

A. Vaidyanathan<sup>2</sup>

THE DESIRABILITY OF transferring a significant part of the responsibility for maintenance of facilities and managing water allocation in irrigation projects is now widely accepted. Precisely what responsibilities are to be transferred, at what level and through what means, as well as the manner in which such transfer and the consequent restructuring of irrigation management as a whole is to be accomplished are among the central issues on the agenda of this conference. This paper outlines the nature of the problem and the contemplated solution in the case of India.

It is useful to start with the obvious, but none-the less important, observation that "turnover" of management is not necessary and the form it takes need not be the same in all irrigation works. In this context, we need to distinguish between three broad types of irrigation; (a) groundwater; (b) small surface irrigation works which serve one or at best a few villages; and (c) surface irrigation systems which serve relatively large areas covering many villages.

## GROUNDWATER

In India, groundwater is an important and rapidly growing source of irrigation. Currently it serves over half of the total irrigated land in the country compared to 30 percent some 30 years ago. Typically individual farmers construct wells, install and operate lifting devices primarily to irrigate their own lands. In recent decades, purchase and sale of groundwater among farmers appears to be growing apace, though the incidence of such "water markets" is highly variable from region to region, even within a given region. The main point here is that extraction and use of water is done mostly, if not exclusively, by the private sector.

In principle, the state is supposed to define the property rights over groundwater, and to regulate its use in the interests of equity and at sustainable levels. However, property rights are poorly defined.<sup>3</sup> A person who owns a particular piece of land has the right to dig wells on his plot and tap water from underground. But this right is not unrestricted in as much as if the extraction by one farmer affects the supplies of a neighbour, the latter is legally entitled to restrain the former. In point of fact, the high cost (in terms of time and resources) required to settle such conflicts though the judicial process makes these legal principles practically irrelevant. The reality is that anyone who can afford or access the resources, can extract as much as he wants. Purchases and sales of water are not subject to any legal regulation.

The state has also the right to regulate the exploitation of groundwater by individuals. A number of regulations have been introduced with a view to prevent exploitation of canal seepage through wells within proximity of canals and distributaries; and ensure that overall rate of extraction of groundwater in any given area is contained within "sustainable" levels (i.e., a level which does not exceed the annual rate of recharge). It is well known that neither set of regulations is effectively enforced.

Reliable monitoring of these phenomena is both difficult and expensive; collusion between those who violate the regulations and the officials who are supposed to act as agents of the government in enforcing them is always a possibility. And it seems very difficult to devise a self-enforcing incentive system which will reduce the incidence of such collusion. Significantly the state has been unable to regulate groundwater use even when it has the means to do so (e.g., by denying electricity connections and credit) and even in situations (e.g., when competitive deepening of wells increases private as well as social costs of water, and leads to over-exploitation resulting in less and less water for everyone) when one would expect a strong collective interest in regulation.

Under these circumstances, the interests of equitable and sustainable use seems likely to be better served if individual property rights over groundwater were replaced by community rights, and if the community concerned rather than the state functionaries were made responsible for regulating exploitation and use of water. A major difficulty here is that the boundaries of the aquifer which are appropriate for defining collective rights seldom coincide with boundaries of villages and other territorial units defined for administrative purposes. The difficulty is the greater when, as in the hard rock areas, aquifers are highly localised and disconnected, as well as in areas--as in the Indo Gangetic Plain--where the aquifers are interconnected and cover extensive areas.

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<sup>2</sup>Madras Institute of Development Studies, Madras, India.

<sup>3</sup>For a recent comprehensive discussion of issues concerning property rights in groundwater and the problems of regulating its exploitation see Moench et al (eds.) 1993.

In sum, the turnover problem in the case of groundwater centres on regulating the overall rates of exploitation consistent with sustainability and equitable access. The focus should be on findings ways of defining aquifer boundaries and property rights on a community basis and evolving an enforceable collective agreement within each community on exploitation and use, be it on an individual or on a collective basis. Such a turnover in the management of groundwater would be superior to the existing regulatory system.

## SMALL SURFACE IRRIGATION WORKS

A sizeable portion of irrigated area in India is served by tanks and diversion works with a relatively small command area. As of 1986-87, there were an estimated 250 thousand tanks irrigating [some hectares.] Most of them serve a single village or part of a village, but a small fraction serve several villages. The relative importance of this category has been declining everywhere and official statistics suggest that in several states the area served by them has declined in absolute terms. The relative decline is not surprising in view of the preoccupation in the post-Independence period, with the development of groundwater and large canal systems for irrigation.

The absolute decline is more difficult to explain. It is widely attributed to the degradation of minor works due to neglect by the State and to the decay of local institutional arrangements for managing such works. To some extent, the decline may be due to the encroachment of tank beds and their ayacuts as a result of urbanisation and the displacement of local systems by modern large-scale canal systems.

The relative importance of these factors in accounting for the apparent decline in minor surface irrigation, however, cannot be judged with any degree of confidence. There has been no systematic and comprehensive survey to assess the true state of the minor surface irrigation works, most of which are old and receive only scant attention by the government. However, some limited studies, covering a relatively small number of tanks in different parts of Tamilnadu<sup>4</sup> do not indicate either a significant reduction in actual area irrigated compared to the registered ayacut, or any general breakdown in the functioning of local community arrangement for maintenances and water management.

Thus, a survey of 15 tanks served by the Palar Anicut System reports 8 having cleared inlet channels in the course of the 5 years preceding the survey with beneficiary contribution. In 9 tanks, the main distributaries and the field channels were reported to be maintained on a regular basis. Seven tanks reported that the traditional "murai" or turn system for rationing water allocation in terms of scarcity continues to be operative. Five tanks still had a village-level functionary specially responsible for irrigation water; in all villages the traditional village leadership plays a role in tank related matters; and almost all reported that the *neerkati*, the lowest level of irrigation functionary appointed and paid by the irrigation community, still exists and functions (Janakarajan 1991). Studies of other parts of Tamilnadu (Tambaparani Basin and the upper part of the Cauvery Delta) also show local institutions to be quite active in tank maintenance and management.

And in the case of two of the largest tanks in Tamilnadu (Kaveripattinam and Dusi Mamandur) - each severing some dozen or more villages - local maintenance, water allocations as well as lobbying with the Public Works Department on tank related matters continues to be active even though the formal organisation for the management of the tank as a whole is in disarray.

This is of course not a complete picture: the coverage is limited to certain parts of the state and to tanks which are linked to larger storage/diversion systems. We need more systematic studies of wider coverage, specially of non-system tanks, to be able to assess the state of local community institutions. But given that a sizeable area continues to be irrigated by these sources and since the state is not doing much about them, it is reasonable to suppose that maintenance and water allocation functions are being handled by local institutional arrangements.

My intention is not to suggest that the traditional local institutions are "ideal" either in terms of efficient and smooth working of tanks/diversion works or in terms of their concern for "fair" and "equitable" distribution of water. Nor do I wish to imply that the traditional institutions here have remained unchanged in structure or efficiency. Changes in land control and in the local power structure of villages, the spread of conjunctive use of surface water and groundwater and the increased value of water as a result of technological and economic changes, have brought about far-reaching transformations in local institutions and most likely made them looser, less disciplined. But they have not ceased to function.

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<sup>4</sup>These studies cover system tanks in the Palar Anicut System, Tambraparani System, and Upper Cauvery Delta. The material on the Palar are available in Vaidyanathan and Janakarajan (1989), and Janakarajan (1991). Material on other systems, including 2 multi-village tanks in Palar, have been collected by S. Ramanathan, A. Rajagopal and K. Sivasubramanian for their doctoral dissertations. See also Vaidyanathan (1992).

## LARGE CANAL SYSTEMS

### Main Characteristics

The problem of turnover of operation and maintenance is really relevant, and needs urgent attention, in the case of relatively large state-run surface systems. In India, at present 26 million ha of cultivated area is under major and medium surface irrigation works compared to 10 million ha in 1950-51. These are relatively large systems. In the late 1970s projects irrigating 1,00,000 ha or more accounted for about half the area served by surface irrigation sources. Some 10 systems irrigated more than 500,000 ha each, the largest being Bhakra Nangal (1.3 m ha). There are some 50 reservoirs with a storage capacity of 500 mm<sup>3</sup> or more and they accounted for 80 percent of total storage capacity, while tanks and small ponds accounted for less than 10 percent (Rao 1979).

By contrast, in China large gravity canals are reported to have accounted (in the mid-fifties) for less than 10 percent of irrigated area. The bulk of surface irrigation is reported to be from farm ponds, weirs and gravity systems based on small ditches and aqueducts (Chao 1970). Several larger storages have been built since the 1950s. Those with a capacity of more than 100 mm<sup>3</sup> rose from 10 in 1949, to 300 in the late 1970s. But these were mostly for flood control rather than for irrigation (Nickum 1981).

In 1982, there were only 66 surface irrigation systems serving 33,000 ha or more and they irrigated altogether 5.8 million ha or barely one-eighth of the total. Systems with command areas below 1,000 acres together with groundwater accounted for well over half the irrigated area. Partly because of their size, and partly due to deliberate policy, construction of new water control projects as well as improvement of existing systems through local effort has been the highlight of the post-revolution period. The responsibility for mobilising the resources for these works vested almost entirely with the communes. Even in the case of larger irrigation and flood control projects, while the provincial and central governments had necessarily to play a leading role in design and construction, a large part of the cost was met by labour contributions from the beneficiaries.<sup>5</sup>

In sharp contrast, the responsibility for construction and improvement of all surface irrigation works in India - and especially major and medium projects--has been almost entirely assumed by the government. The preparatory surveys are done by the public works or irrigation departments of the various state governments which also do the detailed design and engineering of the projects and determine how much area is to be irrigated by the available water and for what crops. The maintenance of system structures and facilities up to practically the farm level and the regulation of water allocations are managed entirely by the state bureaucracy in the case of major and medium projects. The costs of both construction and operation/maintenance are also met from the state budgets. The users thus have little stake in terms of their own contributions to the capital cost of the system and also little say in their management.

In theory, the government is supposed to recover the cost of providing irrigation services from the farmers in the form of irrigation charges and of betterment levies. But in actual fact, the rates have been inadequate to cover full costs. Governments have been reluctant, for political reasons, to revise rates despite the steep rise in costs. Actual collections are often much less than what is due under prevailing rates. Altogether, these systems do not recover even O&M costs, and the gap has been growing rapidly.

It is estimated that in the mid-seventies, on the average, collections of irrigation charges was limited to only 78 percent of the *current* operating expenses; by the mid-eighties less than half the current operating expenses was being recovered. Obviously, if the capital charges were included--as they must--the recovery rate is even lower. The total uncovered costs (including both current expenses and capital charges) on account of major and medium irrigation in India rose from Rs 2.8 billion a year in 1977-78; to Rs 15 billion in 1987-88. The magnitude of unrecovered costs *per annum* in 1987-88 was equivalent to 70 percent of the annual public investment in irrigation at that time. And the situation has worsened progressively since.

### The Necessity for Reform

Recognising the serious nature of the problem, the Indian Planning Commission set up a special committee to go into the whole question. The Commission's report (GOI, PC 1992), points out that effective rates per unit of irrigated area under public systems are very low both in relation to costs and relative to the benefits from irrigation. At present, on the average, actual collections per unit area are no more than 4 percent of the difference in per ha output between irrigated and rainfed area. While substantial improvement in assessment and collection of dues is possible even with existing rates, a sizeable increase in the level of rates would be unavoidable even to cover both O&M and a small part of the interest costs. The Committee suggested a phased programme for revising rates so that eventually user charges cover the total cost (current and capital) of providing the service.

<sup>5</sup>For a more detailed review of the evolution of Chinese Water Control Management, and the contrasts with India, see Vaidyanathan 1983, 1986.

The Committee, however, recognised that the problem of rate adjustment cannot be viewed independently of the efficiency of public systems and the quality of service rendered by them. Both capital and operating costs of public systems are higher than they need be. Substantial reduction in costs are feasible if the users had a significant stake in their system, a significant and effective role in its planning and management; and larger direct responsibility for maintenance and water allocation at the tertiary levels.

The quality of service also leaves much room for improvement. At present, the managers of government and systems are not--except in the North India systems based on "warabandhi system"--obliged to deliver specified water to each segment according to a well-defined schedule, much less according to the needs of the crops. Nor are they equipped to do so in as much as the rules regarding water allocation are not clearly laid down and made public. The management is unable to enforce the presented crop pattern because of political pressures; the decisions regarding the data of opening and closing, as well as the deliveries of water to different segments of the system are open to extraneous influence. The systems are generally not equipped with structures to effectively control the flow of water into different branch channels and distributaries. Nor are they in a position--given the political climate--to check violations of such rules as exist in respect of crop patterns, underground pumping within a certain distance of main and branch canals, illegal diversions of canal water and the like. Water charges collected from the farmers are put into the general pool of the government and the quantum of resources allocated to O&M, both overall and for particular systems, are decided by the state government and the departmental headquarters. The allocations have been inadequate--and increasingly so--to ensure proper maintenance of system facilities. There is little incentive for efficient use of available resource in construction or in operation.

### THE ROLE OF USER GROUPS

The Committee therefore saw better cost recovery and improved quality of management as integrally related components of reform. Greater user participation which is essential to improve water management in large public systems has now become generally accepted and has been incorporated as part of government policy. Thus, the National Water Policy statement of the Government of India prepared in 1987, after consultation with and approval of the states, declared "efforts should be made to involve farmers progressively in various aspects of management of irrigation systems, particularly in water distribution and collection of water rates." This view is widely shared by state irrigation officials with long experience in managing such systems.

Over the past two decades several states have enacted legislation to permit user involvement in management of state systems. A number of initiatives to set up and foster user associations have been taken up by the government as well as non-government organisations (for details see GOI, PC 1992, ch.6 and annexures). But these efforts have been patchy and can claim only a limited success so far. "...The area covered by these initiatives is very small, less than 1 percent of area irrigated at present... For the most part the outlet and canal committees are the only in name [sic]; their functions are vague; they seldom meet; they are not consulted on substantive issues; nor are department offices required to follow their advice. There is also considerable reluctance, if not opposition, from the operational staff of irrigation departments to involving users in management; and even users themselves tend to be apathetic to the idea" (GOI, PC 1992; pp.126-7).

One important reason for this is that mere formation of user groups at the tertiary level cannot by itself do much to improve the quality of irrigation service. "Steps for accelerating the process of forming effective users groups has to be conceived in a wider framework **combining better management of the system as a whole with incentives for group formation**" (emphasis added).

"An essential precondition is to convince users that they will benefit from such group activity by getting more water, more assured supplies according to a pre specified schedule (or according to the needs of crops), greater flexibility in the use of water or some combination of these....."(ibid).

These improvements are beyond the capacity of user groups at the territory level of the system. They are "contingent on a radical change in the system management, involving fresh investment..." "better formulated/transparent operational rules for the system; and confidence that the rules will be enforced.....both" (ibid).

### MAIN FEATURES OF RESTRUCTURING

The committee has therefore proposed a thorough reorganisation of management of state-run systems. The main features of the proposed reform include the following;

- (a) A careful reassessment, in the light of experience of each system, and in consultation with the users, leading to a clear statement of the principles and criteria governing the timing and quantum of water distribution.

- (b) Ensuring that the management of each system is autonomous of the government, strictly ad hoc to the accepted allocation rules without any interference from the outside.
- (c) Involvement of user representatives in the system management with provision for making information on the actual supplies to various segments available to the users.
- (d) Financial autonomy to enable each system to levy and collect water charges from its users and retain the proceeds; subject to reimbursing the state agreed capital and O&M costs incurred by it.
- (e) Reducing the scope of system managements O&M responsibility by an arrangement, whereby, the system agrees to provide designated amounts of water during specific periods, according to a specified schedule up to outlets commanding 500 ha.

The system would enter into an explicit commitment with the users of each outlet specifying volume, duration, periodicity of supply, and the amount each user group has to pay for the supply. Each group would then be left free to decide how the water is to be allocated within the command of their particular outlet, the crops to be grown, the basis on which members are to be charged, how collections are to be made and for what purposes they are to be used.

Under such an arrangement, the amount that farmers have to pay gets limited to the quantum of water used and the quality of service. The system managers will be under pressure to adopt and observe transparent water allocation procedures; and reduce the cost of O&M costs as well as costs of assessment and collections to be borne by the state.

### PHASED TRANSITION

However, for a number of reasons, such a drastic change of regime is not immediately feasible. In the first place, defining system allocation rules to improve the quality of service (in terms of timing and predictability) to everyone and laying down generally acceptable criteria for sharing shortages will take time. Also, the ability to effectively control water deliveries according to prescribed schedules is contingent on modifications in operational procedures, establishing better monitoring of flows and additional investments in communications and regulatory structures at appropriate points in the distribution network.

The changes also need a major reorientation in the attitudes of both government irrigation departments and of cultivators. The former, being familiar with the existing arrangements which have been in vogue for long and which give officials considerable discretionary power (and the attendant opportunities for rent seeking), are likely to resist any substantial reduction in their power, accompanied by substantial increase in their accountability to users. The users on the other hand are unfamiliar with the intricacies of large system management, and uncertain of the implications of a change in regime. They are likely to be averse to shouldering the responsibility for mediating and settling conflicts among themselves. Both types of resistance will take time to wear down.

For all these reasons, one has to think of a phased strategy to change the time structure and functioning of institutions concerned with canal management. A three-phased transition has been proposed. The first phase, it is suggested, should focus mainly on rationalising the existing system of individual assessment based on irrigated area under different crops, to one of season-specific area rates reflecting differences in irrigation requirements between seasons and crops. This would make various crop rates correspond more closely to the volume of irrigation water they use. The level of cost recovery to be aimed at this phase is also rather modest.

The second phase would seek a shift to a fullfledged volumetric system--after effecting the necessary physical changes in the distribution system for more effective regulation of water deliveries and reworking the operation rules and procedures for the main system--based on a proper study of the relative merits (in terms of equity and productivity) of different patterns of use under different conditions of supply and the pattern which is socially most acceptable. By bringing about a more assured and predictable supply of water between seasons (and within seasons), and leaving the farmers the flexibility to determine how best to use the water, the modifications would add substantially to productivity and may well lead to saving of water which can be used to extend irrigation to a larger area.

Consultation with users is crucial to evolve an informed and socially acceptable set of operational rules for allocation. But ultimately, the state cannot escape the responsibility for striking a balance between competing claims of productivity and equity in distribution, and of conflicting claims of different segments of the system. This is likely to be more difficult in the case of existing systems (in as much as the claims which various users have established in practice will be affected) than in new systems where the planners have a cleaner state in which to work out allocation rules in consultation with potential users.

## INCENTIVES AND PRESSURE

In order to overcome the reluctance of farmers to take on the responsibility for group management, the committee emphasised the necessity "to device incentives which discriminate strongly in favour of farmer groups and discourage individual service" by making the revised rates, in the transitional phase, substantially less for those who opt for group-based volumetric levy, by giving preferential allocation of government funds to farmer groups for effecting improvements for better use of water, and awarding such group contracts for maintenance of system facilities in their vicinity.

The committee went on to argue the need to combine these "incentives" with "pressure" and "positive measures to support and nurture groups." "In order to exert pressure, the government must declare its intention to withdraw, after a designated period of 5-10 years, from the responsibilities for management below the outlet and confine itself to delivering water for a specified duration at the minors or the outlets. The message to the farming community should be clear that the government considers the water user groups as the main instrument for improving the management of the irrigation system. Government's commitment to the improvement of irrigation efficiency and farm productivity should also be visible, and the farmers should perceive the political will to improve cost recovery. This policy initiative should also be reflected in a time-bound programme of introducing group delivery and volumetric pricing."

"The positive measures include, besides educating farmers about the rationale of the new system and its advantages, the cultivation of a supportive attitude on the part of the departments concerned (including the Irrigation department) at all levels to the formation of groups, the provision of technical advice and assistance in working out rules and procedures for their operation, and the encouragement of voluntary organisations to play a larger role in the process." (GOI, PC 1992: 131-2).

## CONCLUSION

The task is obviously far from easy. But for the first time we have a comprehensive blue print which recognises that cost recovery and quality of service are inter-related, and that quality of service cannot be improved without simultaneous and purposive action to improve system-level management *and* promotion of greater user stake and participation. The phasing of different components of reform as well as a set of incentives to facilitate the transition have also been outlined. There remains the question of "political will." Of course this cannot be wished into existence. Users need to be educated and mobilised to exert grass roots pressure for reform, and the circumstances which make reforms imperative need to be brought forcefully home to the leadership of all political parties. The growing difficulty of sustaining the desirable level of investment to expand and improve these systems, and the general convergence of professional opinion in favour of reform constitute a favourable conjuncture for such initiatives.

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