should not be charged on the user farmer. A.Vaidyanathan (2001) stated that the Committee on Irrigation Pricing stressed the necessity to view the strategy for reform of water pricing as part of the larger programme of modernisation of irrigation system and restructuring of their management.

Results in a study made in Gujarat indicated that if irrigation efficiency is increased, farmers would be prepared to pay an increased water rate up to 2-3 times (GoG, 2001). Study of the irrigation set up in Philippines shows that making farmers repay the investment, while at the same time giving them a say in planning and implementation of the project, significantly reduces cost of
the project (Gulati, Ashok, Mark Svendsen and Nandini Roy Choudhury, 1994).

According to a study made by Centre for Management of Agriculture, IIM Ahmedabad (CMA Monograph No. 180), the performance of irrigation organisations should be measured in terms of their capability to raise the required resources. The primary goal of reform should be to do what is required to make irrigation organisations foster willingness to pay among users. Farmers are likely to pay more for irrigation only when they believe that irrigation organisations are responsive to their needs and have become accountable to them. Willingness to pay can be fostered if the quality of irrigation service is in direct relation to what they pay. Irrigation Departments would have incentives to foster willingness to pay only if they begin to see themselves as service providers. This is most likely when their revenues are dependent on charges collected from users and there is a threat to their survival. The study further observes that if incentives are linked to generation of recurrent finance, a positive impact on staff motivation and efficient working of projects can be made. Small and Carruthers (1991) have suggested that the Irrigation Departments should be given an autonomous status in addition to making their resources dependent on user charges. Autonomous position also leads the departments to make more realistic evaluation of projects.

Tushaar Shah (2003) found that in an effort to improve management and distribution systems in line with the needs of revision in canal water rates and improved cost recovery, the water distribution system in the Sardar Sarovar Project has been planned for sophisticated computerized water control systems to regulate water from control rooms situated across branches and distributaries throughout the command area. Out of the proposed collection of water fee of Rs. 157/- per irrigation per hectare, Rs. 7/- will go back to the Water Users' Association as subsidy to meet administrative expenses and strengthening institutional functioning.

CJ. Perry (2001) believed that developing countries could deliver water to an intermediate point, like a farmer organization on the basis of volumetric pricing and then allow the farmers to distribute water internally. But this still requires managerial efficiency in terms of delivering differentiated supplies
to individual farmers, maintaining and enforcing regulations, measuring and billing etc. If this happens, cost recovery in canal irrigation could be a realistic goal.

Amita Shah (2002) concluded that when economic efficiency and equity were brought about, a fifty percent contribution towards project cost was made possible to be mobilised even from poor tribals in Bharuch district, by an NGO called Aga Khan Rural Support Programme (India).

Alagh (2003) opined that farmers were willing to pay higher water charges if they were given reliable irrigation water supply. However, he believed that cross subsidisation in irrigation would not be successful.

To sum up, the remark in the report by the National Commission on Integrated Water Resources Development Plan suffices that if a water pricing system is to be used to encourage efficiency and still meet equity concerns, future water resources management in India should be improved. This would depend upon how imaginatively the institutional reforms are implemented (Gol, 1988). The report further observed that improvement in quality of services from major and medium irrigation schemes through institutional reforms and better operation and maintenance, is a simultaneous requirement along with higher water tariffs.

### 4.2.10 Recommendations of various Committees about canal water pricing

Having discussed the various issues plaguing the irrigation sector in India, such as wastage, inequity, inefficiency, poor cost recovery and faulty pricing of canal irrigation, there is a need to review and understand the efforts made by the Government of India for rationalisation of water pricing and related issues through appointing various committees. The discussion below, gives an overview of these recommendations.

Apart from the studies by various independent analysts, the various Finance Commissions of the government of India have also addressed the issue of irrigation subsidy from time to time and expressed their concern over rising magnitude of canal irrigation subsidy and rising fiscal indiscipline. Almost all the Commission reports asserted that the irrigation projects must earn a
positive return for the state governments. The Second and Third Finance Commissions found that the various projects functioning in different states were making losses. The Fifth Finance Commission expected that apart from covering O&M expenses, the projects would be able to generate 2.5% return on the capital invested, but this could not happen in reality. The Sixth Finance Commission opined that the state government should at least be able to recover working expenses from the revenue generated by the projects. However the Seventh Finance Commission recommended that the state governments should work towards achieving not only the recovery of O&M expenses but also one percent of the total capital invested each year. The Eighth Finance Commission again reverted back to an earlier position when it said that the return from irrigation projects should be at least enough to cover the operation and the costs of the project (Ghatak Ram Narayan, 1997)

The Committee of State Irrigation Ministers had suggested in 1964 that water rates should be fixed at 25-40% of the additional net benefits keeping in view the variations in relevant meteorological, hydrological and economic factors (GoI, 1988).

The Irrigation Commission (1972) stated that the water rates should not be linked to project costs but be so fixed as to keep its level between 5% (for food and fodder crops) and 12% for cash crops (GoI, 1988).

The National Commission on Agriculture (1976) recommended that where a new irrigation facility is created, the norms of water rates should provide incentives for water use efficiency and should have a gradually increasing structure for the first two-three years.

The Central Water Commission (1993) in its report indicated that existing water rates for canal irrigation were too low to meet even the O&M costs of the projects. The fixation of water rates in all states was based on ad-hoc rather than rational approaches. The Commission had observed that there has been a continuous increase in subsidy in the irrigation sector and efforts to improve the financial position of irrigation projects should be made.

The Committee on Pricing of Irrigation Water 1992 (also known as Vaidyanathan Committee) measured irrigation subsidy as the operational and
maintenance expenses, plus one percent of cumulative capital cost at historical prices minus the payments made by farmers for irrigation water (Gulati A. and Narayanan S., 2001). Some of the salient features of the recommendations of this Committee are: treating water rates as user charge, the objective being ultimately to recover cost; linking revision of water rates with the improvement in the quality of service; revision and implementation of water rates in phases, consolidation of the system of farmer group management; upgrading the system to higher levels of efficiency in water use and productivity; switching over progressively to volumetric water rates structure; the setting up of "High Powered" autonomous boards at state level to review the policy, establish norms regarding maintenance costs, assess the actual expenditure and determine the parameters and criteria for raising water rates; mandatory review of all matters related to water pricing every five years, etc. Subsequently, to go into the recommendations of the above Committee, the Planning Commission constituted a Group of Officials under the chairmanship of Secretary, Planning Commission and members from selected States and concerned Government of India Ministries or Departments. The Group unanimously recommended that full Operation and Maintenance cost should be recovered in a phased manner i.e. over a 5 year period starting from 1995-96 taking into account the inflation also and that subsequently after achieving Operation and Maintenance recovery level the individual states might review the status to decide on appropriate action to enhance the water rates to cover 1% of the capital cost also. In addition to the above, the setting up of Irrigation and Water Pricing Boards by all the States and mandatory periodic revision of water rates at least every 5 years, with an opportunity for users to present their views were also recommended. Further, the Group also recommended the formation of Water Users Associations and the transfer of the maintenance and management of irrigation system to them so that each system may manage its own finances both for O&M and eventually by expansion/improvement of facilities. During Ninth Plan, all the states were to be persuaded to implement the recommendations of the Group as a first phase of implementing the Water Pricing Committee’s Report. (http://planningcommission.nic.in, accessed on 15th April 2004).
Thus, from the above discussion, it is clear that water rates should be such as to convey the scarcity value or the resource to the users and to foster the motivation for economy in water use. They should be adequate to cover the annual maintenance and operation costs and a part of the fixed costs. Efforts should be made to reach this ideal over a period, while ensuring the assured and timely supplies or irrigation water. The water rates for surface water and ground water should be rationalized with due regard to the interests of small and marginal farmers. Efforts should also be made to involve farmers progressively in various aspects of management of irrigation systems, particularly in water distribution and collection of water rates. Assistance of voluntary agencies should be enlisted in educating the farmers in efficient water use and water management.

4.3 Costing

In most cultures, including ours, water is taken as nature's free gift and access to water is considered as a basic right of every person. In this sense it is a social good. However, the availability of water is not equitably distributed over space and time. While the requirements are universal and perennial, efforts have to be made to include space and time utility to the natural supply of water by investing in storage and conveyance in order to supply water at the point of demand as and when required. Thus, water in this sense no longer remains a free good but partakes the characteristics of an economic good with an opportunity cost attached to it. Thus, cost of production is attached to canal irrigation, which needs to be recovered in order to ensure its uninterrupted supply. In India, although minor irrigation is privatised to a large extent, major and medium irrigation still remains largely under direct government supervision, mainly because of huge capital requirements for construction and maintenance of such schemes. However, dependence on state treasury for funds has meant a certain lack of concern, at the local level towards improving the condition of these schemes, leading to poor management of the system and substantial increase in cost (Gulati, Ashok, Mark Svendsen and Nandini Roy Choudhury, 1994).

The available data indicate that a substantial increase has taken place in the cost of creation of irrigation potential per hectare from the Sixth Plan...
onwards which is mainly due to introduction of the extension and distribution system up to 5-8 hectare block, the cost of rehabilitation and resettlement, environmental & forest aspects, inclusion of the cost of catchment area treatment, inclusion of drainage system in the command of irrigation projects and increase in establishment costs etc. (www.planningcommission.nic.in accessed on 15th April, 2004).

While in the First Five Year Plan only 44 major and 169 medium irrigation schemes were taken up. During the Fifth Plan (1974-78), 70 new major and 300 medium schemes were taken up, although 97 major and 130 medium schemes were already under implementation in 1974. Thereafter also, the tendency to start more and more new projects continued unabated, which resulted in a thin spreading of the available limited financial resources. However, later on during the Seventh and the Eighth Plans, as a strategy, only a few new major and medium projects were taken up and greater emphasis was laid on the completion of ongoing projects as a first charge on the available resources. During the Eighth Plan 14 major and 50 medium irrigation schemes were taken up (Working Group Report for Major & Medium Irrigation Projects for Ninth Plan).

During the first Five Year Plan period, the cost of creating irrigation potential per hectare was Rs. 1,200 at current price level and Rs. 8,620 at 1980-81 prices while the same figure in the annual plans of 1990-1992 was Rs. 66,570 at current prices and Rs. 29,587 at prices of 1980-81. (Report of the Working Group on Major & Medium Irrigation Programme for the 9th Plan, paragraph 1.3)

4.3.1 High Proportion of establishment cost

When a discussion about needs of outlays for Operation and Maintenance is being done, it needs to be remembered that there are two components of Operation and Maintenance outlays namely, the cost incurred for actual maintenance and Repairs or M&R, used for the physical upkeep of the system and the second part that consists of the establishment cost, which refers to the salaries and other remuneration accrued to the staff of the irrigation project. Establishment cost is more or less a fixed liability, and thereafter, the
residual amount left over from the total outlay is used for actual M&R of the system. This, though sounding like a logical argument, has many dimensions to it. In a study made by Himmat Patel about four irrigation projects in Gujarat (Patel, Himmat, 1990), it was revealed that even in face of a secular increase in per hectare O&M cost during the period of 1982-83 and 1985-85, the M&R cost has not similar increase, making the fact very clear that a significant share of the increased C&M has been absorbed by establishment, leaving the M&R activities on the residual amount left for it. He also found that during the three-year period from 1982-83 to 1985-86, out of the total outlay for Operation and Maintenance the establishment cost amounted for nearly 47% in Dantiwada, 48% in Ukal-Kakrapar, 52% in Mahi-Kadana and 36% for Shetrunji project. Thus, on an average, 46% of outlay for Operation and Maintenance actually went on establishment costs, leaving only 54% of the outlay on an average for actual Maintenance and Repair work. This tells on the maintenance and upkeep of the system where the reason for dilapidation of the system is often cited as the insufficiency of funds. Thus, it can be said that the figures quoted in account books about O&M expenditure in irrigation projects are illusionary in nature. The figures may be high or showing an increase, but a large part of this increase is absorbed by the establishment costs, which do not contribute much towards the physical upkeep of the system.

Besides, the actual costs incurred on pubic irrigation, whether capital or recurring are invariably much higher than warranted on account of the defective designing of projects, time over-runs, over-staffing and deficiencies in management. The analysis of O&M costs suggest that establishment charges on staff etc. claim a disproportionately high share of total O&M provision leaving a grossly inadequate amount for Maintenance work. (Patel, Himmat, 1995). It is widely felt that it would be unfair to place the financial burden arising out of such inefficiencies on the user farmers.

Parthasarthy (2000) studied the amount required for Operation and Maintenance of existing irrigation schemes in Gujarat from the period between 1998 and 2003. He concluded that in all the years, the allocation for maintenance and repairs of the system would require to be around 41% of the
total outlay for Operation and Maintenance whereas establishment costs would take up the remaining 59% of funds, on an average.

The government of Gujarat, on the basis of analysis made for selected major and medium irrigation projects arrived at a norm of O&M cost at Rs. 240/- per hectare for un-gated spill-way and Rs. 250/- hectare for gated spill-way as the requirement for proper O&M works. This figure is inclusive of establishment charges of Rs. 90 per hectare (Gol, 1988).

The Committee to Study the Financial Requirements for Proper Maintenance and Management of Irrigation Projects, Central Water Commission, Ministry of Water Resources, Government of India (Gol, 1988), has given the following recommendations:

a) The O&M grant of major and medium surface irrigation projects should be Rs. 180 per hectare per annum of gross irrigated area.

b) Also Rs. 65 per hectare of gross irrigated area per annum should be granted for regular establishment cost.

c) One-third of (a) above should be provided for un-utilised potential.

d) 20% of (a) above should be provided for special repairs, which are not part of normal maintenance.

The Vaidyanathan Committee in 1992 noted that a large part of the Operation and Maintenance expenses went into the increase in establishment cost. The average establishment cost was 43% of the total Operation and Maintenance cost in 1986-87, which went up to 70% in 1990-91, leaving very little behind for actual maintenance and upkeep of the water delivery system.

Further, a study by Himmat Patel (Patel Himmat, 1990) suggests that there is a wide difference between the increase in outlay for operation and maintenance purpose, and the actual increase in expenditure over maintenance of the system.

Since establishment costs are soaring and in the extended period of projects rise to unprecedented levels, a ceiling on establishment cost (including work-charged) should be enforced. The ceiling should be 20% of the total cost and
every effort should be made to keep it around 12-15%. Expenditure above 20% should not be reimbursed (Gol, 1999).

The Tenth Finance Commission (1995-2000) has suggested the norms for O&M cost of works at the level of Rs. 300 per hectare in case of utilized potential and Rs. 100 per hectare for the unutilised potential with 30% increase for hilly areas and suitable increase for covering inflation. Accordingly, the estimated total O&M cost per annum for the country would be about Rs. 2500-3000 crores. Against this requirement the O&M funds being provided are actually less than even 1/4th with wide variation from State to State. This is one of the major reasons for the deterioration in the performance in terms of adequacy, timeliness and equity in the provision of irrigation water. The Vaidyanathan Committee (1992) recommends that water rates should be based on Operation and Maintenance norms and capital charges including interest and depreciation costs. Also, the state governments must make sure that the actual Operation and Maintenance outlays more or less correspond to the norms specified for this purpose, which should also be revised once in five years.

Another important factor contributing to escalation of costs in the canal irrigation sector is the delay in planning, environmental clearance, resource mobilisation, construction and implementation and the costs incurred on rehabilitation of project affected persons (Gol, 1992). According to a report of the National Commission of Integrated Water Resources Development Plan (1988), there is a great scope of reducing Operation and Maintenance costs by curtailing over-staffing drastically, providing better communication facilities, establishing participatory irrigation management etc.

4.4 Cost recovery

Appropriate pricing is the necessary, but not the sufficient condition for improving the revenue performance. The sufficient condition is sincere and honest efforts to recover water charges along with strong punitive action against the defaulters.

During the pre-independence period, irrigation projects were operated as financially viable ventures, except for those, which were specifically
considered as protective works. But after independence, they have been viewed more as instruments of development and social benefit; therefore cost recovery was not accepted as one of the most important objectives of implementing the project. However, in view of the growing financial crunch faced by the government at almost all the levels, financial and economic viability of irrigation schemes, competing for public investment with a host of other activities and vested interest, cost recovery from government run irrigation schemes has gained attention. In the early 1970s, the National Irrigation Commission, appointed by the Government of India argued that accepting social cost–benefit evaluation as the basis for investment decisions does not minimise the "importance of securing an adequate return from investment to irrigation projects and recommended that the financial return of a project should also be examined at the time of approval, and if found inadequate to cover working expenses and indirect charges, water rates should be raised" (Vaidyanathan, A., 2001).

Low prices of water and high cost of its provision implies that a huge implicit subsidy is given on irrigation in Gujarat. The cost recovery rate of 2.57% for irrigation and 0.33% for drinking water and sanitation is much below the national average. Estimates reveal that the absolute burden of subsidy on irrigation rose from Rs. 2025 crores during 1993-98, implying about 9-10% of compound rate of growth per anum (Gulati, Ashok, 1989). Bhatia (Bhatia, 1989) observed that often, the cost of collection is higher than the total cess collected. In terms of per capita subsidy on irrigation, Gujarat ranked second amongst 15 major states at Rs. 290 crores per anum in 1994-95. The question arises whether such a large amount of subsidy would be sustainable in the coming years. Dholakia (Dholakia, Archana, 2001) felt that an independent regulatory authority for irrigation is the need of the day, so that adequate rise can be made in water prices and improve the recovery of water charges. This in turn would improve the possibility of financial return on investment in irrigation, which would encourage projects of co-operative or private participation in this sector.

Vaidyanathan Committee (1992) believed that unauthorised irrigation and incorrect reporting of crops and irrigated area are the major reasons for poor
water rates recovery. Lack of co-ordination among different agencies involved in assessment and collection also aggravates the problem.

Pant (Pant, Niranjan, 1981) concluded that the recovery of canal water rates is poor in most irrigation projects of India. In a study of Kosi irrigation project in Bihar, it was found that the recovery of water rates was annually averaging 42% only and the actual recovery in terms of past arrears was only 7%. However, the charges collected were not even sufficient to meet Operation and Maintenance. In a study made in Kabini Project area in the Cauvery Basin in Karnataka, it was found that water rates paid by farmers formed just 17% of the actual cost of water supplied in the case of paddy, 33% in case of sugarcane and 25% in semi-dry crops (Nagraj, N., K. Shankar and M. G. Chandrakanth, 2003).

A. Vaidyanathan (2001) believed that making user associations bear the responsibility for both funding and execution of Maintenance and Repairs below the outlet level could be one way of improving cost recovery.

According to Tushaar Shah (2003), the most important challenge is to establish Sardar Sarovar Project's rules according to the original vision, because, once the farmers get used to lifting water directly from the minors, it is difficult to get them to organise in the form of WUAs and persuade them to pay water cess, when they become used to getting free water in the initial stages of the project. He cautions that for smooth functioning of the Sardar Sarovar Project, issues of pricing, cost recovery and mobilising user organisations should be given immediate attention. He recommended that the irrigation fees should be collected in advance, water indents should be accepted only through WUAs, irrigation schedule should be announced in advance and be strictly adhered to, a fair business relationship should be established between the Sardar Sarovar Narmada Nigam Ltd. (SSNNL) and the farmers, defaulters should be strictly dealt with and not be allowed to lift water from the canal. Some of the measures that have been suggested by some experts for improving the recovery of canal water rates are discussed hereafter. Patel (1990) suggested the efficient use of water through imposition of volumetric water rates should be encouraged so that the farmer is forced to economise on water use. This should be accompanied by incentives for
propagating the use of water conserving technologies like sprinkler systems etc. and providing fiscal incentives for the same (Patel Himmat, 1990). He further suggested that Better operation and maintenance of irrigation schemes makes sure that losses of water, productivity of land through water logging and soil salinity etc. does not occur and the scarce canal water could be used to irrigate as much area as possible. 

Wade and Chambers (1980) believe that expanding the command area of the irrigation system can increase the returns from irrigation. This can be done by saving water at the upend by resorting to volumetric pricing so that more water is available to the tail enders or those farmers whose lands are located farther from the minors and sub-minors. This would increase the number of beneficiaries at the tail end and improve the water rates recovery. Rotational water supply could also be implemented which would ensure that tail enders receive water in a more reliable and timely fashion. This would bring higher production and more equitable distribution of income. Patel (1995) opined that the working expenses can be reduced by modernizing the system, better water management, organizational reforms and improved infrastructure, curtailing over-staffing by redeployment providing better communication facilities and participatory irrigation management by user-farmers. He believes that if the above measures were implemented, there would be substantial improvement in the quality of irrigation service, which would mean less resistance from farmers on increasing water rates. The end users should not be made to pay unrealistic and unreasonable water rates emerging from system, inefficiencies, high level of O&M expenses, especially the establishment cost. If water rates are hiked steeply without taking into consideration the above factors, then cost of cultivation may go up, forcing the farmers to agitate. Further, he argues that by making suitable changes in cropping pattern of the command area, a positive impact can be made on the financial working of the irrigation projects. If it is tilted in favour of more water consuming crops, with a given amount of water in the reservoir, lesser area is served, with the result that cost per hectare of area-irrigated remains higher. However, such a cropping pattern generates more revenue per hectare, as more water consuming crops are generally cash crops carrying higher water rates. The ultimate impact of the cropping pattern on revenue generation, however, depends much on how revenue receipts respond to the command
area and efficiency with which the available water is utilizing for this purpose. Patel (1990) found that in case of Kakrapar project revenue from sale of water for non-agricultural purpose was Rs. 90.27 lakhs during 1985-88 to 87-88, which accounted for about 19.4% of revenue receipts. In case of Mahi project, non-agricultural revenue receipts accounted for 24.2% of total receipts during the same period. This shows that in case of Mahi & Kakrapar projects, revenue from non-agricultural use of water forms significant proportion of total revenue indicating the fact that water rates charged for non-agricultural use of water is an additional variable, which can influence the financial working of these projects in the long run. However, Alagh (2003) does not agree with this argument and opines that cross-subsidisation of canal water rates between industry and agriculture is not likely to be successful.

It is worth noting that all the above measures are not exclusive of each other but are interrelated in such a way so as to reinforce each other to create either a vicious circle. It is therefore, a task of all those concerned to make suitable amendments and make it into a virtuous one.

The cost recovery analysis should therefore include measures like prescribing some parameters benchmarking efficiency in the irrigation system and determining the maximum permissible level of establishment costs. Having arrived at a realistic figure of O&M, water rates should be fixed such that O&M plus one percent of capital cost is recovered from the project revenue. Moreover, efforts of revenue collection should be increased. According to a report of the National Commission of Integrated Water Resources Development Plan (1988), for better collection of water dues, it is suggested that the Irrigation Department may adopt a contract system of deploying a separate collecting agency. A percentage commission linked to the actual amounts of collection and a specified time limit for collection may be fixed. This would motivate the agency to get maximum collections expeditiously.

Thomas and Ballabh (2004) concluded that higher cost recovery is a fall out better management, which is an essential condition to bring increased investment, including private sector investment in irrigation sector. According to them, measures to improve cost recovery should include increase in service area, more concentrated efforts for collection, discounts on early
payments and penalties for delays. They observed that the present legal environment was not supportive enough due to which, even defaulters could continue to draw water from the canal. In absence of adequate legal support, increased cost recovery was difficult. In their opinion, improving the recovery system was a more immediate concern than increasing the water rates. They recommended the unification of distribution and recovery functions to provide positive and negative incentives both to the farmers as well as the irrigation department in order to improve cost recovery.

4.5 Funding

Irrigation sector in India suffers from a growing financial crunch. The funding for construction of ongoing projects has been shrinking, resulting in an undue delay in project completion and hence, reduced benefits. Resources for normal operation and maintenance are also under severe pressure as the cost recovery from canal irrigation is extremely low, and the state budgets are not able to allocate more funds because of the overall fiscal crunch.

Furthermore, existing systems do not perform well, which is often attributed to management problems, agency incompetence, as well as inadequate maintenance. In turn, the poor performance of many surface irrigation systems makes farmers unwilling to pay more for their water, thus limiting the resources that irrigation systems generate to cover their own costs, leading to further resource shortages and inadequate maintenance. This state of affairs, points towards an impending financial crisis in Indian canal irrigation. Without urgent steps to reverse this trend, such as thoroughly innovative institutional reforms, canal irrigation would remain much below its potential and could be heading for a collapse.

Financing for new water projects, especially for irrigation, has been moving towards collapse in recent years due to declining donor and government funding. The traditional sources of finance for the irrigation sector namely government and multilateral bodies are becoming inadequate. Therefore, there is a need to explore the capital and debt markets to provide alternative sources of funding. Thus, a need to establish an alternative institutional arrangement for water management emerges.
4.5.1 Traditional Sources of Funding

Irrigation and domestic water supply projects worldwide face serious lack of funds. The World Water Commission (2000) reported that worldwide, additional investment of $100 billion per year is needed to meet needs of irrigation, water supply, and sanitation infrastructure to meet the food and domestic needs of a growing population. At the same time, funding from traditional sources like government budgets and development assistance is drying up. Alternative financing arrangements are needed even to sustain existing investment in water systems. This is not only a concern of governments, but also of the international community. For example, the World Water Council, the Third World Water Forum and the Global Water Partnership have formed a high-level panel led by M. Michel Camdessus, former General Manager of the International Monetary Fund, to consider solutions to the future global financial needs of the water sector. The panel is to identify innovative approaches to mobilizing resources, as well as how financing arrangements can contribute to better water governance. Yet much of the emphasis in global discussions has been on international financial markets, and particularly the role of multinational corporations in financing water-related infrastructure. Much less attention has been given to the potential of domestic financial markets to provide such funding. Even in developing countries, these may control substantial resources.

The traditional sources of funding in the water sector are mainly budgetary resources of government, funds from multilateral as well as bilateral foreign agencies, and financial institutions. Besides, 90-95% of funding in groundwater development comes from farmers themselves. Private sector participation in hydro-power development, industrial and urban water supply, roads, ports, harbours, jetties etc. has started only in recent years and limited only to a small fraction (Diwan, P. L., 2003).

In India, even though irrigation is a state subject, the finance for major and medium schemes is shared equally between state and central government in case of centrally sponsored projects (Gulati, Ashok, Mark Svendsen and Nandini Roy Choudhury, 1994).
The government has made huge investments since independence for the expansion of the irrigation sector. During the first five year Plan the outlay for the irrigation sector, at current prices was about 24% of the total State Plan. However, since the Fifth Plan, the overall investment in irrigation has been unsatisfactory. Even though the outlay has increased, the actual outlay has increased only to about six times instead of the requirement of 15 times or more. So far the finances have not been adequate enough to meet the growing requirements of this sector, As a result, there has been a thin spreading of resources over a large number of projects, which has been mainly responsible for time and cost over-runs (Working Group report for Major and Medium Irrigation Projects for Ninth Plan).

The working group on major and medium irrigation projects for India in the Eighth Five-Year Plan (1992-97) considered the issue of inadequate funding for projects, which was experienced during the Seventh Plan. Against the spill over liability of Rs. 280 billion for major and medium projects that remained uncompleted from previous Plans, the Seventh Plan outlay was only Rs. 115 billion.

To enable the central government to assume a more positive role, in 1988 the Ministry of Water Resources formulated a proposal for establishment of Irrigation Finance Corporation to provide financial assistance to projects of national importance in the irrigation sector (Gol. 1995). Though this proposal was supported by a large number of states, the Planning Commission did not approve it.

4.5.2 Non-traditional Sources of Funding

In view of the growing financial crunch faced in the irrigation sector and the growing requirements for investments, non-traditional sources of funding are increasingly being explored and tapped.

4.5.2.1 Capital Markets:

While conventional government and multilateral financing for irrigation is decreasing, the capital and debt markets provide an important alternative source of funding. The debt markets trade bonds of public sector undertakings and corporate debentures, which are subscribed by major financial institutions. There are prospects for such financing to become a major source of funding in the near future. These bonds must be professionally
designed and issued, with terms, interests, and payments modes, which attract investors at large. Several state governments have begun to tap into this domestic financial market to finance irrigation development. Some Indian states have undertaken innovative institutional reforms by setting up financially autonomous corporations to mobilise required funds from the domestic bond market. Over the years, the states that had important ongoing projects established autonomous irrigation finance corporations. In south India, Karnataka’s Krishna Bhagya Jal Nigam Limited (KBJNL), Maharashtra Krishna Valley Development Corporation (MKVDC) for Krishna Valley Projects, Sardar Sarovar Narmada Nigam Ltd. (SSNNL) for Sardar Sarovar Project in Gujarat and Jal Bhagya-Nigam for Upper Krishna Project, Karnataka have issued bonds for mopping up funds from the private market. (Raju, 2003).

The Planning Commission (http://planningcommission.nic.in accessed on 15th April 2004) has discussed the pros and cons of private sector funding and management in the canal irrigation sector and concluded that private sector participation in irrigation & multipurpose projects is feasible but selectively. Some procedural and legal changes are required to be undertaken in respect of clearances of projects and involvement of private sector investors in this sector. Private sector participation could be thought of on Build Own Lease (BOL) or Build Own Lease Transfer (BOLT) basis for a specified period of say 10-30 years. While it may be more suitable for medium and minor projects, it could pose some problems in the case of major projects. The Government departments should carry out clearances such as forests, environment, resettlement and rehabilitation, acquisition of land etc. Concessions should be offered to private sector investors to augment their revenue. These may include tourism, water sports, navigation, moratorium on loans, tax concessions, etc. Distribution of water after bulk supply to Water Users’ Associations (WUAs) should not be handled by private sector. WUAs should be encouraged to be formed at the outlet level and they should manage distribution. The Government departments should look into safety and sociological aspects. There should be a guarantee on the return of investment of the private sector. In difficult terrains, there should be investment from the Government side also. While broad national policy the
Centre may frame broad guidelines on private sector participation; details may be worked out by the States as suited to their conditions within the framework of such policy and guidelines. The obligations of the Government departments and the private sector should be clearly spelt out in the agreement for such participation. It should also include penalty clauses applicable to both the parties so that slippages do not occur in implementation.

The analysis of the performance KBJNL (K. V. Raju, Ashok Gulati and Ruth Meinzen-Dick, 2002) indicates that even if adequate funds are mobilised, and physical works are on schedule, the new Institution may not be able to enhance overall irrigation performance and to move towards financial sustainability of the irrigation project. The issuing companies or corporations, must have the capacity to generate enough cash flow to service the bonds, which is constrained by the very low levels of water charges at present.

4.5.2.2 Private Sector Funding:

According to Saleth (Saleth, R. Maria, 1999) there is a need for encouraging a new paradigm in private sector participation in water sector in India. This would result in improved management and operational efficiency in existing systems. The feasibility of the private sector to renovate and modernize parts or whole of an irrigation system, and to charge commercial rates of water for this purpose, should be looked into. There is a need to conceive private sector broadly to include the corporate sector but also the consultancy and contracting firms, WUAs, NGOs, and the general public. Apart from additional investment and cost saving possibilities, private participation in irrigation development and management could also minimise some inherent problems of public management like delayed construction, cost escalation, slow utilisation of created irrigation potential, since water rates would be revised to reflect the changing economic realities, cost recovery would be more efficient. The various models of privatisation in the water sector have been explained by Maria Saleth (1999) in detail.
**Build Own Operate** where private companies plan, construct and operated the irrigation system, generate power, look after system maintenance through private contractors. In the case of projects on BOO basis, the Irrigation Department may buy water in bulk from the agency at mutually agreed price for distribution to the farmers.

**Build Own Sell** where private companies plan, construct the system, and sell water in bulk either to the irrigation department, private companies or a consortium of WUAs.

**Build Own Transfer** where the private company with the best bid builds the system according to design, capacity, quality and deadline specifications given by the government. The government extends help in acquiring land and obtaining environmental clearance.

**Lease Own Operate System** where one or more private groups lease an existing irrigation project on a long-term basis and undertake the task of water distribution, fee collection, system maintenance etc.

**Water Bonds** where the public or private agency managing the irrigation project issues water bonds to which the project farmers can subscribe and secure thereby a share of water storage in proportion to their subscription. As the water shares of farmers are like an in kind return to their investment in water bonds, there is neither a separate payment nor the cumbersome process of cost recovery. Due to difficulties in defining water rights, large and spatially separated irrigation system design and delivery points, and a large number of small, uneven and dispersed farms, the practical utility of this concept is extremely limited in the Indian context at present.

**Financially Autonomous Irrigation Agency**: Under this set up, the irrigation agency provides an essential service to farmers, i.e. Irrigation water in the quantity and quality desired by the user, while users, in turn; provide the agency with the financial resources necessary for its existence and operation. The agency is autonomous in terms of resource generation from the capital market, fixing water charges and management of physical assets of the irrigation infrastructure in such a way that additional incomes besides water
charges is generated. There is a link between financial incentives, delivery of irrigation service and cost recovery in this set up.

Raju et al (2003) believe that appropriate pricing is the most crucial issue for private sector participation because present canal water prices do not reflect actual cost or willingness to pay for the service. Some states like Karnataka and Tamil Nadu have taken steps to introduce economic water charges at the local level. He opines that people are willing to pay higher prices if they are assured of good and reliable service. There is a need to implement this expressed willingness to pay higher charges. He believes that there is a definite linkage between increase in funding through private sector participation and management reforms.

The Planning Commission (www.planningcommission.nic.in accessed on 15th April, 2004) explains the private sector as not only the private corporate sector but also groups like farmers' organisations, voluntary bodies and the general public. It says that about 90-95% of ground water development is by private efforts either through own financing or institutional financing or both. However in the case of surface water, especially major and medium projects, all the irrigation projects are not equally endowed with the potential for privatisation and, as such, identification of projects as a whole or partially (i.e. planning and investigation, construction, operation and management financing and maintenance etc.) may have to be undertaken in the light of its viability vis-à-vis various privatisation options as available. With hydel power generation and recreation, etc. along with irrigation, the viability for privatisation of a project improves.

4.5.2.3 Peoples' Participation in Irrigation Funding through PIM:

A part of the funding for canal irrigation could come from the beneficiaries themselves in the form of contributory labour as well as payment of irrigation cess. The maintenance of minors could be handed over to the water users' association. This would bring about a reasonable reduction in the costs and responsibility of government agencies. Besides routine Operation and Maintenance, WUAs could also take up collection of revenue and improve upon it. The success story of WUAs already operating in some states needs to be
extended to other states, with suitable local adaptation. For field-level works in case of major projects, minor irrigation works, repairs of tanks etc. as much funds as possible should be generated through community involvement. There is considerable scope for this and it would also relieve the pressure on government funds (Gol, 1992). In recent years there are also signs that farmers are taking active interest in improving the quality of irrigation. There is increased advocacy of user participation for decision making in the irrigation sector. The creation of water-users associations and the declared commitment of the government to turn over management to users have kindled both awareness and interest in these matters. If the media and political leaders patiently try to mobilize opinion in this regard a strong grassroots pressure could be built for this purpose. Also, if there is a strong backing from political leaders, the indifferent attitude of the bureaucracy can be changed to a positive one. If maintenance and repairs were entrusted to WUA's rather than contractors, it would generate a strong sense of involvement on the part of the users and bring speedier completion of works at lower cost and of better quality (Vaidyanathan, A., 2001). The Vaidyanathan Committee report, 1992 recommended that each WUA below the minor level should become and autonomous entity which manages its own finances both for Operation and Maintenance and eventually for expansion and improvements in facilities.

4.6 Management

The problems of poor cost recovery, lack of sufficient funding from avenues other than the government exchequer and general dilapidation of irrigation infrastructure, are all attributed to inefficiency of management in state run irrigation systems. According to a study of representative parts of the command area of 11 major and medium projects in India co-ordinated by Development Support Centre, Ahmedabad, one of the major deficiencies in canal management were found to be, inefficiency of water delivery system which was often unreliable, inequitable and unjust to small farmers. Moreover, no incentives were given to farmers to conserve water and economise on uses. The quality of irrigation service to farmers was poor and marked by insensitivity. The levy of water rates and actual collection of charges has no
relation to actual cost of water delivery. Poor cost recovery and lack of funds for maintenance and repairs resulted in a wide spread deterioration of infrastructure. This coupled with the main system's deficiency in terms of providing water at the required time and place, increased the dissatisfaction among farmers. It resulted in a mismatch between the cropping pattern of farmers and water delivery schedule of the irrigation authority. Clearly, at this rate, India would soon face erosion of a huge irrigation potential it built at a massive investment (IWMI-Tata, 2003).

The issue of management of canal irrigation sector has been explored with the help of various studies carried out on this subject.

4.6.1 Breaking the vicious circle through institutional reforms

Price reforms in irrigation must be accompanied by institutional reforms, because when the consumers pay more, they also expect qualitative improvements in supply. Thus price reform is essential but not a sufficient condition for a self-functioning irrigation system (Raju, Ashok Gulati and Ruth Meinzen-Dick, 2003). Also, since the cost-recovery in the form of water charges is very low, O & M is also in a bad shape. Therefore there is a deterioration of the irrigation systems, which affects water delivery and supply, which in turn raises costs and reduces benefits arising out of them. On the other hand, the cost-recovery from canal irrigation is extremely low; due to which a resource crunch is faced even for O and M expenses of this projects. Moreover, existing systems do not perform well because they are in a bad state of repairs and maintenance and are faced with poor management due to lack of incentives for efficient management. This poor performance makes the farmers unwilling to pay more for water, which further worsens the situation of financial crisls, leading to shortages of funds and deteriorating O and M situation. This trend of a vicious circle needs to be urgently reversed through institutional and price reforms in the irrigation sector (Patel Himmat, 1995).

Raju et al (2003) believe that in order to remedy this situation, the role of the state in water management should be reduced and that of the people enlarged. Privatisation of water sector management can take several forms,
from turn over of O&M to formation of Water Users' Associations (WUAs), to volumetric or quasi-volumetric pricing at farm level, to development of water markets to tradable water rights. The benefits of privatisation are expected to include impact on productivity and equity, gains from freeing up of government resources for use elsewhere and more efficient O&M. Success or failure of private sector management depends more on the quality and commitment of the implementing agencies and local leadership factors in the process of turn over, than on the nature of the turn over itself. An attempt should be made to find out the option, which would serve the purpose of augmenting financial resources for the irrigation sector as well as long-term benefit in terms of better maintenance and upkeep of irrigation systems and improved customer satisfaction for user farmers, which would ultimately result in better cost recovery in this sector.

Several options have been identified in India for private sector participation in management of urban services, which could also be a torchbearer for financing the irrigation sector. These are namely, service contracts, local body financing through municipal bonds, joint sector company to finance and implement the project, Build Operate Transfer (BOT) contracts, Build Own Operate (BOO) contracts, Construction and management contracts etc.

Chakraborty (2003) dwells on the nature of management contracts as follows:

**Management Contracts** where the service provider awards a contract to a private company for a fixed period to manage the water utility. The investment is public while the commercial risks are either private or shared by the public and privates sector.

**Lease contracts** where the contract is offered on lease for a finite period and the risks are shared.

**Construction contracts** where private investment is used for public utilities so that greater risks on the part of the management can be taken.

**Divestiture** where there is an outright sale of public utilities, following which, everything from ownership to risk belongs to the private companies.
Water users' and community participation where farmers own, operate and manage the canal water from the outlet level onwards. They also manage and operate water distribution, collection of dues and oversee operation, maintenance and repairs of the system.

Financially Autonomous Irrigation Agency:

According to Raju et al (2003) the objective of setting up financially autonomous irrigation agency discussed earlier goes beyond raising funds. A policy of user fees implemented by a Financially Autonomous Irrigation Agency creates the potential for improvements, both in the operation and maintenance of existing irrigation facilities and in the process by which investments decisions are made. The creation of Financially Autonomous Irrigation Agency can be an effective means for: a) introducing administrative and financial autonomy; b) increasing accountability; c) facilitating contacts with, and contracting out to farmers, NGOs and private firms; d) introducing less politicised procedures to set and collect water charges; and e) mobilizing private sector funds. Such corporations must provide for O&M and recurrent expenditure out of their own revenues, even if capital expenditures may still continue to be funded by the state. For this, they must have both the mandate and the authority to set water charges at a level adequate to cover their expenses and service their debts. They can also sell debt in the bond market after becoming financially strong.

A better control over its budget, better quality and speed of Operation and Maintenance, incentives of the agency staff linked with their efficiency and performance in satisfying the demands of end users, income of the agency depending upon the revenue collected for irrigation service, incentive for more regular and stricter collection of revenues from user groups etc. are some advantages of this management set up. It would create a self sustaining system for better irrigation service to facilitate regular payment of charges. Financial autonomy thus provides a functional link between collection of revenue from users of irrigation water and more effective irrigation performance by suppliers of water.
Further, in this set up, incentives are created to reduce costs. The irrigation agency provides an essential service to farmers, i.e. irrigation water in the quantity and quality desired by the user, while users, in turn; provide the agency with the financial resources necessary for its existence and operation. This mutual dependence can result in greatly expanded potential for efficient irrigation management and efficiency in resource use as a whole. This agency could be an agency of user groups, or a private company, or an autonomous corporation created by the government under the Company Act, or a combination of any two or more of these. Four Indian states (Gujarat, Maharashtra, Karnataka, and Andhra Pradesh) have now set up corporations, or Nigams, that focus on mobilizing funds for surface irrigation. This set up also helps in distancing pricing from political interference. However, this model is not without its limitations. In a free market environment, costs of production/service are kept low by competition. But canal irrigation is more of a natural monopoly, and unless its costs are kept under tight control and its operations made transparent, it runs the danger of passing on the high costs to the users of water. Thus, there is need for an independent regulatory body as a complement to financially autonomous agencies, to ensure transparency in the operations of such an agency. These reforms should have consumer as their priority and social interests as their focus.

4.6.2 Irrigation Management Transfer

The term "irrigation Management Transfer" (IMT) normally means the relocation of responsibility and authority for irrigation management from government agencies to non-governmental organizations such water users associations. It may include total or only partial transfer of responsibility to deliver irrigation services. Also, it may include full or only partial transfer of authority. It may be implemented only at subsystem levels such as distributary canal commands or for entire irrigation systems (www.inpim.org). Vermillion(1999) observes that IMT is a process of shifting basic irrigation management functions from a public agency to a private sector entity, a non-governmental organization (NGO), a local government or a local water users association (WUA). The most common form of IMT relocates management responsibility from a government irrigation agency to a more or less
financially autonomous, local organization in which water users have a substantial voice in control over the management of their irrigation system. It reduces the role of the government in irrigation management and expands the role of water users and other local institutions in irrigation management (Vermillion & Johnson 1995). It transfers authority and responsibility of decision making about financing irrigation, diverting and/or distributing water, maintaining infrastructure, rehabilitating systems, managing water related disputes, allocating water rights or planning crop calendars. Management transfer does not necessarily mean total withdrawal of the Government, nor, in most cases, does it include the transfer of ownership or privatisation of irrigation systems assets.

Locally built farmer managed irrigation systems constitute about 50% of the irrigated land in India, Sri Lanka and Morocco. In Nepal they constitute 70% of irrigated area. However, infrastructure for large-scale systems, particularly, primary storage and conveyance structures and canals have been built by governments (including for flood prevention and drainage).

The rationale for IMT emerges from the severe financial and water resources constraints faced by the governments at all levels. On the one side, there are large irrigation agencies that are often inefficient and overstaffed with outdated personnel policies, which impede organizational responsiveness. On the other side is the problem of intense competition for water among various sectors, including industries, municipalities, fisheries and so on.

The objectives of IMT are to improve the management performance and sustainability of irrigation systems; to reduce government costs for O&M; to reallocate scarce government revenues to more technical or more inherently governmental functions, such as regulating water use along river basins and addressing environmental and health concerns related to water; to bring capacity building among farmers to manage irrigation systems by themselves; to provide transparency and accountability for irrigation management between the irrigation agency and water users and to establish an autonomous water service agency fully financed and supported by the users and beholden to the users.
IMT has been translated as an operational programme in the form of Participatory Irrigation Management (PIM) in many states of India including Gujarat. In participatory approach in irrigation management essentially talks about a bottom-up approach giving adequate representation to grass root level concerns and involves the ultimate beneficiaries in the decision making process. Involving the farmers in the irrigation systems is one obvious remedy for addressing the management problems. As long back as 1938, the Irrigation Enquiry Committee, also known as Visvesvaraiya Committee, had recommended entrusting of irrigation to a village or group of villages if the farmers were willing to take up cooperative irrigation. The Command Area Development Programme started in 1974 envisaged the participation of farmer organisations from the outset as a necessary condition to run the micro system. The Sixth Plan emphasised the need for participation of farmers in the scientific management of water resources. The Seventh Plan reiterated the need for participation of farmers in the management of irrigation. The National Water Policy, 1987 also stressed the involvement of farmers in various aspects of the management of the irrigation system particularly in water distribution and collection of water rates. The Committee on Pricing of Irrigation Water (1992) also recommended farmers participation in the management of irrigation systems. Participatory Irrigation Management is supposed to bring better quality of Operation and Maintenance, efficient water use, increased productivity and higher ability to pay (Jairath, Jasween, 1998). Evidence from different parts of the world points to the fact that PIM has led to higher collection rates, better quality of Operation and Maintenance is superior to publicly managed systems (Small, 1989).

Driven by financial pressures, many state governments in India are transferring full or partial management responsibility of irrigation systems to farmers organized into 'water users' associations (WUA). The Sardar Sarovar Project in Gujarat aims at volumetric distribution of water through WUAs throughout the command area as a mandatory measure. In Gujarat, the government made it clear as early as 1989 that its policy in the case of Narmada River water supplied by the Sardar Sarovar project will be to sell water on a volumetric basis to WUAs. Its plans for PIM elsewhere are the same: it will be up to the
WUAs to pay in advance the entire amount owed for water supplied to the association on a volumetric basis, and then to collect the individual charges from their members. As an incentive for prompt payment, the Gujarat government has agreed to a 50 percent rebate on water charges for WUAs if they pay their bills in full in a stipulated time period. The Gujarat Participatory Irrigation Management Programme (PIM) and the Andhra Pradesh Farmers Management of Irrigation Systems (APFMIS); two of the first IMT programmes in India have served as an example worldwide. In order to make IMT pro-poor and ensure the viability of WUAs, steps should be taken to raise small farmers' awareness and access to information, making the elections of WUAs transparent and competitive, instead of favouring the elite. Responsibility envisaged for the WUA includes distribution of water, setting of water rates and collecting them and implementing repairs and rehabilitation of canals. Small farmers should be encouraged to participate in the WUAs decision-making process. But participation and awareness is very low in both Andhra Pradesh and Gujarat. In Gujarat, WUAs are in the process of undertaking water allocation, distribution and fee collection, which might prove to be a serious extra burden for irrigation committee members. The WUAs may not be willing or equipped to carry out revenue functions. This replication of PIM in Gujarat at a larger scale in other areas will require considerable effort and resources. Long-term benefits of PIM and the viability of WUAs itself is at a risk because there are serious inequities between rich and poor farmers within the WUAs. Better inclusion of the poor in information and decision-making flows will be able to improve the situation (IWMI-Tata, 2003).

There is an urgent need to seek the co-operation of farmers in water management through water-users' associations. Gujarat needs to replicate the experiences in Andhra Pradesh and Madhya Pradesh in this regard (GoG, 2001). Gujarat has a tradition of promotion of farmers' participation. Mohini Co-Op Society of the Ukai-Kakrapar project was one of the pioneering efforts in participatory irrigation management in India. Though the society was very successful in the beginning, it has not been able to sustain itself, because the society depended too much on a particular person and there was no
institution building. Unlike the Maharashtra Irrigation Act 1976, the Bombay Irrigation Act 1879, applicable in Gujarat, does not talk about volumetric supply through water committees or societies. The government of Gujarat issued an executive order in June 1995, adopting the principle of Participatory Irrigation Management. It took up 13 pilot projects in different parts of the state in different agro-climatic conditions. A model Memorandum of Association (MoA) was also prepared by the government of Gujarat in this regard.

The problem of financial and physical sustainability is the most critical issue under the IMT set up. Since it devolves managerial functions to users. In many countries, it may not be possible for water users associations, by themselves, to ensure sustainability of irrigation systems. A new partnership between WUAs, government and the private sector may be needed; Government may be needed for regulation and provision of support services. Likewise, private sector may be needed for provision of support services and investment in irrigation systems, agricultural extension and marketing.

Neetha N. (2003) believes that in Kerela, the state has proved to be a failure in the distribution of water; it is appropriate to limit the state's involvement in production. She concludes that distribution efficiency can be ensured through the tapping of possibilities of market intervention or private and user group efforts. There is a need to organize user-farmers and involve them in decision-making process of the project.

Parthasarthy (1999) opined that water users' associations should be entrusted with carrying out Operation and Maintenance and collecting water charges on volumetric basis. There are instances of misuse of canal water for other purposes, which can be checked by collective action of farmers. In the command area of Chopdavav irrigation project in Gujarat, when one brick kiln was suspected of using canal water by the water operators, the matter was brought to the committee and it was decided that until the members of the minor took the responsibility of stopping illegal use of water -water wont be released. All the farmers of the minor then united and a joint pressure was
exerted against the guilty. Finally the illegal use of water could be stopped without resorting to legal action.

According to a study made by Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad (CMA Monograph Series No. 180), a required package of reforms includes introduction of fiscal accountability, and autonomous status for irrigation organisations and a clear specification of rights and responsibilities of both managers and users. Mangers would seek to increase revenues by reducing wastage, spread water as widely as possible, designing and choosing projects for implementation, particularly if they are also made liable for damage caused by water logging. When users expect to bear full costs of water supply, they would have greater incentive to work together to get the most out of each unit of water. Irrigation organisations would be able to reward those who contribute to organisational excellence. Operation and maintenance will become a more challenging task for engineers rather than simply a posting endured. The role of non-engineers would begin to be appreciated and irrigation management would become truly multidisciplinary, as it should be. A total dependence on user charges would mean a steep hike in user charges, which might be a politically unacceptable thing. What is required is an intermediate step in which the irrigation organisations become dependent on user charges to some extent and therefore become accountable to users. With improved willingness of Irrigation organisations to serve the needs of users, it may be politically more feasible to withdraw subsidy to users at a later stage.

The study (CMA Monograph Series No. 180) suggests that reforming irrigation organisations is a far more difficult thing than discussing it. Farmers do not want irrigation charges to be increased. Improving performance of irrigation departments is not a major issue with politicians. The irrigation departments themselves are in no hurry to make any changes. It can only be hoped that states, which face growing financial problems, would at some stage find that they could no longer subsidise operation and maintenance of irrigation systems. The Vaidyanathan Committee (1992) observed that the initiative of WUA formation would come forth from the farmers only if they see a
reasonable prospect of substantial gain and if circumstances create the compulsion of co-operation.

The success of IMT programs probably also depend on the extent of organizational, functional and financial autonomy granted to water users organizations. Bose (Bose Ruskin, 2003) concluded after a study in Maharashtra that the new WUAs are formed mostly at the tail ends of the canals where it is easier to motivate farmers into forming associations. After IMT in Phillipines (Vermillion 1997), there has been a substantial increase of over 50% in the water fee collection rate, improvements in O&M, and a rise in cropping intensity. However, there is little evidence that IMT has resulted in reduction of costs in irrigation management by the government. Johnson III (1997) suggests that in order to sustain the IMT program in Alto Rio Lerma district of Mexico, the users need to establish an investment fund to cover emergencies in the future, and sustain the transfer. The irrigation fees in Mexico have not risen even to compensate for the erosion of the value of the currency (Parthasarthy R., 2000).

4.6.2.1 Benefits of Irrigation Management Transfer:

PIM is supposed to be the only key to salvage India’s canal irrigation sector from its dismal financial performance and dilapidated physical and operational state. Many researchers have lauded the benefits of PIM. A review of some of them is presented in the following pages.

Jairath (1998) concludes that PIM offers an opportunity not only for more effective water delivery but also for a more sustainable irrigation system. The evidence available so far hints that where farmers feel they own the system, they look after its maintenance. However, according to her, a distinction has to be made between participation and involvement. Peoples’ participation has very clear connotation of control by the people over decisions of water regulation, upkeep of physical works and use of finances collected for Operation and Maintenance.

Merry (1996) studied institutional design principles in large scale irrigation systems and established a hypothesis that single irrigation systems managed by specific organisations that are financially and organisationally autonomous
and accountable to their customers generally perform better and are more sustainable over the long run.

Small (1996) in a study about Vietnam found that financial autonomy of irrigation system is enhanced by supply co-operatives that act as an intermediary between farmers and the central water authority. Johnson (1997) in Mexico found that WUAs have proven capable of operating and maintaining the system in Mexico. They have established an investment fund to cover emergencies and future investments.

Palanisami (1999) found that in order to increase water use efficiency and cost recovery by WUAs, the following short-term measures are advisable. Better management strategies by WUAs, better technologies of irrigation, use of wastewater and saline water for irrigation.

Also, payment in advance on a collective basis engenders a sense of collective ownership and responsibility collective control of irrigation by a water users' association necessitates that big farmers must work with small farmers, regardless of caste, and that they should think of the village interest, not just their own. This brings much needed harmony and unity into the village community.

Politically speaking, the PIM programme implies not only the building of a new institution (the WUA) but also the assertion of village autonomy and less dependence on government. Thus, the dominant answer for resolving the ills of the canal irrigation sector is widely claimed to be the involvement of farmers in managing their irrigation systems through PIM. Several states in India have already started efforts to encourage PIM, following the example of states like Andhra Pradesh. However, results of these reforms are still hazy. It remains to be seen whether PIM or IMT would salvage India's public irrigation systems (IWMI-Tata, 2003).

4.6.2.2 Impact of PIM on recovery of canal water charges:

Evidence suggests that better institutional management of irrigation system indeed has a positive impact on recovery of dues from the user farmers. A case study from Thalota village, Gujarat shows that the Water Users'
Association is successfully charging one and a half times the government's price, covering its O&M cost (Parthasarthy R. 1999).

A case study based on Pingot irrigation Project in Gujarat (Singh, Katar, 1994) supported by AKRSP concluded, that not only the service delivery, but even the recovery of canal water rates was much better in the WUA set up. The financial performance of the society was good in the first year (1990-91) of its operation. It recovered the water charges from member farmers paid all the water dues to the government, and made a net profit of Rs. 28,430 in 1991. However, in 1991-92, it incurred an operating loss of about Rs. 9,529. The loss was due partly to the inability of the society to recover water rates from some of the members who utilised irrigation water during the year and partly to handling of marketing of members' produces. The members of the society and AKRSP staff opined that the defaulting members were not able to pay their water dues because they had very poor crop of groundnut that year. However, in January 2003, all the water dues had been recovered from all the members. Singh further concludes that having two parallel systems of water rates in the same command area is detrimental to financial viability and sustainability of the society, farmers will always prefer to pay lower water rates if they have an option to do so. It is necessary therefore that the same water rates should prevail in the entire command area and all the farmers be brought under the fold of one or other co-operative societies.

In a study made in North Gujarat (Parthasarthy, 2000) it was found that some of the WUAs like Thalota, Tranol and Lakshmipura had fixed new water charges, which were different than the government rates. Thalota had initially fixed the highest rate, which was then two and a half times higher than the government rate. Lakshmipura, around this time, had fixed water rates at 30% higher than the government. Tranol charged a flat rate of 20% of were charges and created an Operation and Maintenance fund. Farmers in North Gujarat view the utility of tube well irrigation to be more than canal irrigation because of its higher reliability and efficiency therefore, they are ready to pay a higher price for tube well irrigation. For the same, reason, higher charges of canal water by the WUA are not resented. It was not clear as to why the farmers did not mind paying higher water rates to the WUAs when the
improvement of reliability of water supply was beyond its control. The incremental utility of canal and tube well irrigation was perceived to be equal by the farmers because not only the incremental returns to canal water were zero (unless the number of waterings increase), but the additional cost of tube well irrigation was also zero, due to subsidised, fixed charge of the electricity connection. The standard practice here was to charge a lower price for tube well irrigation (Rs. 30-45 per hour for 75 hp motor) during Kharif season when the water demand function was highly elastic and twice as much or more for rabi and summer (Rs. 60 and Rs. 75 per hour) (Shah Tushaar, 1993, quoted in Parthasarthy, 2000).

In a study made by Niranjan Pant about ten WUAs of Maharashtra between the period of 1991 to 1996, the total percentage of recovery of water rates was found to be up to 100% in six WUAs and more than 79% in the other four WUAs. The percentage of recovery was found to be the highest in the case of hot weather irrigation, compared to Kharif and rabi season. (Pant, Niranjan, 1999). Further, it is interesting to find that rabi crops contribute 31.8% of total recovery, hot weather crops 58.6% and kharif crops 9.6%. Even though hot weather use of water contributes maximum recovery to the government, in most of the project designs, there is hardly any provision of hot weather crops and hence, of hot weather irrigation. The study further concluded on the basis of discussions at the site, that the biggest defaulters of water charges were upper reach farmers, while farmers in tail end locations did relatively punctual payment. The percentage of profits for the WUAs also varied from a minimum of 45.9% to a maximum of 126.6%. Per unit of water use, water use efficiency was found to be higher after IMT. WUAs charged higher water rates from farmers, which enabled to accumulate funds for Operation and Maintenance. The overall recovery in case of ten WUAs included in the study was found to be 94.4%. This is a very high rate considering the fact that the recovery of water charges has been the most depressing feature of irrigation projects all over India.

According to a study made by Bose (2003) in Maharashtra, the efficiency of WUAs is attested by the fact that the irrigation department recovers 90-95% of the cost of irrigation from the WUAs whereas earlier, it only managed to
recover 20-25% water rates from individual farmers, despite the fact that water cess has been increasing steadily increasing over the last few years.

According to Oorthuizen and Kloezen 1995 (quoted in Vermillion, 1997), in Phillipines, the fee collection rate after IMT rose to 81% from a previous level of 20%. According to Bagadion 1994, in Phillipines, (quoted in Vermillion, 1997), the fee collection rate rose from 27% to 60% after IMT. According to Svendson (1992), in a study conducted in Phillipines, (quoted in Vermillion, 1997) after IMT, there was found to be a reduction in the frequency of deficit budgets, increase in revenue from water charges and other income and a 29% drop in expenditure on Operation and Maintenance. Kalro and Naik (1995) (quoted in Vermillion, 1997) found that while there was no decline in government expenditure on Operation and Maintenance after IMT, there was an improved rate of recovery of water charges. According to a study conducted by Maurya (1993) (quoted in Vermillion, 1997), water fee collection rate rose from 50% to 90% in the first year after IMT. Johnson, (1996), Gorriz, Subramanian and Simas (1995), in Mexico (quoted in Vermillion, 1997) found that after IMT, while the water rates increased by 45-180%, increase in fee collection rate rose from 15% to 80-100%. According to Svendsen and Vermillion 1994, (quoted in Vermillion, 1997), a study in USA revealed that water charge was 67% before IMT and it increased to 80% after implementation of IMT.

The conclusion of a study made by Kalro (2000) is noteworthy for its disagreement with the above conclusions. He presents a warning against over enthusiasm about recovery performance of a WUA set up. According to his study about a WUA in Maharashtra, the experience in recovering water charges from farmers has not been quite satisfactory. The maximum recovery rate was 98% during 1996-97 and kept falling, averaging to around 75%. The overall recovery rate had steadily declined from 50% in 1992-93 to 28% in 1997-98. The WUA under study was not found to be financially viable in absence of subsidy from the government. This viability is critically dependent on the ability of the society to recover water rates from the members in a timely manner.
A report in the Indian Express examined the case of the villages of Pala & Shira in Vallabhipur taluka in Bhavnagar district, which have formed a co-operative society and registered it in keeping with the PIM scheme of the government; water from the Narmada Canal was received on a volumetric basis. The farmers were charged Rs. 157/- per hectare during one year but this could go up further in coming years. The Water Users' Association would also have to contribute part of the construction cost after the minor and sub-minor level. The head of the WUA, Hasmukh Prajapati felt that distribution of water and collection of water rates might be problematic because the farmers want the government to pay for everything (Ghatwai, Milind, 2003).

Johnson, III (1997) studied IMT in Mexico and concluded that a sharp rise in water fees collected supported water users and irrigation agency staff in Operation and Maintenance of irrigation system in the post IMT period.

Jairath (1999) critically examined the impact of PIM in Andhra Pradesh and concluded that there are two probable reasons for higher revenue collection in post-PIM. She concluded that firstly, WUAs were to get funds from the state government for Operation and Maintenance in proportion to the revenue that was collected from within the command and hence the official entry of irrigated area, which was not reported prior to PIM, had increased. Secondly increased in revenue collection could be owing to higher charges and not necessarily because of larger number of farmers complying with payment.

Parthasarthy (2000) found that some members of the WUA did not agree with the idea of paying higher rate to the WUA than what the government charged, when the reliability of water supply was beyond its control. Thus, it was found that farmers in north Gujarat opposed higher water rates levied by WUAs.

Chaturvedi Vaibhav (2003) concluded from his study about WUAs in Gujarat that water charges recovery was much higher in the "piyat mandalis" along with a higher tendency for rule conformance among the members of the "mandali" and a willingness to pay higher water rates.

Gulati et al (1994) observed that in a study about the Mohini Water Cooperative society in the Kakrapar system in Gujarat, it was found that this society bought water from the government at a bulk rate on volumetric basis.
and sold it to the farmers at crop area rate. Since there was a substantial
difference between the design and actual crop area under sugarcane, the
difference between the two rates yielded almost Rs. 270 per hectare as profit
to the society. The gross irrigated area was also found to have doubled as a
result of water savings. Other relatively younger societies in the Ukai-
Kakrapar system also functioned with great success and had greater certainty
in the collection and delivery of irrigation revenue in the areas managed by
them.

Further, Gulati et al (1994) have traced the success of water rates recovery
performance in the PIM set up in may parts of the world. They have found that
Philippines are a success story in making irrigation service self-financing while
remaining under overall government supervision. The National Irrigation
Administration in Philippines, which was set up in 1964, achieved financial
viability by 1979 and received its last operating subsidy from the government
in 1981. It is now freed from any repayment obligation to the government and
could also raise funds through diverse activities like equipment rentals,
drainage fees, and administrative charges. After the subsidies were phased
out, the agency would become wholly dependent on its collection from
farmers for its operating costs. The agency devolved some of its functions to
the farmers by organising them into irrigators' organisations, increasing
revenues by raising fees and indexing them to inflation, improving collection
rates, initiating secondary sources of revenue, creating a system of financial
incentives to extract better performance from farmers. The Administration took
a pledge from the people that they would contribute 10% of the construction
cost in the form of labour, cash and material for construction. Another
example is that of China, especially the Hunan province, where emphasis is
laid on the financial viability of the already constructed irrigation systems, with
an insistence on generation of sufficient revenue from water rates, the
collection of which is claimed to be quite high. Income generated from
secondary facilities of the irrigation system also generates a lot of income,
sometimes, even surpassing the income generated from water charges.
Similarly, in Korea, while construction and development of services in
irrigation is provided through a centralised agency such as the Agriculture
Development Corporation, responsibility of Operation and Maintenance is delegated to decentralised, financially autonomous groups, such as the Farm Land improvement Associations. It is the user farmers who form the membership of the Farm Land improvement Associations and a federation of these associations at the national level acts as an intermediary between government and individual associations. Some, subsidy is given to the associations by the Ministry of Agriculture. There is an effective pricing policy, through which Operation and Maintenance and part of the construction cost is financed. The carrot-and stick policy of sanctions and rewards is effectively employed for cost recovery, which is supported by efficient institutional framework, which has helped the Korean irrigation has become financially independent over time. Taking the case of USA, here, local irrigation districts construct the systems, with subsidy from the government. The ultimate burden of financing the construction lies with the users, who are sometimes required to pay the entire construction cost, without interest, over a period of 40 to 50 years. The actual year-to-year payment is determined by the ability to pay of the farmers. Most irrigation districts finance the Operation and Maintenance of the system as well as the repayment schedule, through direct water charges. This may be two-part tariff, where the first part is meant for the use of a fixed quantity of water while the second part would depend upon the extra water used. The formation of Water Users' Associations are encouraged by giving them the right to certain secondary sources of income, such as revenue from leasing out project land for greasing and farming, and gains from hydro-power plants on the projects. A legal penalty can be imposed on the farmers for non-payment of irrigation charges. In the Columbia Basin Project, farm property can be foreclosed, if water bills are not paid. Until all dues of construction costs are cleared, no landowner can obtain a clear ownership right to his land.

To summarise, the benefits of PIM to farmers can be considered as better water management at tertiary level, flexibility in use of water, choice of crop and land use, optimal use of water in agriculture, ensuring equity in water allocation, resolution of disputes in water distribution, encouragement of community management of assets, availability of a forum for effective communication for farmers and government departments, better collection of
water rates, better Operation and Maintenance at reduced cost, less corruption etc.

At the same time, benefits of PIM to Irrigation Department are also many, in the form of improved relations with farmers, less mistrust with farmers, Equitable distribution between head and tail, irrigation efficiency, job satisfaction, more time to attend to technical matters, less botheration about unauthorised outlets, improvement in credibility of agency and officials, better collection of water rates and savings on Operation and Maintenance cost.

4.6.2.3 Disadvantages of Participatory irrigation Management

The idea of WUA seems to be simple, but involves complex operational procedure in its establishment mainly because of involvement of human factor with diverse and heterogeneous interest groups among participants. The contemplated institutional reform would be delineating hydraulic units, which are not only technically, socially and administratively manageable but also economically viable (Mitra, 1996). Bose (Bose Ruskin, 2003) felt that without adequate water, the existence of WUAs is threatened. Parthasarthy (2000) felt that for the WUAs to succeed in charging higher prices, some assurances regarding quantity and timing of water are needed.

In a note about PIM in the Ninth Plan Document (Note on "Participatory Irrigation Management for the Ninth Plan", (http://planningcommission.nic.in, accessed on 15th April 2004), the Planning Commission makes the following observations:

As regards equitability, it is obvious that only the landed will benefit directly, which means mostly the already well-off landowners. The relationship of the water users' associations to the newly-constituted panchayati raj institutions has not been clarified, and the possibility of their forming mutually opposed power centres has not been ruled out. Since the panchayat represents, theoretically, all villagers, and not just the landed, and since the panchayat is institutionally connected to higher levels of the political system, it should be the more powerful body. Especially in a context of political assertiveness, both at the village level and above, by lower castes (as in the current rise of 'daht' ("the oppressed") groups, it is not difficult to imagine a
clash of interest between panchayats and water users' associations. In spite of the growing realisation of the urgent need for farmers' participation in the management of irrigation, the progress has been slow so far. It is estimated that today only 8,04,000 hectares in India are being managed by WUAs. Amongst the major reasons considered to be responsible for the tardy progress in the implementation of the PIM, are the prolonged prevalence of government-managed systems has sapped the initiative of the farmers and made them dependent on the Government; non-availability of funds for PIM. At present funds are available to a small extent under CAD programme as one-time subsidy to the WUAs.

The farmers are reluctant to adopt participatory approach unless deliveries of water can be made flexible, practical and responsive to their needs. There are apprehensions in the minds of farmers that under the new system they might have to incur expenditure on operation and maintenance in addition to increased water rates. Here is often a lack of homogeneity in the composition of farmer population and they are reluctant to come together, because of differences of castes and classes, to form an association. Present institutional arrangements are not conducive to the introduction of PIM. Properly oriented, trained and motivated officials to implement this programme are lacking and there is no dedicated wing for this purpose. It is believed that the IMT program in Mexico was more successful because it has a top down approach with more commitment from the political system and involvement of the farmers.

Lack of an enabling law for the establishment of WUAs is an important impediment in the introduction of PIM. There is a need to have a separate law for the formation of Water User Farmers' Associations (WUAs). However, till such time as such a law is enacted any existing law like State Irrigation Act could be used with necessary amendments to define the rights and obligations of the WUAs. The Union Government has taken several initiatives for expanding the PIM in the country. These, inter-alia, include a National Conference on PIM, held in New Delhi from June 19-23, 1995, which adopted a plan of action envisaging conferences at State level for creation of awareness and understanding of issues, initiation of measures for legal changes necessary to implement PIM, preparation of manuals, training of farmers and
officials etc. Following the recommendations of the National Conference State/Regional Level Conferences were held. Training programmes are conducted on PIM at the National level for officers and at State level for officers and farmers. Work on the preparation of manuals for PIM in regional languages has been initiated. The Ministry is in the process of proposing amendments to the Irrigation Acts of States to give legal status to Water Users Associations. The Ministry has requested the State Governments to set up a High Level Group under the Chairmanship of Chief Secretary to prepare policy guidelines for implementing the PIM. The Governments of Gujarat, Himachal Pradesh, Karnataka, Kerala, Orissa, Rajasthan, Tamil Nadu and Utter Pradesh have already set up such High Level Groups. The Planning Commission had set up a Working Group on the role of the NGOs in bringing members of different communities together is quite important. They can assist the Associations in organising themselves, drawing up the bye-laws, getting registered as societies, devising rules of working together, maintaining books of accounts, conducting meetings and so on. They can lend support to the Associations in their dealings with the agencies of the State.

For successful Implementation of the PIM, the Planning Commission had suggested that the following aspects need special attention.

- Appropriate legislative backing should be provided to WUAs as early as possible.
- High Level Committee should be set up to formulate policies for the implementation of PIM and review policy issues from time to time.
- A separate multi-disciplinary wing should be created for PIM in the Ministry of Water Resources in Government of India. The setting up of National Support Group for PIM can also be considered.
- Need to ensure that during Ninth Plan, the PIM programme is prominently highlighted and adequately funded. Under the Centrally Sponsored CAD Programme, the initial management subsidy of Rs. 275 per hectares, which was earlier available, has been changed to a functional grant of Rs. 500 per ha. out of which Rs. 225 each would be borne by Central and State Governments and Rs. 50 by the farmers'
association. Also, non-CAD and non-external assistance areas would need some consideration for the functional grant if the PIM is implemented in such areas (http://planningcommission.nic.in accessed on 15th April 2004).

The foregoing discussion reveals that the success of the WUA depends on many factors among which are the need felt in the community, common interest, collective effort, effective leadership, bureaucratic commitment of agency involved, political will of party in power, financial viability and legal support from the government (Swain Mamata, 2002).

4.6.3 Reforms and Operational Autonomy to Irrigation Departments

Irrigation agencies often lack a service orientation. Government emphasis in the past has been on construction of new systems without much, if any, farmer participation. The less glamorous option of proper upkeep and maintenance of the existing systems is often, not on the priority list of state governments. “The need for providing sustainable services under diminishing budgets calls for radical measures to modernize existing irrigation agencies in terms of technology, management and personnel policies to meet the rising organizational challenges. Modernizing long-established agencies requires strong political support and leadership, much capacity building and sufficient time for institutional change. Registering Water users’ associations one thing and cataloguing them to perform the expected tasks is another The critical challenge facing Sardar Sarovar Project is to activate and energise the 800 odd minor level Water users’ associations, so that irrigation is managed according to Sardar Sarovar Project vision” (Shah Tushaar, 2003). It is even more essential that the irrigation project authorities should be made operationally autonomous and they should be held accountable for the financial performance of the projects (Raju et al, 2002).

According to Singh and Shishodia, (1992-93), even in the traditional set up of state run irrigation schemes, there needs to be brought some fundamental changes in ideology and functioning. There should be an improvement in the management of State Irrigation Departments. There should be a creation of corporate management culture, induction of non-engineering professionals
and their integration with engineering personnel, organisational restructuring along functional lines such as project preparation and design, financial management, Operation and Maintenance, monitoring and control etc. training of existing staff in irrigation management and use of consultants to upgrade expertise in critical areas. Singh and Shishodia suggested that the role of the government now should be to facilitate private investment by farmers in irrigation by providing them needed financial incentives (loans at low rates of interest), technical information and guidance, monitoring of ground water and surface water use through appropriate water and power pricing policies. The resources of the farmers need to be tapped to improve the performance of the irrigation sector.

Singh and Shishodia (1992-93) have further concluded that all future public investment should be made in those activities or projects which have high social benefit cost ratio (high economic viability), are quick yielding and are environmentally sound i.e. they do not have any adverse side effects on ecology and environment. such activities include command area development works that promote fuller and better utilisation of irrigation potential already created, completion of incomplete works, better maintenance of exiting schemes, surface drainage in areas prone to water-logging in the monsoon, drainage and other measures to combat falling ground water table and soil salinity, organisation of farmers and provision of credit, technical information and training to farmers to enable them to construct and maintain small irrigation structures, farm level water courses, fields channels and field drains. Government should encourage private investment by farmers in farmers' associations, ground water development etc. Also, an upward revision of water rates is justified in terms of both the real resource cost of water (supply side) as well as the productivity of water (demand side), which are both much higher than the water rates charged at present.

4.7 Summary

From the above discussion, we can say that, pricing of canal irrigation water raises many questions, the answers to which have been attempted by many economists. Notable issues are:
1. Is water an economic good? Are tradable water rights for irrigation sector appropriate?

2. What kind of institutional set ups are suitable for management of the water sector, and particularly the canal irrigation sector?

3. Should water price cover only Operation and Maintenance cost or also capital cost?

4. Should cost recovery analysis in canal irrigation include capital cost, operating cost or both? If capital cost is to be recovered, what should be the percentage of its recovery?

5. Is there a correlation between improved canal irrigation system management, increased user satisfaction and better cost recovery?

These questions cannot be correctly answered simply with an accountant’s point of view. If the basic objective is to cover up past deficit and create a revolving fund against capital invested the issue of pricing of irrigation water needs to be looked at from a broader perspective.

To summarise, this chapter gives an overview of studies carried out by various independent researchers about crucial aspects of the functioning of canal irrigation sector in India, notably pricing, costing, funding cost recovery and management. It emerges very clearly that these issues are complex and interlinked with each other, and no unique or isolated solution is likely to remedy the situation.

To conclude, if the vicious circle of poor cost recovery, insufficiency of funds, poor state of Operation and Maintenance, poor irrigation service to user farmers, less willingness to pay and still poorer cost recovery has to be broken. It has to be replaced with a positive reinforcement of efficient functioning, increased user satisfaction, better cost recovery and sufficient funds flow into this sector. For this to happen, multi-dimensional reforms in the canal irrigation sector are a must. These reforms are not to be seen or performed in isolation each other, but rather, in conjunction with each other. The most important point from which the reforms process must begin, with a two-pronged process of pricing reforms, being undertaken simultaneously with institutional reforms.
This is because; institutional reforms alone cannot hope to succeed if pricing incentives are not implemented to give sufficient financial incentives and promise of adequate financial returns, for encouraging private sector investment in canal irrigation. Moreover, pricing reforms alone cannot suffice if they are not accompanied by institutional reforms, ensuring betterment of irrigation service to farmers, and resultant improved satisfaction and willingness to pay on the part of the farmers, ensuring better water charges recovery.
To end this chapter on a lighter note, here is a poem by Kenneth Boulding:

Water is far from a simple commodity,
Water's a sociological oddity,
Water's a pasture for science to forage in,
Water's a mark of our dubious origin,
Water's a link with distant futurity,
Water's a symbol of ritual purity,
Water is politics, Water's religion,
Water is just any one's pigeon,
Water is frightening, water is endearing,
Water's a lot more than mere engineering,
Water is tragical, water is comical,
Water is far from pure economical,
So studies on water, though free from aridity,
Are apt to produce, a good deal of turbidity.

(Compiled from Patel, C.C., 2001)