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**Towards Better Financial Performance
of Major & Medium Irrigation
Schemes in India**

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NCAER-IFPRI COLLABORATIVE PROJECT



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Foreword

Development of irrigation in India has entailed huge capital investments resulting in a massive canal network which services a little more than 30 million hectares of agricultural land. But the physical condition of the schemes comprising this network, has been steadily declining. This deterioration has in fact, been sharper since the beginning of the 1980s. This has led to a growing concern over the financial cost and cost recovery from major and medium irrigation schemes such that proper maintenance of the system can be ensured. State Governments have been incurring increasing losses in the irrigation sector as costs escalate and price of irrigation water remains low.

In this context, the present paper discusses the background of the financial performance of irrigation sector and evaluates its past performance. It also discusses various issues related to capital cost, operation & maintenance cost and cost recovery in this sector. Further, this paper also puts forward certain suggestions for effective financial recovery of this sector, especially with regard to granting of financial autonomy to the concerned agencies and inviting active help from farmers' organisations.

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

I am sure this paper would be of great interest to irrigation engineers, planners, policy makers and academicians having interest in water related issues of this country.

April, 1994

S. L. Rao
Director-General

Towards Better Financial Performance of Major & Medium Irrigation Schemes in India

During the last forty years (1951-90) more than Rs 600 billion (at 1988-89 prices) have been spent for creating a huge canal network through various major and medium irrigation schemes. The direct financial recovery from these irrigation schemes is less than Rs 3 billion at 1988-89 prices. This staggering difference between expenditure incurred and revenue obtained indicates that not only is the capital investment a sunk cost, but also that the resources obtained through direct recovery are only half of the one percent level often assumed in project planning documents for proper operation and maintenance of the systems. This only succeeds in pulling down the performance of these systems and undermining the effectiveness of the massive capital expenditure that has gone into building them.

The widespread concern on this account, led to the setting up of a Committee on Pricing of Irrigation Water by the Planning Commission in October, 1991 to study the various aspects of pricing of irrigation. This Committee, headed by the renowned economist Prof. A. Vaidyanathan, submitted its report in September 1992. All the 17 members of this Committee were unanimous in their submission, but, inspite of the significant import of the Report and its suggestions, especially in the current economic scenario, the Planning Commission is yet to take any action on the content. The present paper makes a modest attempt to understand the issues related to cost and cost recovery while also reviewing, in a way, the Vaidyanathan Committee Report. It also, in light of other recent research which bears on these topics, puts forward some further suggestions for improving the financial health and efficiency of the major and medium irrigation schemes.

In Section I of this paper we have discussed the historical evolution

of financing issues pertaining to major & medium schemes in India. Section II talks about the capital cost of constructing these schemes, while Section III discusses various cost related aspects of their operation and maintenance. Section IV is concerned with the cost recovery aspect of the problem and Section V discusses promising options available for addressing the financial problems facing this segment of irrigation sector.

I. Evolution of Financing Issues

In the early part of the British era, irrigation projects were taken up purely on the basis of financial considerations, i.e, only those schemes which could assure a prescribed rate of return on capital invested, after meeting all costs, were allowed to be undertaken. This prescribed rate of return was gradually increased from an initial level of 4 per cent to 6 per cent, at which level it remained till 1949. Project selection, design, and pricing of irrigation service were all done keeping this fundamental criteria in mind. Many of the early schemes were actually undertaken by for-profit corporations under license from the colonial government.

This policy of prescribing a fixed minimum rate of return for sanctioning projects came under scrutiny when the late 19th century witnessed a series of severe famines. It was felt that irrigation's role in mitigating the impact of drought-related famines, and the huge public costs entailed by subsequent relief efforts, was not well served by a purely profit-oriented investment program. It was also felt that this policy was impeding general agricultural development in the Indian subcontinent. Moreover, in fixing a minimum rate of return of invested capital, retrieved through water pricing, peripheral benefits to the state, like increased revenue through various taxes, were ignored.

These criticisms, and the series of famines, together succeeded in forcing the colonial government to relax its stringent rules and led to a two-tiered policy which distinguished between *productive* and *protective* irrigation development. Under the second classification, irrigation projects were allowed to come up in drought and famine prone areas even if they did not satisfy the strict financial return criteria. Another factor behind the relaxation of this rule was the fact that sites for cheap irrigation schemes with assured rates of return were becoming scarce and more costly new projects could not ensure the earlier high levels of return. However, the financial criterion of a minimum rate of return continued to be the chief

measuring stick for sanctioning projects, with other social benefits considered only as exceptions to the primary rate of return rule.

All this changed in the post-independence period when development of irrigation came to be considered as a necessary step in developing agriculture, rather than merely a commercial proposition, and in 1949 the minimum rate of return was reduced from 6 per cent to only 3.75 per cent. Studies initiated by the Planning Commission in 1958 conducted under the guidance of Prof. D. R. Gadgil (GOI, 1961) concluded that total benefits from irrigation included those obtained through improved quality of crops and practices like multiple cropping which led to higher yields and hence larger incomes. Other indirect beneficial developments included setting up of processing industries, development of retail trade, etc. The aggregate return from all these was much larger than the return obtained through the sale of irrigation water alone. Thus the emphasis on financial rate of return was thought to be misplaced. To specify the criteria for sanctioning irrigation projects, a committee under the chairmanship of Prof. Gadgil was set up in 1964 which decided that rather than looking at the financial rate of return, economic benefit should be the primary criteria for judging the viability of a project. It was on the recommendation of this Gadgil Committee that benefit-cost ratio was adopted as the basis for approving irrigation schemes. Although, a benefit-cost (BC) ratio of 1, is generally regarded as acceptable, in the case of irrigation schemes a minimum BC ratio of 1.5 was established. This was because in calculating the benefits accruing through the various schemes, no provision was made for discounting future benefits and costs. The Second Irrigation Commission of 1972 relaxed this criterion in the case of irrigation schemes for drought-prone areas where the minimum acceptable BC ratio was recommended to be set at 1.

It was recognised by this Commission that the emphasis on benefit-cost ratio had reduced the importance of financial viability of a project, and little attention has been paid to this aspect in the years after independence. But gradually, the cost recovery aspect of irrigation schemes gained attention, with government bodies like the Public Accounts Committee (GOI, 1983) noting that public investment in irrigation was resulting in enormous losses to the national exchequer. It opined that irrigation schemes should yield enough to pay for maintenance, operation and depreciation charges along with some interest on the capital invested.

It recommended a five-yearly evaluation of projects to find the extent to which expected benefits have been achieved and to decide what has to be done in future in order to extract maximum benefits.

In 1983, a committee constituted by the Planning Commission and headed by Nitin Desai, recommended that the Internal Rate of Return (IRR) criterion should replace the Benefit-Cost ratio and the minimum acceptable IRR be fixed at 9 per cent. A lower IRR of 7 per cent was suggested for areas where 75 per cent or more of the dependable flows of the basins had already been utilised. This lower IRR was also recommended for projects in hilly and drought-prone areas. Since changing the viability criteria, *per se*, from BC ratio to IRR, was not considered enough, the committee also suggested ways of improving the data base and the methodology for analysis and calculation of social cost and benefit. But these recommendations are yet to be implemented and there has been no perceptible improvement in the quality and effectiveness of cost-benefit analysis as applied to irrigation projects.

Subsequent groups and committees like the 'National Conference of Irrigation and Water Resources Ministers' (1986) and the Jakhade Committee (1987) remarked on the extremely low water rates that were prevalent in the country and the fact that they were not sufficient to cover even operation and maintenance costs. The National Water Policy adopted in 1987 too felt this lack, and like the Public Accounts Committee of 1983, recommended that water rates should be such as to cover O&M charges and a part of the fixed capital cost. This was reiterated by the various Finance Commissions. For example, the Fifth Finance Commission recommended that O&M cost plus 2.5 per cent of the capital cost to be recovered. This proposed rate of 2.5 per cent was subsequently brought down to 1 per cent by both Sixth and Seventh Finance Commissions. Finally, the Eighth Finance Commission brought this rate down to zero, a position which was reiterated by the Ninth Finance Commission. However, it continues to be held that water rates should be high enough to make at least the recovery of the required O&M expenses possible.

The post-independence shift in government policy to justify irrigation investment in terms of social and economic benefits rather than in terms of financial return on capital has resulted in a dramatic expansion in the irrigated area of the country and is a major contributor to India's current self-sufficiency in foodgrains. This success has come, however, at the

expense of heavy drains on state exchequers responsible for providing recurrent cost funding, underfunded operations and maintenance, and weak internal incentives for problem diagnosis and improvement.

II. The Capital Cost

As has been noted before, investment in irrigation started during the British era, although it was only in the post-independence period that a concentrated effort was made in developing irrigation network on a major scale. During the last forty years (1951-90), as much as Rs 262.22 billion (at historical prices unadjusted for inflation) has been spent by the state on the development of major and medium irrigation schemes. This investment increased the irrigation potential by 22.14 million hectares, from a pre-plan (1951) level of 8.62 million ha to 30.76 million ha by the end of the VII Plan (1990).

However, many of the relatively cheap schemes required for developing irrigation in areas with comparatively easy access to water were more or less exhausted during the British period. The states of Andhra Pradesh, Tamil Nadu and Uttar Pradesh witnessed the development of a large number of major irrigation schemes during the pre-independence period. By the time the independent Government of India took up construction of irrigation schemes with the beginning of the plan-period, the capital cost of building up such schemes had increased substantially.

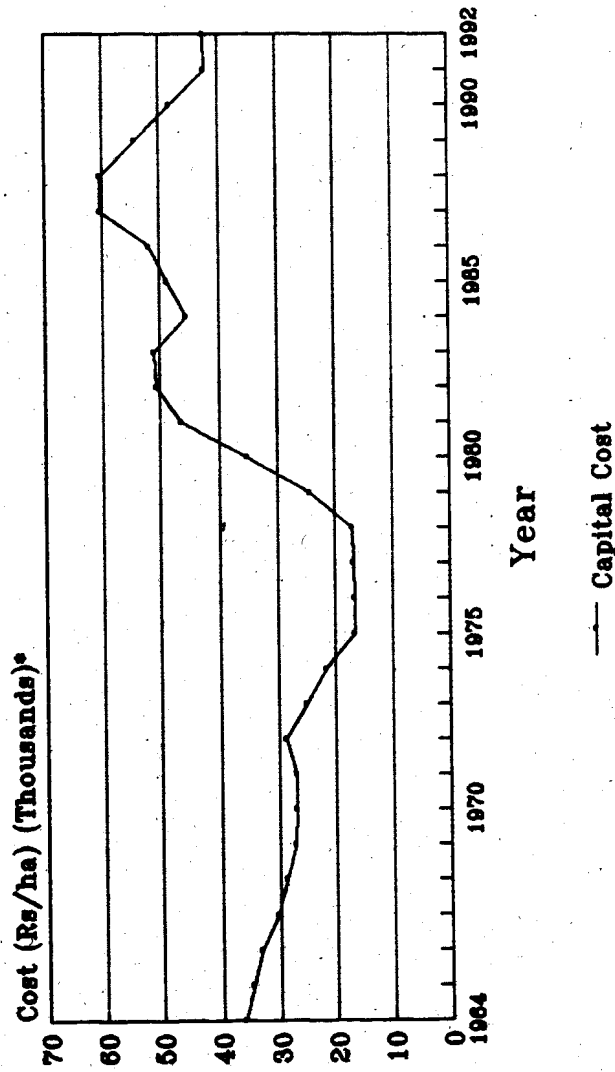
The Working Group on Major and Medium Irrigation for the VIII Plan (1990-95) found that at current prices, investment in irrigation had increased from Rs 1,530 per hectare of irrigated area in the First Plan to Rs 34,924 in the Sixth Plan and to more than Rs 36,800 in the Seventh Plan. These simple estimates paint a distorted picture, however, since the behaviour of capital costs, after considering inflation and the gestation lag between investment expenditure and potential created, is somewhat different. A study by Gulati et al. (1994) on the development cost of irrigation takes into account the inflation rate as well as the gestation lag phenomenon, to examine cost of investment for major and medium schemes. In this study, the concept of *pure time preference* has been used to account for the time gap between expenditure incurred and benefit obtained. The results indicate that, at constant prices (1988-89 price level) and at different rates of pure time preference (5, 7.5 and 10% p.a.), the average investment per hectare of irrigation potential lies in the range of Rs 35,084 to Rs 61,814. Computed

this way, the time-profile of capital cost per hectare reveals a steady decline during 1964-78, and a rise thereafter (Fig 1). Various reasons have contributed to this escalation in cost from the late 1970s, the two chief reasons being:

- (a) A large number of new projects were taken up in most states, during the Fifth Plan (1974-78). As can be seen from Fig 2, as many as 404 major and medium irrigation schemes were taken up in the V Plan as compared to only 127 in the IV Plan. This sudden increase in the number of projects undertaken resulted in thin spreading of the limited funds available for irrigation investment. Substantial sums continued to be invested, in the aggregate, but in many cases produced no output for long periods of time because funds were divided among many uncompleted projects. The resultant time-overruns also served to increase the final cost of these projects. In fact, in some cases, annual fund allocations to individual projects were so small that they only met establishment costs, leaving little or nothing for actual construction work.
- (b) Secondly, projects taken up in the later plans are often on relatively difficult terrain and involve more geo-technical problems and entail higher costs. In addition, environmental and rehabilitation considerations which were of little or no consequence for projects taken up earlier are now an integral and substantial part of the capital outlay of any irrigation scheme. There have been other additions to cost on account of drainage provisions, higher capacity dam spillway, and lining of main canals and distribution systems. Together these factors have resulted in a substantial increase in the per hectare capital cost of irrigation development since the V Plan. It must be allowed that some of the additional expenditure simply internalise cost which were previously externalised and ignored. Others may have resulted in more efficient systems which are able to serve larger areas with a given water supply.

Moreover, the production of higher valued crops can justify increased capital expenditure. However, the fact that the great majority of command irrigated by major and medium schemes is still devoted to cereals and that the utilised fraction of command created has continued to drop over time makes the rise in unit cost an issue of some concern.

Capital Cost Per Hectare Major & Medium Irrigation Schemes



Source : Gulati et.al.(1994)
* Cost is at 1986-88 prices

Fig 1

Major & Medium Irrigation Schemes

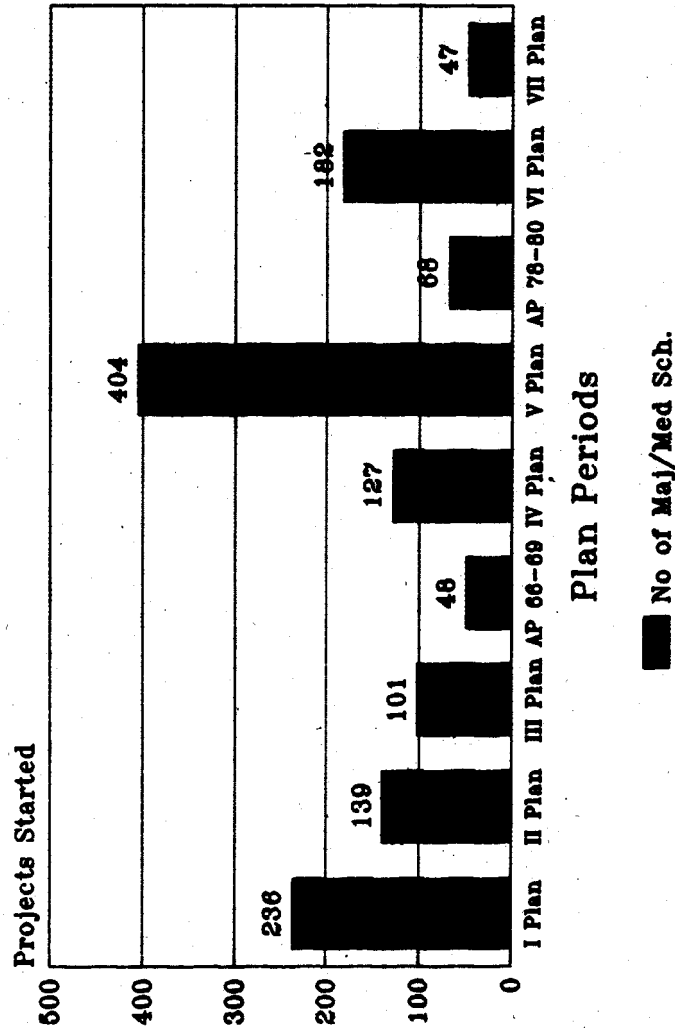


Fig 2

Source: GOI, 1989

III. The Operation and Maintenance Cost

The operation and maintenance of the system has been sadly neglected largely due to the paucity of funds, which in turn is partly the result of Government policies with respect to the level of water rates and their recovery. Irrigation systems are constructed, operated and maintained by State Governments. The operating entities are public agencies which are branches of the state government and operate under civil service rules and conventions. As such, they often have traditions, and rules, going back a hundred years or more. Their ability to operate and maintain irrigation systems effectively and efficiently is presently constrained by a number of factors – poor physical condition of system, a general absence of staff and institutional incentives related to system performance, poor linkage with users, inadequate financial resources, and inappropriate allocation of resources among cost lines and cost centres. Because the focus of this paper is the financial performance of systems, financial resources and their allocation and recovery is given emphasis here. However, while it is an essential element of a solution, increased financial resources devoted to O&M, by itself, will not solve the problem. More fundamental institutional changes are required to achieve this end. Linkages between finances and other institutional factors will be discussed in subsequent sections.

States have followed various practices in the past to allocate funds for O&M of irrigation systems. These practices have varied over time, from state to state, and even for different projects in the same state. To bring a degree of stability and uniformity to the process, Finance Commissions have often allocated O&M funds for canal irrigation schemes primarily on the basis of the area irrigated by each scheme.

Whatever the norm followed, a central financial problem remains that of making enough funds available to carry out adequate operation and maintenance. A Committee of Ministers, set up in 1973 to study 'Under Utilization of Created Irrigation Potential', brought attention to the fact that, although a great deal of expenditure is undertaken and emphasis laid on starting new irrigation schemes, operation and maintenance of existing

¹ Utilization of irrigation potential was only about 85 per cent of the total created potential in 1990. Apart from poor O&M, the prime reason behind this low utilization ratio is that the cropping pattern in general turns out to be more twisted in favour of water-intensive crops than planned in the initial Project Reports. Farming of high water-intensive crops at the head of the canals thus, does not allow utilization of potential to the extent projected in the Project Reports.

major and medium projects is often a neglected field and is an important factor leading to under-utilization of created potential¹. The Working Group on Major and Medium Irrigation for the VIII Plan, found that most of the allotted money for O&M was being spent on staff payments. It argued that the grants made for the purpose of O&M were inadequate and steps were needed to ensure a higher level of resources for O&M so that the system could operate more efficiently. In addition, as pointed out by the Vaidyanathan Committee, even within the funds allotted for O&M expenses, the portion being spent on wages and salaries "had risen sharply on account of the build-up of surplus staff inherited from the construction stage and periodic salary revision".

It has now been felt by the Working Group that a minimum of Rs 200 to Rs 250 per hectare is required to maintain the system in good order. A study by Gulati et al. (1994b) on O&M expenses, found that in the period 1960-61 to 1986-87, the total working expenses at 1988-89 constant prices have ranged between Rs 109 and Rs 192 per hectare. Looking at Fig 3, we find that the O&M expenses have risen steadily and sharply till 1970, after which the allocation on O&M fell substantially over the next few years. But from 1978-79 onwards, the outlay on working expenses for major and medium schemes have shown a tendency to increase and during the relevant period, it reached a peak of about Rs 190 per ha in 1985-86. But despite this increase, the outlay, in general, remains less than desirable. Moreover, as mentioned before, overhead expenses like wages and salaries eat away a significant part of the total amount available for O&M, leaving very little for actual maintenance work. As seen in Fig 4, the share of Direction & Administration has constituted a substantial part of these total expenses. This head, which includes the wages and salaries, has shown an upward trend over the years. This trend has been sharper from 1976-77 onwards and by 1986-87, had reached almost 50 per cent of the total working expenses on major and medium schemes.

The various Finance Commissions have also been going into the question of maintenance of irrigation system. The Eighth Finance Commission (1984) recommended the provision of a consolidated amount of Rs 100 per hectare of gross irrigated area for purposes of maintenance and an additional 30 per cent for the Hill States. A Later Committee set up by the Ministry of Water Resources upgraded this norm to "Rs 180 per ha per annum of gross irrigated area for O&M grant taking the base year as

O&M Expenses Per Hectare (At 1988-89 Constant prices)

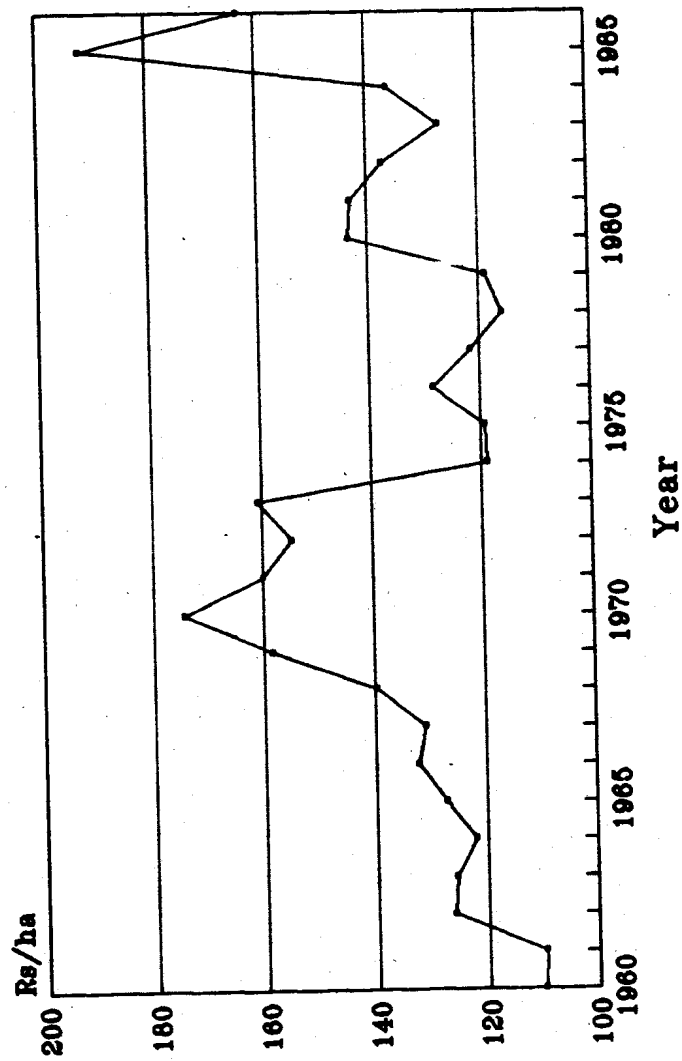


Fig 3

Source: Gulati et.al.(1994b)

Share of Direction & Administration in Total O&M Expenses

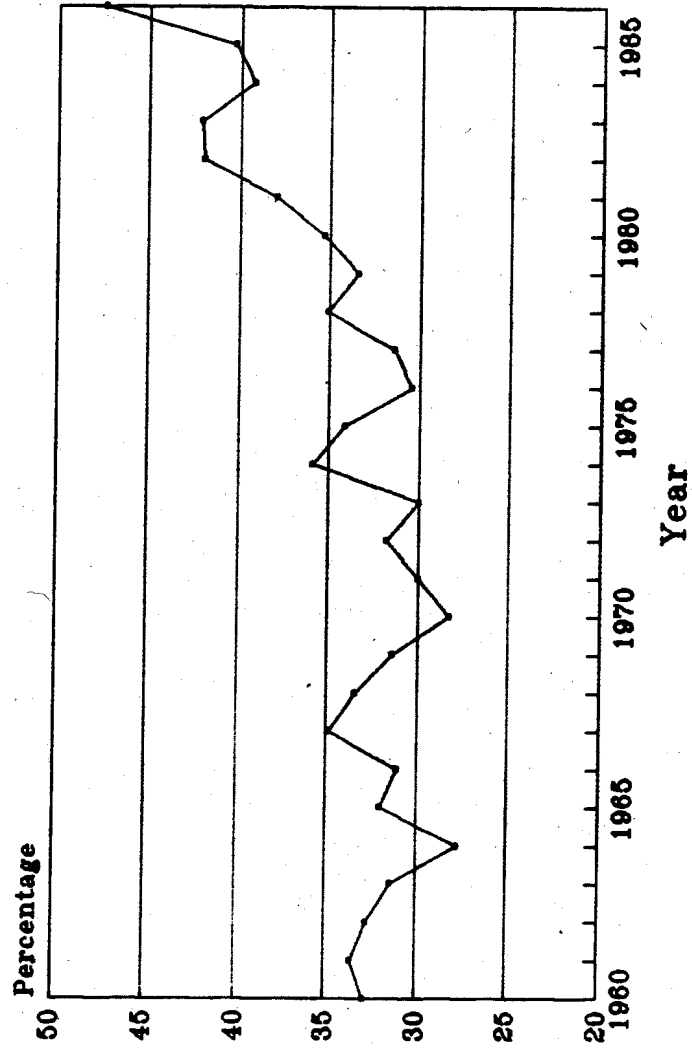


Fig 4.

Source: Gulati et.al. (1994b)

1988". They also suggested some additional provisions for regular establishment, drainage and special repairs. It was expected that the expenditure would be matched by water rates and other irrigation receipts. But as pointed out by the Working Group on Major and Medium Irrigation Programmes for the VII Plan, it has been seen from past experience that deciding a norm does not, by itself, ensure proper maintenance. Several states fail to make proper provision for O&M even at the existing low norms. The main need is for finding the means for providing the required funds. Also, the existing system of fixing flat rates per ha of irrigated area for O&M, without considering the nature of the project and the nature of maintenance required for it, is not rational. Maintenance requirements will also vary from place to place, depending on system design, age, quality of past maintenance, and topographical, meteorological, and other physical conditions particular to the area. The Group felt that norms should be suggested by states after detailed studies in different regions.

The overriding need of the hour is to improve quality of irrigation services to farmers through improved operations, and sustained improvement in the physical condition of systems through improved maintenance. Among other things, this requires provision of adequate funds for O&M in a way that does not put further pressure on stressed state recurrent expenditure budgets.

IV. Cost Recovery

The abandonment of financial criteria for irrigation investment decisions and the substitution of more general economic benefit criteria decoupled capital cost repayment and receipt of benefits. Cost recovery and loan repayment thus became a general government obligation rather than the responsibility of the indirect beneficiaries. To meet such general obligations, governments have available to them a variety of measures to recover capital expenditures, from administered prices for inputs and outputs, to general taxation, to fees for services. Although proportions of the different sources vary, in India and in most other developing countries, revenue from fees collected directly from beneficiaries are usually far below projections made and targets set by planners.

Given scant attention during the push of the 1970s and 1980s for increased food production, cost recovery has moved toward centre-stage in recent years, and increasing attention is being focussed on the poor direct

recovery of costs in the irrigation sector. There are a number of reasons for this attention. First, national debt burdens have become oppressive for a number of developing (and some developed) countries, and governments are looking for ways to contain indebtedness and repay loans. Second, many developing countries engaged in a massive buildup of irrigation capacity following World War II, and recurrent-cost financing burdens mounted along with the expanding hectarage. Since 1979, the pace of that buildup has slackened drastically, along with international funding for irrigation development¹, but the recurrent cost burden of the buildup remains. Thirdly, there is a perception that the poor operational performance displayed by many public schemes is connected with inadequate recurrent cost financing. Fourth, because of the large subsidies and economic rents involved in irrigation development, there is the perception that investment decisions have been seriously distorted by private and political incentives. All of these factors lead to increased attention to and emphasis on recovery from beneficiaries of the costs involved in irrigation management (Svendsen, 1991).

One of the more immediate causes of poor direct cost recovery in India relates to water rates. All states except Assam and the north-eastern states, are charged a rate for use of irrigation water from public systems which is separate from general land taxes. These rates differ from state to state and also according to season and crop grown. The factors underlying rate structure have been set out by the Second Irrigation Commission (1972) and include quantity of water consumed by particular crops, paying capacity of irrigators, assurance of water supplies, and the need to cover the annual costs incurred in providing irrigation. However, no uniform rule for combining these considerations was prescribed by the Commission, and states follow many different procedures in balancing them.

In addition to their inconsistent structure, water rates are extremely low. The Irrigation Commission did prescribe optimum levels of charges for use of water for irrigation as a percentage of gross income, estimated to be around 5 per cent for food crops and 12 per cent for cash crops. But actual receipts vary from less than 1 per cent to a maximum of 2.9 per cent (Vaidyanathan Committee Report, 1992; Table 2-3, page 33) of the

¹ For Asia, international lending for irrigation development is but half of its level of ten years ago, in real terms.

gross output per hectare of irrigated area. In fact, for the states of Tamil Nadu and West Bengal, this percentage is as low as 0.1 per cent (Fig 5).

The argument presented above implicitly assumes that fees due are actually collected by the appropriate revenue establishment. In practice, this is often not the case. Bhatia (1991) found, for example, that for Bihar actual collections were only about 20 per cent of current assessments for the years studied, 1982 to 1984. Nevertheless, even with perfect collection efficiency, low irrigation rates in most states would result in revenue inadequate to fund proper O&M. Poor collection efficiency, however, may have a serious negative effect on farmers' willingness to pay if payment is seen as avoidable, negotiable, or inequitable.

Low water rates have been prevalent in the various states for years despite the Irrigation Commission's recommendation that rates be revised every five years. A case in point is Tamil Nadu, where water rates have not been revised for the last 30 years. The last revision of water rates for states like Punjab, Haryana, Himachal Pradesh and Kerala took place in the mid-1970s. Even in states where revision has taken place in the 1980s, increases have been small. Implementation of revised water rates have often been held back by political and other factors. So far, Maharashtra is the only state which has followed the Commission's recommendation of reviewing its rates every 5 years.

The result of this non-revision of water rates has been a wide gap between O&M expenses and the cost of irrigation service, although the rise in price of agricultural output does not in any way justify stagnant water rates. In the period 1974-75 to 1986-87, yield from irrigated land rose and prices of agricultural commodities roughly doubled (GOI, 1992). Simultaneously, the cost of operating and maintaining an irrigation system also climbed steeply. During this period, gross receipts per hectare in major and medium irrigation schemes rose by 55 per cent. However, revenue from water charges increased to a considerably smaller degree and their average share also declined from 74 per cent in 1974-76 to 56 per cent in 1984-87, indicating that relatively little of the increase in overall receipts is attributable to receipts from charges of water. This modest increase in receipts from irrigation schemes was not sufficient to keep pace with the increased cost of O&M. This has been the trend for all the states in the country with the single exception of Orissa. It has been found that the recovery ratio (i.e. ratio of gross receipts to total working expenses), for

Receipts of Irr. Deptts. from Canal Water (As %age of Irrigators' Value of Output)

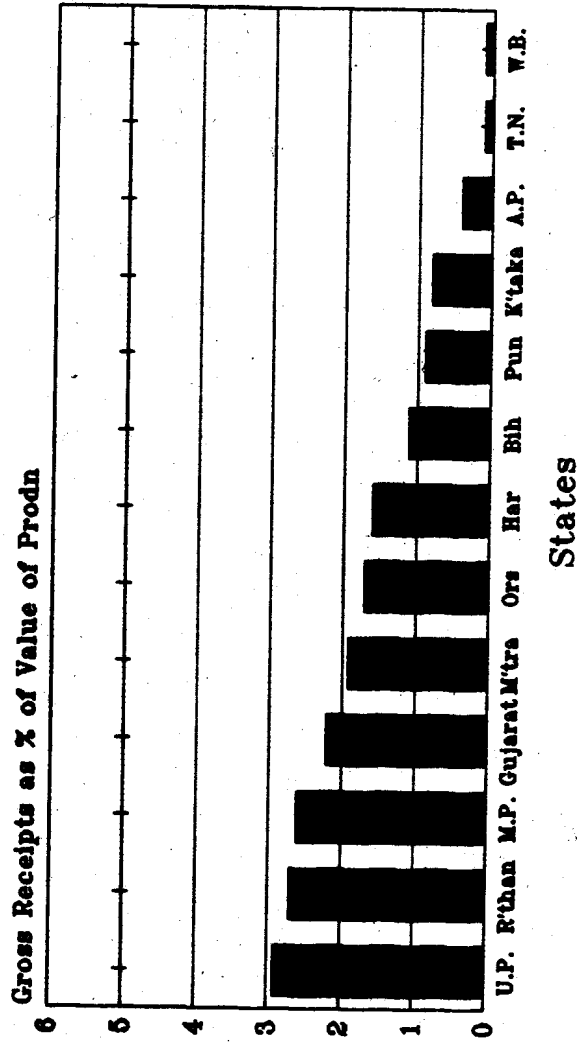


Fig 5

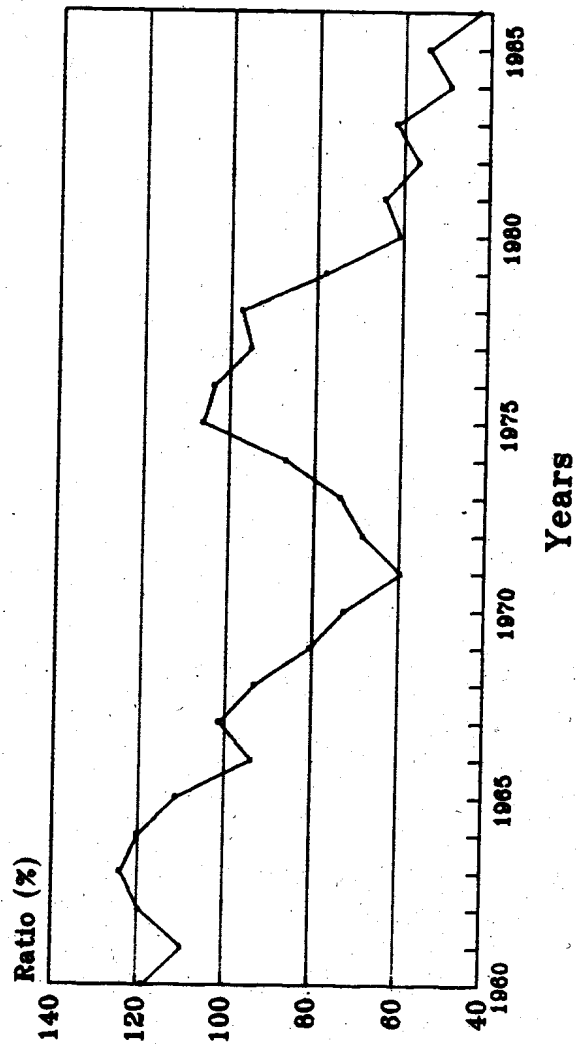
Source: GOI, 1992

the country as a whole, declined steadily since the mid-1970s (Fig 6) (Gulati et al., 1994b). The general downward trend is broken only during the first half of the 1970s, when the recovery ratio tried to climb due to a substantial increase in almost all states of the country.

This asymmetry in receipts and expenses of irrigation systems has come about due to the outdated welfare bias in investment and management principles. Low water rates have been justified by state governments on three grounds: (a) Irrigation facilities are basic infrastructure for increasing foodgrain production, and subsidies on irrigation are therefore justified in the larger interest of the economy; (b) Output prices are generally 'unremunerative' and the price of other inputs is increasing as also the dependence on them. Increasing water rates would thus prove to be a serious disincentive to increased production; (c) Water rates are looked upon, by most farmers and even some experts, as a tax paid by the farmers. Hence they need not have any relation to the cost incurred in providing irrigation water. It is the total contribution of the farmer to the national exchequer through sales tax, mandi tax, excise tax, and contribution to economy/Government of their output below the 'free trade prices' etc. which should be taken into account.

But, as the Vaidyanathan Committee points out, though there may be some doubt about the basis on which the cost of irrigation service should be determined and also about how much of the cost should be recovered, there can be no second opinion about the principle that users of public irrigation must meet the cost of provision of this service. Viewing the development of irrigation sector as a welfare measure would be justifiable only if the entire agricultural sector was a beneficiary of this development. But in reality, it is only a section of the farming community having land in the command areas of the irrigation works, who benefit from this particular aspect of development. Thus these farmers benefit enormously from the subsidised water resource at the cost of the rest of the farming community and the general tax-payers. There is also inequitable distribution of water between the head-end farmers as compared to tail-enders, although the charge paid by each is the same. Thus, the present state of affairs not only puts an unfair burden on the general tax-payer, but also encourages inefficient development and use of the water resource by sending out the wrong signals. Also, as Repetto (1986) points out "Divorce of economic benefit from financial responsibility creates significant economic rents in

Recovery Ratio : All India (Gross Receipts/Working Expenses)



— Recovery Ratio

Fig 6

Source: Guleti et.al.(1994b)

public irrigation systems, which weaken incentives for efficient use of resources and promote inequities”.

The current view, both in India and abroad, is that the total income from irrigation schemes should cover annual O&M expenses as well as a certain nominal percentage of the capital invested (GOI, 1983; Small and Carruthers, 1991). There can be differences of opinion, though, over how legitimate O&M costs are to be determined. Because irrigation service is provided by a monopoly concern, and because public oversight and control is often deficient, it is not correct to simply consider all of the costs incurred by the irrigation agency as legitimate costs to be recovered from farmers. Thus costs must be apportioned in some fashion between activities related to goals of public sector employment creation and other public and personal goals unrelated to high quality irrigation service to farmers, and those which do serve farmer interests. Alternatively, incentives must be created to make irrigation agencies more performance oriented and to reduce operating costs. One approach falling in this latter category is suggested in the final section of this paper.

However, the story does not end with the reestablishment of the principle that the costs of irrigation service should fall principally on direct beneficiaries, coupled with an increase in irrigation rates. Neither of these desirable steps, however, has any strong direct impact on the quality of irrigation service provided to irrigators, quality of system maintenance, or level of agricultural output. The strongest direct effect will be to improve the financial position of the state exchequer, while impact on the system's efficiency will remain weak and indirect.

This is true because irrigation development budgets are not connected with the level of receipts generated by irrigation water charges. If receipts go up, there is no assurance that the increased state revenue will be devoted to irrigation. It might just as easily go for road repair, school construction, or legislative assembly operations. Likewise, when irrigation receipts decline, expenditures on irrigation system O&M do not necessarily fall in step. More likely, O&M expenditures respond only to the general financial position of the state in each direction — a much looser linkage.

Moreover, if irrigation budgets do rise, there is no real assurance that the quality of operation and maintenance will improve. Often the first response to a budget increase is the hiring of additional staff, which in turn

places additional stress on the already over-extended support services, supplies, and equipment needed to perform actual O&M tasks.

Simply increasing water rates, while a necessary step, fails to establish the accountability linkages between the operating agency and its farmer clients which are necessary for sustained provision of high quality irrigation service by responsive operating agency. Building such accountability linkages requires the imposition of *financial accountability* on operating agencies, and involvement of farmers directly and significantly in decision making relative to system operation and maintenance. This means that irrigation agency operating budgets, and their staff levels, perquisites, and bonuses, must be a direct function of receipts generated by their operations. That is to say, O&M expenses should flow directly from farmers to agency, in which case they will be an expression of farmers' satisfaction with the quality of irrigation service received. It has the added effect of helping bring actual costs of O&M into line with 'legitimate' costs.

V. Towards Better Financial Performance

Improve Design and Appraisal

We have already seen that the capital investment in India in the irrigation sector is very large. As percentage of State Plan outlays, investment in irrigation is between 24 and 38 per cent in most states. But the performance of the sector does not reflect the huge investments that have been made. One of the reasons most projects (whether Government funded or funded by some external agency) show poor performance is that numerous delays are encountered in their implementation. Also, benefits are frequently well below expectations because of poor operational performance and faulty assumptions made during project design.

In India it is also very difficult to evaluate the performance of an irrigation scheme, since data on performance and economic viability of irrigation projects is very limited. Ex-post reviews of performance and economic viability of various projects are seldom performed, although for some schemes funded by it, the World Bank had reviewed economic viability (World Bank, 1991). At the time of appraisal, all projects reviewed displayed economic rate of return (ERR) of 15 to 30 per cent. But despite the fact that World Bank funded projects have a great many advantages, such as more thorough project preparation and lower financing constraints

during implementation, on completion most displayed significantly reduced ERR's, generally less than 10 per cent. Declines in world foodgrain prices in the mid-1980s was one of the factors responsible for lower ERR at completion stage as compared to the appraisal stage, but the main factor leading to the low ERRs has been various implementation problems. For projects evaluated in 1989, capital cost was higher than estimated cost by 49 per cent to 147 per cent in real terms. This higher cost is, in turn, the result of factors like weak institutional capabilities, an inadequate data base and inadequate analysis during project design. The World Bank study concluded that while economic viability has been poor among projects all along, an obvious trend is deteriorating construction quality and maintenance standards over the past two decades accompanied by poor water management on most surface irrigation schemes. This seems to indicate that future investments in irrigation should be directed at improving water management and the quality of operation and maintenance rather than taking up more new projects which are themselves likely to exhibit disappointing economic performance.

The World Bank study also gives support to the contention of the Nitin Desai Committee which concluded that the changeover to IRR or ERR criterion is not going to have much impact on the quality of projects constructed without accompanying improvements in the database and analytical methods.

Restructure Management Institutions

With respect to improving the performance of the large installed base of major and medium scale irrigation capacity, the need for fundamental change in the organisational set-up and incentive structure of the managing agencies, the state irrigation departments, has been previously noted. Incentives must be created to induce irrigation departments to take on more direct responsibility for providing higher quality irrigation services, and, at the same time, to devolve some responsibility and power to farmer groups. Financial autonomy is an essential step to bring about this change. Thus, it has been suggested that irrigation departments, and managing divisions for the larger individual systems, be made financially autonomous, like corporations or regulated public utilities, and that their income be dependent on the revenue they themselves collect for irrigation service. This will provide incentive for more regular and stricter collection of

revenues from user groups and/or the supply of better irrigation service to facilitate this. Financial autonomy thus serves to provide a functional link between collection of revenue from users of irrigation water and more effective irrigation performance by suppliers of water (Svendsen, 1991). With financial autonomy, various factors come into play, the two main ones being:

- i) *Incentive to increase agency income:* This factor will come into play even when water rates are being levied on the basis of area irrigated, as is the current practice in India. It will act as a strong incentive to increase the area under irrigation services, improve collection rates, and increase the value of agricultural output per unit of water used, and thereby farm incomes, increasing farmers' ability and willingness to pay.
- ii) *Incentive to reduce cost:* This incentive comes into play as higher level managers evaluate system managers in terms of the financial viability of the schemes they are responsible for, as well as technical factors relating to quantity of work accomplished, condition of structures, and so forth. This change in personnel evaluation criteria must logically accompany the structural changes in the irrigation agency.

Working together, these two factors help establish a relationship of mutual dependence between the supply agency (i.e., Irrigation Department) and the farmer user-group. The Irrigation Department provides an essential service to farmers — irrigation water in the quantity and quality desired by the user, while users, in turn, provide the department with the financial resources necessary for its existence and operation. This mutual dependence results in greatly expanded potential for efficient irrigation management.

Increase and Restructure Irrigation Fees

In the recent past, agricultural output prices have risen steadily. For instance, the procurement price for the 1988-89 crop of wheat has increased from Rs 183 per quintal to Rs 330 per quintal for the crop of 1992-93. Similarly, the procurement price of paddy (Common) has increased from Rs 160 in 1988-89 to Rs 270 per quintal in 1992-93 (*Economic Survey, 1993*). Price changes for other major irrigated crops have been in the same direction. This removes the main objection to increasing water rates, since

farmers are now receiving significantly higher prices for their outputs. By rough estimate, raising the price of water to the extent needed to just cover the O&M expenses and about 1 per cent of the capital cost, works out to only 6 per cent of the gross value of output per irrigated hectare (GOI, 1992).

Theoretically, it is also desirable that water rates be differentiated on the basis of nature of the project. Part of the reason for differential treatment is that each type of project has different kind of costs attached to it due to design, age, terrain, etc. More recent projects, for example, cost more due to the escalation in costs that has taken place due, in part, to inflation. However, farmers may object to paying for projects which were completed long ago, perhaps even before they were born. As a practical matter, at some point older system construction may be treated as a sunk cost. A differentiated cost structure, since it would be dominated by O&M cost component, would also make apparent to farmers that they were paying for O&M of their own system and not one half a sub-continent away.

An important reason that irrigation fee collections regularly fall behind expectations is that the rates are fixed in current rupees and updated only at long intervals. Rates, therefore, are constantly declining as inflation erodes the value of the Rupee. One alternative would be to fix the rates annually at the beginning of the agricultural year, based on the system's estimated O&M costs for the year. This is done in many farmer controlled irrigation systems both in developed (e.g., USA) and developing (e.g., Nepal) countries. Another alternative is to index the rates. In the Philippines this is done by denominating fees in measures of rice, converted to Pesos at the current government index based on a variety of commodities.

The Vaidyanathan Committee recommends volumetric pricing of canal waters. It is felt that the water charges should explicitly be a function of the volume of water used and the season of use. The amount paid by users of irrigation water should be linked to the quantity used and the quality of service received. A shift to volumetric pricing would remove the need for fixing crop-specific rates and estimating the area under different crops.

However, if water delivered to individual farmers were to be measured at each farm outlet, the costs of measurement would be prohibitive. Given the small size of holdings prevalent in India, volumetric pricing can be made affordable only by delivering measured volumes of water, wholesale,

to groups of irrigators. The Irrigation Department could charge a bulk rate at the head of the distribution system supplying this group of users and leave the collection of water charges from individual farmers to representatives of a user-group. Farmers could devise any means they wished to allocate costs among individual users, though their expected concern with transaction cost minimisation would likely lead them away from volumetric pricing at this level. This suggestion takes the Vaidyanathan Committee's argument for effective devolution of power a little further, suggesting that primary collection of revenue be, in effect, privatised. Although careful thought must be given to means to insure financial probity, this approach would greatly simplify the cost recovery process for the state, and substantially reduce the time and cost involved in revenue collection.

The Vaidyanathan Committee suggested that, since amount of water available and used for irrigation will differ due to climate and other variations, while many costs are fixed, a two-part tariff would be more suitable than a fixed or completely variable one. All cultivators whose land lie in the command area would pay a fixed annual fee on a per hectare basis (a connection fee) for the privilege of having access to irrigation water. The second part of the fee would be variable and depend on the extent to which the service has been used. Following the scenario sketched above, this scheme could be applied by the system manager at the irrigator group level, with the irrigators having discretion to adapt and adjust it internally while remaining responsible for honouring the financial terms of the overall agreement with the Irrigation Department.

Farmer Participation

It has been noted that it is not possible for a centralised agency to efficiently administer the use of water at thousands of points across a large irrigation system without the help of user-farmers. For this purpose, efforts have to be directed at building up strong and effective farmers' organisations which can take up the responsibility of receiving bulk supplies of water from the Irrigation Department and distributing the water among the member farmers. This will bring about a substantial reduction in the costs and responsibility of the government agency. The farmers' cooperatives can also take on the task of collecting revenue from individual farmers, thus leaving all interaction with individual farmers to farmers' groups.

Farmers' participation in system management thus emerges as a prime prerequisite for a smooth and successful transit to a more efficient system. Once sufficiently large organised user-groups come into being, they will themselves be interested in seeing to it that projects are implemented economically and that the quality of water management improves substantially. Past experience has shown that developing such groups, and sustaining them once external support has been withdrawn, is not an easy task. It is not, however, an impossible task. Successful experiences in many other countries of the world, including subcontinental neighbours Nepal and Sri Lanka, demonstrate otherwise. However, efforts must be concentrated on creating policy and institutional conditions conducive to such organisations and on generating farmers' interest and transferring appropriate skills, such that organised groups are able to play their necessary part in a reorganised management system.

In order to cause farmers' groups to feel a greater degree of responsibility for improved management of a system, they can be made co-owners of the irrigation works. This can be done through the introduction of 'Water Bonds' (Gulati, et al, 1994c). Five per cent of the capital invested in the project, which can be termed as 'equity', can be offered to involved associations in the form of water-bonds, possibly in exchange for labour contributions to project construction. This would not only increase farmers' stake in running the system efficiently and cost-effectively, it would also help recover part of the capital investment. In addition, such a step would help equilibrate the power balance between users and suppliers of irrigation water, making the entire system more stable.

It is thus seen, that surface irrigation development and management needs major revamping, and that the Vaidyanathan Committee has pointed in the right direction through its various suggestions. It is now upto the Planning Commission and the Irrigation Departments at the Centre and State levels to take note of these suggestions, think through their implications for giving a new strategic direction to the irrigation sector, and act upon them to check the enormous losses being incurred by the irrigation sector. Successful moves in the right direction will not only improve the general health of the economy, but also the financial health of the irrigation sector, and the well being of individual irrigated farm families.



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