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# **Institutional Reforms for Better Cost Recovery and Efficiency in Indian Canal Irrigation**

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## Foreword

The Indian irrigation network is one of the largest in the world. But the productivity of these large numbers of surface irrigation schemes is nowhere near optimal and one of the main reasons ascertained for this is poor financial and physical management. In fact, in the current scenario of inflated costs and poor cost recovery, the government is finding it impossible to sustain its irrigation development efforts. In order to correct this anomaly and bring about improved management, it has become imperative to bring about a change in the institutional structure of this sector. Government has already taken some steps towards this by encouraging formation of users' associations to manage sections of major or medium schemes. But such isolated efforts are not proving to be enough and in this context this paper looks at these isolated efforts, as well the experiences of various nations which have been successful in developing efficient irrigation systems. Most of these successes are found to be either wholly or partially financially autonomous and this, in fact, appears to be the key to efficient management of these systems. This paper makes a modest attempt at putting forward certain suggestions for improved functioning of the irrigation sector, based on the experiences of the various States of India and other countries like Philippines, Korea, China etc.

The present paper forms a part of the collaborative project entitled "Irrigation Cost and Cost Recovery in India", between International Food Policy Research Institute (IFPRI), Washington, D.C. and National Council of Applied Economic Research (NCAER), New Delhi.

I hope this paper would be of immense use to policy makers, academicians and others having interest in water related issues of this country.

July, 1994

S. L. Rao  
*Director General*



## **Institutional Reforms for Better Cost Recovery and Efficiency in Indian Canal Irrigation**

India has one of the largest canal irrigation networks in the world. But the condition of this extensive network of major and medium irrigation schemes is far from the optimal level. Experts fear that unless some urgent steps are taken to stem this steady downward spiral, it will not be long before the entire system, built up at an enormous cost becomes sub-optimal. The major problem with the existing setup has been identified as lack of sufficient funds for the proper operation and maintenance (O&M) of the system and attention now needs to be specifically focussed on this particular issue. For this, cost recovery and efficient management are the two main areas where reforms have to be brought in and a change in the institutional structure has been perceived as a pre-requisite for bringing about these reforms.

Under British rule, irrigation projects had been taken up as both protective and productive measures. But after independence, the Indian government's shift in emphasis towards self-sufficiency in foodgrains relegated the financial criterion to the background. Consequently, despite the addition of 22.14 million hectares to her inherited irrigation potential of 8.6 million hectares, during the next forty years (1951-90), the maintenance of already created structures was woefully neglected due to overall resource crunch (Gulati et al, 1994b).

The burden of financing major and medium schemes is shared equally between the state and centre in case of centrally sponsored projects, while the rest of the schemes are financed entirely by the State governments (GOI, 1972). On completion, all schemes are transferred to the state for maintenance, thereby increasing the non-plan liability of the concerned state government (GOI, 1989).

A large number of institutions/departments have been created over the years, to look at the technical and non-technical functions associated with irrigation. At the apex of this setup is the Ministry of Water Resources which is responsible for framing policy guidelines and programmes for the development of the country's water resources. However, all the institutions or departments carrying out the Ministry's guidelines address only specific questions on technical and non-technical matters and issues related to cost recovery remain entirely peripheral to the main functions of the bodies in question.

This paper concerns itself with the problem of coming up with viable alternatives for financial recovery in major and medium irrigation schemes. In this context, we take a look at the different institutions for cost recovery that have come up, particularly those where farmers' participation was involved, in different states of India (I.1) and in selected countries (I.2). Taking into account these experiences, Section II puts forward some suggestions regarding changes to be brought about in the present institutional structure in India for better cost recovery in surface irrigation schemes. Additionally, Section III presents certain concluding remarks with regard to these institutional structures in the context of better management and cost recovery.

## **I. Institutional Experiments in Management & Cost Recovery**

### *I.1 Experience from Selected States of India*

In Andhra Pradesh reasonably successful attempts have been made during the past four decades, in the Sreeramsagar Project (SRSP) on river Godavari, to involve farmers in management. The first major experiment, in this regard, was carried out with the creation of Command Area Development Authority (CADA) in mid 1970's. In the case of this particular project, the unusually close relationship existing between the CADA, the Water Management Circle of the Irrigation Department and the farmers, resulted in emergence of some fairly efficient management systems and helped reduce the gap between the creation and utilisation of irrigation potential (Hassan, 1986). The association between the official organisations and the farmers took place mainly at two levels: construction and maintenance.

A programme known as "On Farm Development" (OFD) activity was taken up for development of land and construction of field channels, the design and execution of which was entrusted in 1974-75 to *pipe committees*. Each of these Committees was divided into upper, middle and tail sectors, with farmers of different socio-economic backgrounds being represented in the management of these committees. Although this institutional arrangement proved to be quite successful, once the construction stage was over, the utility of these *pipe committees* declined and they disintegrated due to lack of adequate interest on part of the farmers.

Despite this, experiments with farmers participation in other areas continued. For instance, to specifically address the problems of the tail enders, the *Warabandi system*, or rotational supply, was tried out during the period 1978 to 1988 (Hassan et al., 1992). Rather than merely deciding the quantum of water to be released to each distributory, with the involvement of farmers, focus shifted to allocation of water between the various distributories, majors, minors and pipes. Maintenance being the responsibility of the farmers committees, the uncertainty element in the water supplies was significantly reduced.

However, certain basic deficiencies in the system may prevent further success of the experiment. For instance, since the farmers are not charged for water by volume, there is no incentive to conserve. The functioning of the irrigation departments too leaves a lot to be desired and they have been unable to gain the confidence of the farmers. Most importantly, the pipe committees do not have the authority to raise funds through collecting and retaining water fees (Pathak, 1991). In fact, specific cost recovery schemes were never formulated in this project, despite provisions in the AP Irrigation Utilization and Command Area Development Act (1984), for the Irrigation Departments to carry out responsibilities on behalf of farmers and to recover the costs from them. Some indirect attempts at cost reductions took place through (a) the farmers' role in maintaining the minors and contributing labour for OFD works; and (b) their participation in clearing and desilting operations below the outlet, which led to a corresponding reduction in costs to the concerned irrigation departments. But experiments in these areas too, could not succeed on a long term basis due to lack of sufficient interest on part of the farmers (Hassan et al., 1992).

In Bihar, an inter-disciplinary Action Research Programme (ARP) was established by the central and the state government, in the Paliganj Distributory (CCA 12,197 hectares) of Patna canal under Sone Canal System, under the sponsorship of USAID.

Since its incipience, the Sone Canal System had functioned reasonably well with participation of farmers in various aspects of its functioning. As per the Bengal Irrigation Act, 1876, permits were issued to farmers for irrigating specified plots against request or *satta* and heavy fines were imposed for unauthorised usage of water, which was estimated on a volumetric basis. A beneficiary farmer was appointed as Sattedar for each outlet to help in management and collection of water rates, in return for a fee of 2 per cent of the revenue collected. User-farmers were required to maintain the village channels and improper maintenance led to imposition of penalties. Distribution of water to each individual field was also the responsibility of the farmer, while assessment and collection of water rates was taken care of by the revenue wing of the irrigation department. Thus the administration was run in such a way that the users of irrigation water were satisfied and the system performed well (Srivastawa, 1992).

But after independence, attention shifted from productivity to protection of deprived farmers, which made the entire 'satta' system increasingly unmanageable and finally in 1974, the Bengal Irrigation Act (1876) was abolished. Assessment and water tax demands preparation began to be done on the basis of actual irrigation undertaken, the records of which were to be properly maintained. With absence of water managers, power was now centralised with high level officials which also meant a lack of control over the actual usage of water at the ground levels. Those getting water first, simply flooded their paddy fields, thus depleting the supply of irrigation water to the further reaches of the command, where it was in any case inadequate to meet the demand. Due to the worsening situation over years, the state government reintroduced the 'satta' system in 1988 (Srivastawa, 1992).

The Action Research Programme (ARP) in Paliganj distributory was started in 1988. Regular meetings with farmers indicated that adequate water supplies to the lower reaches of the canal was not possible without proper supervision of distribution operations by government functionaries. The ARP appointed farmers' "Ad-hoc



Canal Operations Committee”, for suggesting roster for water distribution in different parts of distributory command, so as to ensure greater predictability and reliability in the timing of water deliveries and also to ensure equitable water distribution. As a result of this change, the wastage of water in the upper reaches of the channels was prevented and farmers in the middle and lower reaches gained access to relatively more water. The farmers were also encouraged to participate in training programmes initiated by WALMI (Water and Land Management Institute) and eventually helped in formulating maintenance plans and prioritisations of the maintenance works. But as is clear from above, the ARP confined its efforts at ensuring farmers’ participation to the question of distribution of water at the level of distributory.

In *Gujarat*, the Mohini Water Cooperative Society in Kakrapar system is one of the most successful examples of improved water management and efficient cost recovery through farmers’ participation. In Surat district, in village Mohini of Taluka Chorasi, a society was started under the State Cooperative Societies Act of 1961, which has been involved in irrigation management since March, 1979 (Pathak, 1991). The water cooperative undertook effective implementation of revised rotational schedules and charged government-fixed water rates from the farmers. It has been fairly successful in almost eliminating the arrears in payment and also in minimising the wastage of water. The members of this society now receive dividends and sizeable reserves have also been built up. There has been considerable improvement in water-use efficiency and there appear to be no complaints about inadequate or non-delivery of water. This has been accomplished through cooperative efforts with minimum interference from either the revenue department or the irrigation department. Another factor which has contributed to the financial success of this society is that it buys water at bulk volumetric rate from the government and sells it to the farmers at crop area rate. Since there is a substantial difference in the design and actual crop area under sugarcane, the differential in the two rates yield almost Rs 270/ha as profit to the society (Pathak, 1991). The gross irrigated area has also almost doubled as a result of water savings and acquiescence of farmers in receiving measured volume of water supplies from the authorities (Chambers, Saxena & Shah, 1989).

Other relatively younger societies in the Ukai-Kakrapar system in

Gujarat, such as the Rayma Users Cooperative Society and the Saras Users' Cooperative Society, have also been functioning with a remarkable degree of success (Pathak, 1991). The methods of operation and rules followed are similar to Mohini and these efforts are being actively encouraged by the Government, since not only does it allow some delegation of responsibility to the farmers, but also ensures a greater certainty in collection and delivery of irrigation revenue in the areas managed by these societies.

*Maharashtra* has, in the past, been characterised by well developed farmer-managed irrigation systems. These systems were independent with regard to various functions related to maintenance of the canal network, recovering management costs and payment of irrigation fees to the government. Institutions like the Canal Advisory Committee, *Pani* (Water) *Panchayats* and Bagaitdar Sangh (associations of all irrigators on canal), developed through experience over centuries, facilitated accomplishing such a task (Kulkarni and Kulkarni, 1992).

In these systems, examples of which still exist in Nasik and Dhule districts, the land lying between the channels was irrigable area and was divided into suitable management units called *phads*. The management of the phad system was entrusted to farmers' associations, known as Water Management Committee (or *Pani Panchayat*), under whose direction maintenance was carried out by means of contributory funds from the users and organising voluntary labour (Pathak, 1991). Neither these committees, nor the canal advisory committees, put any direct emphasis on the financial aspects of the system. Their activities were mostly confined to evolving participatory management units responsible for maintaining secondary distribution network and implementing the 'schedule of turns' of irrigation in a village. Dissemination of knowledge regarding new techniques, water requirements of crops and availability of seeds was also undertaken by these decentralized participatory management units.

Maharashtra Irrigation Act, 1976 provided for the legal formation of water committees for distribution of water and maintaining sanctioned cropping patterns, provided it had the support of 51 per cent of total land holders or land under a particular canal. Some such societies have, in fact, existed since pre-independence days, like the Manjari society in Khadakvasla canals and Samvatsal society on

Godavari canals. Irrigation department of the Maharashtra government has been making conscious efforts to organize similar societies, with the ultimate aim of handing them over to the farmers' organisations. This has been done through a discount on the water bill and an additional incentive on timely payment of the bill. Growth of seasonal and non-seasonal crops is generally the basis of fixing volumetric rates for government supplies of water to farmers' associations, although for individual farmers, the farmers' associations have the liberty to fix rates (Kulkarni & Kulkarni, 1992). But so far, the financial aspect continues to be of secondary importance for these societies, with neither financial independence nor effective cost recovery being the guiding principle behind fixation of water rates.

Apart from the above cited examples, water users' associations have come up in some areas of Kerala, Orissa and Madhya Pradesh. However, in these, as well as in most of the cases studied above, the primary focus has always been on better management of the existing irrigation systems through farmers participation. Although farmers participation indirectly reduced the costs of operation and maintenance, cost recovery has been, at most, a peripheral objective and has, therefore, not been realised. We now take a look at different countries, with regards to their experiences in farmers' participation and cost recovery.

### *1.2 Experience from Selected Countries*

*Philippines* : The example of Philippines is normally cited as a success story at making irrigation services self-financing, while remaining under overall government supervision. Experiments have been carried on in this country for the past 25 years, to figure out ways of reducing the cost of supplying irrigation services and streamlining the agencies in charge of development of irrigation and its management. Attempts have also been made to involve farmers more extensively and directly in the process. The main agency dealing with irrigation development and management in Philippines, is the National Irrigation Administration (NIA), set up as a semi-autonomous corporation in 1964 (Small & Adriano, 1989). In the initial stages, NIA dealt mainly with technical functions related to design and construction, system maintenance, physical rehabilitation and water distribution. But due to a shortfall in the target irrigated area in the early 1970s, need was felt to involve farmers' organisations in achieving the given

targets and in 1974 NIA was given this responsibility. Behind all the structural and organisational changes was the new concept that NIA must be made financially viable in order to be successful. It indeed achieved financial viability by 1979 and received its last operating subsidy from the government in 1981 (Svendsen, Adriano & Martin, 1990).

Between 1964 and 1974, new canal networks, built under the supervision of NIA, were often found not to conform to previous distribution systems and help of farmers' organisations was sought in redesigning the same for better efficiency of the system. But operation and maintenance remained a serious problem, with receipts from irrigation remaining well below actual government outlays. In order to correct this deficit, an increase in the irrigation fees was brought about, which, in turn, led to demand for improved maintenance of the system and the deficits remained (Bagadion, 1993). Thus, while NIA was reasonably successful in involving farmers in construction of new systems, problems with regards to O&M had escalated.

As a solution to all these problems, amendments were brought about for the required transformation in NIA. It was now freed from any repayment obligation to the government and could also raise funds through diverse activities such as equipment rentals, drainage fees and administrative charges. The subsidies were to be phased out in five years, when NIA would become wholly dependent upon its collection from farmers (Bagadion, 1993) for its operating cost.

In response to the governments initiative of changing the functioning structure of NIA, this agency reciprocated by adopting certain broad measures to bring about a balance in its revenue and operating expenditure. These strategies included - devolution of some of the responsibilities to farmers through organising them into viable irrigators' associations; increasing revenues by raising fees and indexing them to inflation, improving collection rates and initiating other secondary sources of revenue; creating system of financial incentives to extract better performance from units and individuals.

For smaller systems, management activities were delegated entirely to farmers' organizations. For larger schemes too, costs were minimised by entrusting the operation and maintenance of large parts of the systems to irrigators' associations, while the NIA continued to take care of the main canal and headworks. The government,

however, continued providing infrastructural facilities such as roads, flood control, reforestation, power generation, etc.

In order to ensure willing and meaningful participation from the irrigators, NIA felt the need to instill a sense of ownership on the part of the farmers. Thus, apart from the formal turnover of the system to the irrigators' association on completion, NIA took pledge from the people to contribute 10 per cent of construction cost in the form of labour, cash or material at the time of construction (Bagadion, 1993).

In case of communal systems, the existence of various successful indigenous irrigators' organisations was recognised and a partnership between these and NIA was envisaged as a system which would ultimately increase the strength and usefulness of both. Thus, in 1976, two pilot communal irrigation projects (Laur and Nueva Eciza) were started at sites where such indigenously managed systems already existed. In these pilot projects, community organisers were fielded by NIA, who lived with the farmers and made an effort to understand their needs and responsibilities, while trying to incorporate the expertise of the NIA with these needs. These interactions thus laid the ground for the subsequent negotiations of the irrigators with the NIA. Such two-way cooperation improved decision making within the association, ensured water rights of the participants, added to irrigation facilities and reduced the capital costs through substantial labour contribution from the beneficiaries, without payment for the same.

In case of 'nationals', the deficit in the O&M budget still remained. It was decided to develop associations to manage the entire system in case of small nationals, or entire secondary canals in case of large ones. The first pilot project of the kind was taken up in 1980 in the Buhi-lalo Irrigation Project (Bagadion, 1993). On large national systems, smaller groups of farmers called "turnout groups" were formed to manage the area irrigated by a single turnout on a canal (between 25 and 50 ha). These "turnout groups" formed the lower strata for zone level associations, which then negotiated with the NIA regarding the sharing of responsibility and irrigation fees for operation and maintenance. The NIA also provided training to these associations in O&M of the systems and financial management. The Buhi-lalo experience proved to be a successful one in making irrigators' associations share the responsibilities of O&M of irrigation systems, putting Philippines well on its way to transforming its entire irrigation network into a

showcase for effective farmers' participation under government supervision. Such policies have also contributed towards control of expenditure (through farmers' participation, farmers' contribution in the form of labour contribution for O&M functions) and raising the revenue collection from irrigation and secondary sources resulting in a gradual disappearance of the deficits.

*China* : Various managing and operating practices are followed in irrigation systems in China. Here, we concentrate on the diverse practices adopted in the western Hunan province of China. In this province, the primary government irrigation development and management agency is the Water Conservancy & Hydropower Bureau. Its main responsibilities include construction and reservoir management, as well as administering the operation of large canals. A major part of the irrigated land in this province is serviced by government built or assisted reservoir-based systems, most of them medium in scale.

In these medium systems, an annual meeting is held at the beginning of each season to discuss various issues such as water delivery, fee receipts, expenditure and maintenance works in the previous year's irrigation season, as well as the irrigation fees for the coming season. This fee is not distinguished either by type or number of crops in a year, since the system normally runs only for 6 months and the crop is almost always rice. In some of the systems, like the Sa Reservoir, water rates are denominated in terms of rice, fixed according to the official procurement price and are about 2 per cent of a typical yield. Farmers have the option of paying in either rice or cash, with the charge being nominally higher for cash. In the large Huangshi Reservoir system, the water charge is a combination of two components - an area based flat rate levied on each farmer in the system, regardless of the amount of water taken and an additional amount for water actually delivered. The first component is apparently representative of the cost of maintaining the capacity of water delivery to the farm.

In such large systems, water management units do the actual collection of irrigation fees, while in the medium systems, this responsibility is generally undertaken by the farmers themselves. In each village, a bookkeeper keeps an account of the farmers' produce and the fees due. In systems where most of the fees is in the form of paddy, the village leaders collect the appropriate amount from the

farmers and officials of Water Management Department (WMD) of the Water Conservancy Bureau (WCB) then transport this paddy on an appointed day. Department officials claim that grain handling is not a problem and the collection rate is ordinarily very high. There appears to be some doubt about the veracity of this statement, as an estimate by Svendsen and Changming for the 1987 irrigation season indicated a 40% shortfall, as opposed to the claim of only 5% by the officials. In systems where most of the fee collection is in cash, village leaders simply collect and record cash payments and turn the proceeds over to the WMD station accountant. But here too, there are indications that the collection rate may actually be below the ideal reported rate of 80 to 100 per cent (Svendsen & Changming, 1990). Thus, despite certain collection incentives being provided to WMD personnel as well as to villages, collections do not turn out to be as high as warranted. Part of the gap could be explained by a shortfall in actual irrigated area vis-a-vis the nominal 'effective irrigated area' on the basis of which expected collection is calculated.

In the western Hunan province, apart from irrigation fees, villagers also contribute to maintenance of irrigation systems through labour, which in fact, is an important part of the total maintenance requirements of the irrigation systems in this area. In Dayong county in this province, labour quotas are imposed on individual villages on the basis of amount of irrigated land in these villages and all village residents are expected to provide this quota. Although this labour requirement is for all public facilities, most of it is allocated to maintain irrigation system and construct new ones. While 60% actually contribute their own labour, 30% contribute a fee in lieu, while the remaining 10% or so contribute nothing. This labour contribution becomes important in view of the fact that irrigation districts are expected to cover most of their O&M costs through their revenues, due to dwindling public support.

Apart from irrigation fees, funds for operating and maintaining a system are obtained through various sources such as hydropower revenues, fish production in the reservoir, supply of domestic water and sale of fruit from orchards on the slopes above the reservoir. The cash component of the development cost of most of the schemes came from the provincial government. Prior to 1985, this was in the form of grants, but has since been required to be repaid at concessional interest rates, dependent on the relative wealth of the area. As a result of this

change in policy, there has been a decline in new investments in this area. An analogous reason for this reluctance to take up any more projects is that power rates in that area, which are set by the government, have not been increased for some time. It was felt that power revenue, which is essential for generating enough funds to repay costs to government, would not be adequate.

The management of medium and large reservoirs is the responsibility of Reservoir Management Division (RMD), which functions under the WCB and looks after the delivery of water to users and maintenance of the structures. At the lowest level, distribution of water to individual users is the responsibility of the village, which also collects the fees from the irrigators and channels it to the RMD. For large systems like Huangshi, an intermediate unit called 'water management stations' exist between the RMD and the villages, which receive water from RMD, combine it with water from local sources and deliver it to villages for distribution to individual farmers. This helps in facilitating wholesale transfer of water from RMD to the villages. These water management units are given measured quantities of water, charged volumetrically and the same system is followed for villages. But at the individual level, water delivery is measured by timing them, but not through any regulation of the water flow.

Thus we find that in China, especially in the Hunan province, pace of irrigation system construction has slackened and emphasis has shifted towards financial viability of the already constructed systems, with an insistence on generation of sufficient revenue to cover the O&M costs. This has propagated the existence of a number of income-generating secondary sources associated with the main irrigation system and the contribution from the same often exceed the revenue from irrigation fees, the collection of which is also claimed to be considerably high. Labour contribution, both in the original construction as well as in maintenance and repairs, has also played an important role in making the system financially viable. Thus, China provides an ideal example of a centralised economy with financially autonomous irrigation system.

*Korea* : In Korea, while construction and development services in irrigation are provided through a centralized agency such as the Agriculture Development Corporation (ADC), responsibility for O&M is delegated to decentralized, financially autonomous groups like the



Farm Land Improvement Associations (FLIAs) (Small & Adriano, 1989). It is the user-farmers who form the membership of these FLIAs and a federation of these FLIAs at the national level, acts as intermediary between the government and these individual associations. Some of the financial burden of maintenance of the system is contributed by the Ministry of Agriculture and Fisheries by supplying a part of its general tax revenue and also through certain direct and indirect subsidies to the local management entities such as FLIAs. But these form only a small part of the total financial requirements and it is the users of irrigation water who are ultimately responsible for financing the entire O&M costs and a part of the capital cost. Thus, there is an effective reliance on pricing policy. For the smaller projects, it is the FLIAs and irrigators' groups, which are accountable both for implementing various measures as well as collecting revenue from the users, while for larger projects, it is the ADC which is held accountable. Combined with these measures, is the effectively implemented carrot and stick policy of sanctions and rewards, which supported by an efficient institutional framework, has helped the Korean irrigation system become financially independent over time.

*USA* : In the United States of America, local irrigation districts construct the systems with subsidy from government. These districts are otherwise financially autonomous, but work within the structure of government rules and regulations. The ultimate burden of financing the construction lies with the users, who are sometimes required to repay the entire development cost (without interest) over a period of 40 to 50 years (US Water and Power Service, 1980). Thus the total amount that beneficiary farmers are required to pay is determined on the basis of cost, but the actual year to year repayment is on the basis of the ability of the farmer to pay, which is taken into consideration while drawing up the contract. In case of publicly constructed irrigation systems, irrigation districts purchase water from the Bureau and retail it to their members. Most irrigation districts finance the O&M of the systems, as well the repayment schedule, through direct water charges. These may often be two-part tariffs, with a fixed part which may be a kind of betterment-levy on land under irrigation (Small, 1989). In some cases it also entitles the farmer to use a fixed quantum of water while the second part of this tariff would depend on the extra water used. In cases where lift irrigation is required, the fixed part of the tariff may be an energy charge for the initial lifting of water from

the reservoir, as is the case in the Columbia Basin Project (CBP). The entire cost of irrigation may not always be the direct liability of the farmer users, if part of this cost can be recovered through hydroelectric power revenues or by excess revenues generated by the older projects. In fact, formation of Water Users' Associations have been encouraged by giving them the right to certain secondary sources of income such as revenue from leasing out of project land used for grazing and farming, and gains from hydropower plants on the project (Thompson, 1985). In USA, legal penalty can be imposed on farmers for non-payment of irrigation charges. In the CBP, for instance, districts often exercise their right to foreclose on farm property in the event of unpaid bills (Svendsen & Vermillion, 1993). Government rule also provides for joint liability of an irrigation district to repay the construction costs which implies that until all dues are cleared no landowner can obtain a clear ownership right to his land.

As far as the effect of transfer of management from government agency to the irrigation districts is concerned, we find that in the CBP, it has largely been positive, with a fairly smooth takeover of management and costs by the local districts. It was also seen that over time, the real level of the water charges, both on area and volumetric basis, fell substantially. This was chiefly the result of the irrigation districts striving to develop supplementary sources of income as well as reduce O&M expenses.

*Indonesia* : In Indonesia, irrigation is viewed as a necessary step towards development and self-sufficiency of the country and cost recovery has never been of prime importance. During Dutch rule of Indonesia, cost recovery was ensured through a land tax based on productivity differential between irrigated and unirrigated lands. This tax was abolished after independence but was subsequently re-established as a form of taxing rural development activities of district governments (IPEDA or the new Land and Building Tax) (Small & Adriano, 1989). Even though this represents an indirect means of recovering irrigation costs, there is no direct link between revenue earned through this tax and the outlays for O&M. All funds for irrigation development and O&M of the systems thus come through the central or regional governments, with a heavy dependence on the funds provided by the central government. It was expected that over time, the provincial governments would develop self-financing capacities, but in the absence of an adequate incentive structure, this

expectation has failed to materialise.

It is only at the tertiary level, in gravity based irrigation systems, that farmers take on the physical and financial responsibility through various institutions such as village governments and water users' association. In these systems, farmers are required to pay a per hectare per season fee to the associations, either in cash or in kind. They may also be required to supply additional construction material or labour, if the need arises. The water users' associations do not generally face a problem with regard to collection of fees, due to the presence of strong social sanctions and thus, prove successful in implementing their regulations and imposing the sanctions which are previously agreed upon by members.

## **II. Reforming Irrigation Institutions**

### *II.1 Move Towards Autonomy*

We have so far found that all developed and developing nations which have success stories to relate in irrigation development, are characterised by at least partially privatised irrigation systems. In India, although minor irrigation is privatised to a large extent, major and medium irrigation still remains largely under direct government supervision mainly due to the huge capital requirements for construction and maintenance of such schemes. But dependence on the 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. In taking care of this lacuna, it must be kept in mind that financing of the recurring costs is more important than proper management of the system, since the inability to finance the minimum levels of O&M will also mean a failure to carry out procedures according to any reasonable management standards (Small, 1989). More than the actual amount itself, it is the path that money might take in going from the provider to the user, which is of importance since even an adequate amount would be of little benefit to the provider, if misused.

In this context gradual but definite steps need to be taken towards creating autonomous users' groups to handle all or most aspects of operating and maintaining the irrigation systems. Financially-autonomous agencies have a greater incentive for providing quality irrigation than either government or semi-government organisations, since these

largely depend upon the revenue from irrigation fees collected from the users, unlike government organisations. As witnessed in Section I, there has been limited effort towards establishing such autonomous bodies in various states of India like Gujarat and Maharashtra although in most cases the main focus has been on management rather than cost recovery. Moreover, such isolated efforts have not been consistent and have lacked a definite direction. While no definite measure of the extent of such effort is available, the area covered by such experimental initiatives is known to be less than 1 per cent of the area irrigated through major, medium and minor schemes (GOI, 1992). Attention, thus, needs to be focussed on factors preventing the spread of such practices and their greater success.

The most obvious reason for the general ineffectiveness of such initiatives, is the lack of a proper incentive structure for the farmers. For one, they have not been actively encouraged to participate in all activities concerning the irrigation system under their care and their suggestions for improvements have often been neglected by the Irrigation Departments.

As a first step towards effective reform these departments need to be converted into financially autonomous corporations in order to make them more responsible towards their duties and responsibilities. With financial autonomy certain additional factors come into play, such as the incentive to increase agency income as well as the incentive to reduce costs (Svendson, 1991). Moreover, when the operating agency is dependent on the users for its financial well-being, it tries harder to make a success of its operations. All these, in addition to the financial burden of independently running the corporation and maintaining a given system will force this institution to become cost efficient. In order to generate sufficient funds for O&M, there will have to be an increase in the water rates, which are at present well below the O&M cost for most states. On an average, gross receipts from irrigation charges were only about 41 per cent of the total expenditure on O&M (GOI, 1992). It might be a good idea to follow the Chinese and Philippine examples and designate the irrigation fees in terms of the crops, at least in areas which have homogeneity of crops. This would help in indexing the irrigation fees to inflation, without the need to increase the nominal rates each time there is substantial inflation.

While there is need and sufficient justification for an increase in

the water rates, there is likely to be widespread agitation against such an increase on the part of the farmers. To make the price hike more acceptable to farmers, there needs to be a concomitant upgradation in the irrigation services, both in terms of quality and quantity. So far, the supply of water for irrigation tends to be both unstable and inequitable, with farmers at the head of the canals indulging in wasteful use of this important resource and the users at the tail end of the canals often finding supply of water grossly inadequate for their crops. Until there is considerable improvement in the supply structure of canal water, the farmers are unlikely to accept any major change in the price structure of water and it will thus be in the interest of the irrigation corporations to bring this about.

### *II.2 Farmers' Involvement in Water Distribution*

The new pricing system will also need to take care of factors like quantum, timing and reliability of supplies and should be of the kind which promotes a more equitable distribution of water. All these objectives can be achieved by way of a two-part tariff (GOI, 1992). The first part can be a flat rate per unit area, levied on all land lying within the command area of the irrigation scheme. This essentially allows the farmer to become a user of the irrigation water and is similar to the concept of economic rent. The second part of the tariff would be a volumetric rate dependent on the amount of water being used by each individual farmer. But since supervising and measuring the volume of water used by individual farmers may prove difficult, the Irrigation Corporation should instead arrange to supply the water, by volume, to users' groups at the head of the distributory outlet. The charges could be collected for this bulk amount from this group, which, in turn, can distribute this water to the individual users and appropriate the returns from them. Such an arrangement would serve to keep the cost of the corporations low, as well as shift some of the responsibility to the users' groups. The above arrangement, in fact, has proved to be very successful in the Mohini Cooperative Society of Gujarat.

One of the ways in which involvement of farmers' groups would serve to cut down the cost, is through reduction in the wage bill. Indeed, an overwhelming part of O&M expenses of the irrigation system is the salaries and wages being paid to the functionaries of the Irrigation Departments which, in turn, are grossly overstaffed. Thus, at present, the cost of collection of irrigation revenue often exceeds

the revenue collected. With the functions of distribution of irrigation water to individual users and collection of dues therefrom being delegated to users' groups, this inflated wage bill gets cut substantially and makes more funds available for the actual maintenance of the system. There also needs to be no undue concern over large scale deployment of staff. The experience of management transfer in the Columbia Basin Project in USA, showed that many of the staff released from the original government agency could be re-employed by the farmers' organisations in order to gain from their expertise. This would succeed in making the transfer of power smoother.

In order to make sure that the institutional changes that are brought forth are in the right direction, State irrigation departments can take the example of Philippines and appoint some field personnel. They could become familiar with the needs of the farmers and thus become an acceptable link between the two parties when an users' association is set up. Once the associations are set up, the maintenance of the main canal should remain in the hands of the autonomous irrigation departments, while the users' groups should handle the interaction with the individual farmers. In case of small systems, the entire O&M can be left under the care of these users' groups, once these have been sufficiently trained to look after this aspect of the systems properly. Even in case of large systems, specific segments of large canals, such as minors and distributories, can be operated and maintained by farmers' groups. In fact, as successfully tried in Philippines (Small et al., 1989), Irrigation corporations in India too, can give O&M of a part or the entire system to farmers' groups on contract, in return for which these groups could receive some money from the corporation. The water rates could be fixed by the corporation, keeping in mind the running expenses of the system, the depreciation cost and the capital cost (in order to recover a small fraction of this capital cost annually), where the running expenses could be ascertained with the help of the users' groups. With such groups having control over the supply of irrigation water and ensuring the required quality and quantity of services, reliability and efficiency of supplies would improve and through enhancement of productivity of the irrigated land, it would also serve to make users more willing to pay the required fees at the appropriate time.

In order to ensure such proper and timely payments, measures or sanctions which may be legal, economic, physical or social can be

implemented. Legal sanctions have been found to be burdensome to impose since they entail huge costs and are therefore rarely used even where they exist (Small et al., 1989). Economic sanctions like a fine on late payment of irrigation fees or conversely, a discount on timely payment of the same and physical measures like discontinuing the supply of water in the next time period, can also be taken to prevent the users from renegeing on the payment of the fees. But the most effective measure has been found to be social sanctions which act as adequate deterrents against non-payment of fees. In Mexico, for instance, it is the social sanctions which prove to be more effective in making water users refrain from illegal use of water and making them pay their fees on time. Some of the above forms of sanctions could be tried in specific projects in India and depending on their success, a judicious combination of these could be adopted for the entire irrigation network of our country.

Apart from maintenance of the system and cost recovery for the same, other issues such as investment decisions taken in this sector, too need addressing. At present, a large number of new projects are taken up on the basis of political criteria, often resulting in new schemes coming up in areas, already served by some older scheme (GOI, 1992). Also, design and implementation of projects are often found to be faulty midway through construction and have to be redesigned, leading to massive cost and time overruns. Such politically motivated decisions could be restricted if the users were required to at least partially pay for the construction of the project. But in order to prompt correct investment decisions, it is essential to have an institutional link between the decision making process and the end beneficiaries of those decisions. Such a linkage can be established through farmers' groups having the entire responsibility of managing and financing a system. In fact, such groups should be brought into existence even before the start of an irrigation scheme and their involvement solicited at all stages of construction and operation. Such involvement from the very beginning would also help foster a deeper sense of ownership on the part of the farmers, making them more willing to shoulder the responsibilities of operating and maintaining the system under their care. In smaller projects in Philippines, for instance, farmers have even been known to change the design of the project to suit the local needs and reduce the cost of the project (Small et al., 1989). Part of the capital cost of construction of the system could

also be recovered from the farmers. Study of the irrigation setup in Philippines shows that making farmers repay the investment, while at the same time giving them a say in the planning and implementation of the project, significantly reduces the cost of the project. In fact, farmers can be made co-owners of the project through the means of 'Water Bonds', which will entitle the farmer to a part of the water of the system. This could also be looked upon as an instrument of cost recovery, through which 5 per cent of the capital cost of the project could be offered to the farmers. Such 'rights' would not only increase the farmers' interest in the system but would also help in recovering part of the capital cost, which otherwise would have to be entirely borne by the government. This idea can be carried forward by allowing these bonds to be offered for resale, in case the farmer/bondholder requires less water than the 'bond' entitles him to. Such a market for water would have to be created within the command area of a distributory due to inconveniences in adjusting supply across distributories. Some effort will have to be directed towards sorting out the problems of timing and water-flow discrepancies in order to develop such an intra-distributory market of water rights which at the same time, is healthy and viable. Such a market would induce the system to run efficiently and cost-effectively (Gulati et al, 1994a).

### **III. Concluding Remarks**

The sub-optimal functioning of the extensive irrigation network of major and medium irrigation schemes in India, has now made it imperative for attention to be specifically focussed on the problem of generating sufficient funds for adequate maintenance of the system. This can be done through bringing about a change in the institutional structure, which would in turn foster growth of efficiency in the system.

The financing of irrigation in India is almost entirely dependent upon the State Exchequer and this absence of linkage between revenue earned and expenditure incurred makes for highly inefficient functioning of the irrigation systems in this country. The need of the hour is, thus, providing some kind of financial autonomy to the Irrigation Departments, which would lead to increased efficiency among the functionaries of these departments. The ultimate aim of this restructuring should be to hand over the entire running of the systems to the users as represented by groups or cooperatives. Institutionally,



this indicates a change from the 'tops down' to 'bottoms up' policy, such as those in countries like USA, Philippines and Korea. Some isolated efforts have been made in some irrigation schemes of Andhra Pradesh, Gujarat & Maharashtra, etc., but have experienced only limited success mainly due to their inability to function effectively once government support has been withdrawn. Attention thus needs to be focussed on development of institutions or organisations which can carry on their functions independently, especially on a long term basis. In case of a country like India, additional factors like the smallness of size and largeness of number of landholdings would also have to be kept in mind while encouraging users' groups in irrigation and experiments could perhaps be tried on communal farming for use of irrigation water as has been done in some parts of Kerala. Once the user groups have become adept at carrying out the functions of operating and maintaining the system under their charge, they can also be made co-owners of the systems, by issuing them with certain equity shares (a certain percentage of the capital cost). This would also allow them to be involved in the management at the designing and construction phase.

## References

- Bagadion, Benjamin (1993): *The Evolution of the Policy Context: An Historical Overview*, Background Papers of the Consultation Workshop on "Farmer Government Partnership in Irrigation Development and Management" organised by WALMI, Anand and AKRSP, Ahmedabad, February 26-28.
- Chambers, R., Saxena and Shah, Tushar, (1989): *To the Hands of the Poor - Water and Trees*, Oxford & IBH Publishing Company, New Delhi 1989.
- Ghate, P.B, (1987): *Determining Irrigation Charges: A Framework*, Economic Staff Paper No. 37, Asian Development Bank, Manila, Philippines.
- Government of India, Ministry of Finance, *Report of the Taxation Enquiry Commission, 1953-54*, Vol. III, Deptt. of Economic Affairs.
- Government of India, (1972): *Report of the Committee on Taxation of Agricultural Wealth and Income*, Ministry of Finance, New Delhi.
- Government of India, (1926): *Report of the Indian Taxation Enquiry Committee (1924-25)*, Volume I.
- Government of India, (1989): *Approach to the Eighth Five Year Plan (1990-95)*, Planning Commission.
- Government of India, (1989): *Report of the Working Group on Major & Medium Irrigation Programmes for the Eighth Plan (1990-95)*, Planning Commission.
- Government of India, *List of Major and Medium Heads of Accounts of Union and States*, Ministry of Finance, New Delhi.
- Government of India, (1992): *Report of the Committee on Pricing of Irrigation Water*.
- Government of India, (1972): *Report of the Irrigation Commission*, Ministry of Irrigation & Power.
- Government of India, (1988): *Report of the Ninth Finance Commission*.
- Gulati, Ashok, Svendsen, Mark & Roy Choudhury, Nandini (1994a): *Towards Better Performance of Major & Medium Irrigation Schemes in India*, NCAER Working Paper No. 46, April.
- Gulati, Ashok, Svendsen, Mark & Roy Choudhury, Nandini (1994b): *Capital Costs of Major & Medium Irrigation Schemes in India*, NCAER Working Paper No. 47, April.
- Gulati, Ashok, Svendsen, Mark & Roy Choudhury, Nandini (1994c): *Operation & Maintenance Cost of Canal Irrigation and Their Recovery in India*, NCAER Working Paper No.48, June.

- Hassan, T., Rao, C.S. & Kemule, George, (1992): *Farmers Participation - Experiences in Sreeramsagar Project in Andhra Pradesh*, Workshop on Farmers Participation in Irrigation Management at Administrative Staff College of India, Hyderabad, 4-7 February.
- Hassan, Syed Tarabul, (1986): *Irrigation Water Management - A Case Study of Pochampad Project*, National Seminar on "Water Management - The Key to Developing Agriculture", J.S.Kanwar (ed.), INSA, Agricole Publishing Academy.
- Hufschmidt, Maynard, et al, (1983): *Environment, Natural Systems and Development, An Economic Valuation Guide*, The John Hopkins University Press, London.
- Kneese, Allan V. & Smith, Stephen C, (1966): *Water Research* (ed.), The John Hopkins University Press, London.
- Kulkarni, S.Y and Kulkarni, D.N. (1992): *Farmers Participation in Irrigation : Maharashtra Approach*, Workshop on Farmers Participation in Irrigation Management at Administrative Staff College of India, Hyderabad, 4-7 February.
- Martin, E.D., Pradhan, P. & Adriano, M.S, (1989): *Financing Irrigation Services in Nepal*, "Financing Irrigation Services: A Literature Review and Selected Case Studies from Asia", International Irrigation Management Institute, Colombo, Sri Lanka.
- Pathak, R.S. (1991): *Farmers's Participation in Irrigation Management*, Government of India, Ministry of Water Resources, CAD Division, New Delhi.
- Small, Leslie E., (1989): *Irrigation: A Literature Review*, "Financing Irrigation Services: A Literature Review and Selected Case Studies from Asia", International Irrigation Management Institute, Colombo, Sri Lanka.
- Small, Leslie E., & Adriano, M.S, (1989): *Financing Irrigation Services in Indonesia*, "Financing Irrigation Services: A Literature Review and Selected Case Studies from Asia", International Irrigation Management Institute.
- Small, Leslie E., & Adriano, M.S, (1989): *Financing Irrigation Services in the Republic of Korea*, "Financing Irrigation Services: A Literature Review and Selected Case Studies from Asia", International Irrigation Management Institute, Colombo, Sri Lanka.
- Small, Leslie E., & Adriano, M.S, (1989): *Financing Irrigation Services in the Philippines*, "Financing Irrigation Services: A Literature Review and Selected Case Studies from Asia", International Irrigation Management Institute, Colombo, Sri Lanka.
- Srivastawa, L.P, (1992): *Farmers Participation in Operation of Paliganj Distributory (Sone Canal System, Bihar), A Case Study*, Workshop on Farmers Participation in Irrigation Management at Administrative Staff College of India, Hyderabad, 4-7 February.
- Srinivasan, N, (1969): *Agricultural Administration in India*, Indian Institute of Public Administration, New Delhi.

Svendsen, Mark (1991): *Recovery of Irrigation Costs Through Water Charges*, Reference paper prepared for Workshop on Irrigation Water Charges sponsored by Advisory Unit for Agricultural Corporations & International Irrigation Management Institute, Khartoum, Sudan.

Svendsen, Mark, and Liu Changming (1990): *Innovations in Irrigation Management and Development in Hunan Province*, Netherlands: Irrigation and Drainage Systems 4: 195-214. Kluwer Academic Publishers.

Svendsen, M., M. Adriano, and E. Martin. (1990): *Financing Irrigation Services: A Philippine Case Study of Policy and Response*. International Food Policy Research Institute, Washington, D.C. Mimeo.

Swaminathan, M.S (1992): Corporatisation of Agriculture - Entails Clean Break with the Past, *The Hindu*, Survey of Indian Agriculture, 1992.

US Water & Power Service, 1980, *Water & Power Instruction, Series 110: Planning Part 116: Economic Investigations*, Washington, D.C., USA.