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Objects and Accomplishments of Participatory Irrigation Management Programme in India: An Open Pair of Scissors

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Abstract

Participatory irrigation management programme as a prelude to irrigation management transfer to users is being set up by many states for over five years now. Though it is recognized that the government should no longer be in the business of retailing water to individual consumer, the PIM policy or Acts in India as an instrument lacks the sharpness to catalyze farmer management as a cutting edge to irrigation sector reforms. In fact, as the paper argues, the objectives of the reform measure and the actual achievement are in opposite directions so far. What measures are required to close the gap between goals and practices are the central concern of the present analysis.

JEL Classification: ***H11, H54, O31, O23, G28, P41, Q15, Q28***

Keywords : ***Participatory irrigation management (PIM); Irrigation management transfer (IMT); Water users association (WUA); Irrigation policy and performance, Outlays and expenditure on irrigation projects; Financing PIM***

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Objects and Accomplishments of Participatory Irrigation Management Programme in India: An Open Pair of Scissors

R. Parthasarathy

1. Introduction

In recent years community management of water resources is believed to have significant potential in addressing the stagnating agricultural productivity in the command areas of major irrigation projects. One oft-cited reason is that existing irrigation systems are mismanaged and in a state of serious disrepair. The breakdown, it is argued, can be seen most vividly at the village level where government administration of water delivery has become so ineffective that in most cases farmers do not receive an adequate and timely supply. There are oodles of evidence to support this though. Alternatively, irrigation is mismanaged such that too much water has led to problems like waterlogging, salination and soil degradation. There is, thus, a growing consensus that the solution to these problems is in irrigation management transfer (IMT) that is, turning over control of irrigation management to the end-users: the farmers. Not only in India, elsewhere too, the creation of a new institution at the village community level, called the water users association (WUA) and in some cases vertically integrating them at the project level, has become the central focus of governmental programs variously called as Participatory Irrigation Management (PIM), or Farmer Managed Irrigation Systems and so on, which aims to decentralize irrigation management and revitalize rural development at the grassroots. Similar steps have been taken up for community management of watershed resources at very different scales of user participation.

The PIM solution to the mismanagement problem, while ingenious in many ways, is not without its share of difficulties. First, many village communities were neither prepared for the advent of new water management nor had necessary experience in the operation and maintenance of canals. Further, in most states, there were no concerted post-turnover capacity building exercises. The complexities of conjunctive use of water in a given basin are yet to be sorted out. There is, however, conflicting evidence whether WUAs can deliver water effectively and

collect water charges so that the system would become self-financing and less burdensome for the government. Second, it is not always clear who actually controls the allocation of water and who receives the benefits when WUAs manage the resource. Questions of rights to water and equity in access based on gender, land tenure status, locations of plots in the canal network remain to be resolved. Third, there are multiplicity of uses for canal water and a diversity of claimants both within and outside the WUA. Thus, conflicts over rights to the resource can potentially proliferate seeking mechanisms for resolving disputes. A fourth problem lies in the environmental impact of community-based management of increased supply and the question whether WUAs can manage issues like soil degradation caused by waterlogging and salination. Ultimately, the resolution of such problems will depend on whether village communities and their WUAs, linked together in a basin irrigation network, can be empowered to make and implement decisions that enable an efficient, equitable and sustainable use of the resource.

This paper aims to analyze these issues drawing on the multiple studies, completed or in progress (Parthasarathy, 1998; Parthasarathy, 2000; Parthasarathy et. al. 2001, van Koppen Parthasarathy and Safilliou, 2002). The paper is organized as follows: The following section 2, presents a heuristic framework. Section 3, besides presenting an overview of the PIM programme in India also analyses one of the important factors influencing its susceptibility. Further, analysis of targets and accomplishments so far, of the PIM programme and an outline on the financial implications in implementing the transfer programme also forms the content of Section 3. Section 4 briefly explores the challenges identified in the analysis and seeks out possible solutions to sharpen the instrument – participatory irrigation management programme and to narrow the distance of the open scissor blades. Section 5 presents the summary.

2 A Heuristic Framework

It is important to note that the justification for IMT or PIM lies in seeking not only improved water management but also an effective implementation of India's rural development strategy in order to meet the increasing strain posed by the rapidly growing population and consumption of resources. The turnover of irrigation management to end-users is significant because it coincides with the wider reform measures initiated by the Government of India and several states that aim at reducing governmental controls and subsidies. In rural India, the reform and

revitalization of rural development are unlikely to succeed unless they reach and evoke a response from millions of cultivators long dependent on government administration.

The present analysis on the irrigation management transfer programme is situated at the intersection of a number of literatures. The literature on decentralization of development initiatives includes work by Dreze and Sen (1995), Bardhan (1996) and D. Korten (1990). These works focus on the challenge of getting decision-making control out of the hands of government bureaucrats and into those of end users. They highlight the importance of providing incentives and requiring contributions in order to stimulate participation and a sense of ownership both at the individual and community levels.

The literature on the management of common property resources provides a wealth of ideas and an array of problems that bear on community-based irrigation management. Ostrom (1992), Vaidyanathan (1999), Jodha (1992), Sengupta (1991), Shah (1993), and others have approached the 'tragedy of the commons' dilemma from a variety of perspectives and methodologies. The on-going debate on the issue of linking land ownership with water rights has not resolved the problem of multiple claims on water exercised by those who want it for uses other than crop cultivation, such as home consumption, animal, urban and industrial use, power generation, etc. Little has been written about the fact that village communities inevitably find themselves nested in a wider context of powerful stakeholders for all of whom the state must find accommodation and how the community based institutions would deal with competing claims.

Under the irrigation management transfer policies new rights are conferred on stakeholders. But, in most cases clarity on what constitute a ‘right’ is absent. Legitimizing the 'rights' of hitherto marginalized users as well as those who have traditionally enjoyed water rights brings to the fore conflicts of interest and also managerial problems (Bruns and Meinzen-Dick, 2000). In addition to existing irrigators’ *rights* (*sic*) there is a new focus on the rights to users such as municipalities, industries, etc. Thus resolution of which uses get priority must be undertaken.

What does a "community" means in large-scale canal irrigation systems? Even within a WUA, in many cases its jurisdiction varies from one village to as many as ten. In Andhra Pradesh, a number of WUAs (roughly, six to ten) make up a

Distributory Committee and about eight to ten Distributory Committees would make up a Project Committee, when formed. Thus, the "community of water users" in a particular village is integrally part of larger communities defined by different hydraulic levels within the same basin. When reference to a "community of water users" is made under PIM however, one should recognize that they may have a common interest in, or may be in conflict over the use of the resource. Therefore the proponents of decentralization must confront the issue of how this community of heterogeneous groups would treat the marginalized groups within this community such as, women, disadvantaged castes or tribes, tenants, the land-poor and the landless. The vast literature on India's rural sociology has developed several new foci: gender and equity analysis Agarwal (1994), Meinzen-Dick et al (1997), Shiva (1988), Mosse (1994), Moench (1998), van Koppen (1998; 2002), Zwarteveen (1997), the political-economy of caste relationships and mobilization Kohli (1987; 1990), Mendelsohn and Vicziany (1998) as well as changes in land and labour use patterns in the post-liberalization era Agarwal (1994), Bhalla (1976), Parthasarathy (1992). Within the field of irrigation management itself there is a substantial literature focused on community participation and conflict resolution (Chambers (1988), Chambers, Saxena and Shah (1989) Mosse (1994), Brewer et al (1999), Maloney and Raju (1994), Sengupta (1991) and Parthasarathy (1998; 2000; 2002).

Common property resource management is intimately linked with environmental analysis and there is a burgeoning literature that provides warnings regarding the overuse or misuse of water. The developmentalist school points to consumption imperatives and argues that environmental problems are amenable to innovative solutions. The protectionist school, including Gadgil and Guha (1992, 1995) and Agarwal and Narain (1997), argue that it is local citizens, as heirs to a conservationist tradition, who are most likely to utilize their resources rationally and sustainably. The concern on the impact of PIM is on resource sustainability amidst increasing demands and usage. The irrigation literature provides ample evidence regarding the dangers of waterlogging and salination (e.g., Dhawan (1995), Merrey (1987), Joshi and Dinkar (1996)). The impact of IMT also requires an understanding of the engineering problems that arise in a dramatic change of water and land use. For example, in the new system, water is to be sold (ostensibly on a volumetric basis) to the village communities, which will require more complex measurement technology as well as administration of water rates that will make the system self-sustaining. Moreover, it is expected that the new irrigation will involve conjunctive use of both surface and groundwater that will require careful management if soil damage is to be mitigated. In general, a significant change in

water and land use invariably produces significant environmental consequences. As mentioned earlier, not only waterlogging and salination but also the overuse of fertilizer and pesticides usually associated with new "green revolution" technology may affect the long-range sustainability of the resource. The experience, however, is that the WUAs so far, have not shown an ability to cope up with this class of issues.

Water distribution and management are hardly a new phenomenon in India. The users are accustomed to traditional practices for allocating and utilizing the resource and for resolving conflicts over its use. Sengupta (1991), Agarwal and Narain (1997) and Vaidyanathan (1999) have shown how these practices decayed over time and how they deserve fresh attention even while modern technology and management methods are being implemented. IMT or PIM itself represents an attempt to adapt a tradition of community participation to a modern need, one that fits with the larger pattern of India's economic reforms. The policy documents, however, show no signs as to how the water user communities can use the Water Users Associations as a bridge from old to new management techniques.

3 PIM in India: A Historical Account

From the beginning of 20th century, efforts have been made to encourage farmers to participate in irrigation management to improve the performance of the system. Way back in 1938, the Irrigation Inquiry Committee, referring to the under utilization of irrigation in the erstwhile Bombay state had recommended farmers' participation in management. Subsequent Irrigation Commissions formed in 1947, 1960 and 1972, the National Water Policy of 1987 and the Committee on Pricing of irrigation Water (1992) have also stressed the need for farmers' participation in irrigation management.

The national water policy formulated in 1987 highlighted that efforts should be made to involve farmers progressively in various aspects of management of irrigation systems. Later, all the State Governments were requested to take up farmers' participation in at least one minor comprising 100-2000 ha of area in each project as a beginning. However, very few state governments responded to this proposal. The India Irrigation Sector Review by the World Bank in 1991 observed that while central government policy statements supported farmers

involvement in irrigation management little was actually done at the field level and much of what was done was promoted by NGOs.

In 1992, a Committee on Pricing of Irrigation Water reviewed the PIM progress and observed that the area covered under PIM was less than one per cent; while the outlet and canal committees are non-existent and their functions were vague. There was also no cooperation from and coordination with the irrigation department. The committee suggested as a first step, a substantial reduction in the sphere of responsibility of the government and encouragement of user groups to take over maintenance, management of water allocation, and collection of water rates for a group of outlets serving at least a village[1].

Recent efforts to promote PIM had begun in most states in 1970s. By then, it had become clear that there was a big gap between the irrigation potential created and the potential realized. Agricultural specialists had suggested that there was a need to pay more attention to portions below the outlet to improve water use efficiency. In response, a Command Area Development Programme (CADP) was launched in 1974. Under CADP, attempts were made to organize farmers at outlet level to form organizations. These organizations or committees were confined to outlet command and were made responsible for distribution of water within the outlet command. In most states, however, these committees were not effective because rights and responsibilities of these committees and of the irrigation department were not clearly defined. The programme also witnessed resistance from irrigation department functionaries. Lack of institutional framework and legal back up and lack of motivation among irrigation officials have also been reported as major constraints. After the adoption of the National Water policy in 1987, several states enacted or are in the process of enacting irrigation laws with emphasis on Irrigation management transfer. However, as discussed above there are many constraints in the course of implementation of the PIM programme.

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[1] In the January 1997 National Conference, MOWR officially recognized the imperative need of paradigm shift in irrigation management in the country. Following this, MOWR once again urged all states to set up a working group under the chief secretary; appoint a senior officer of rank not less than joint secretary to exclusively look after PIM; set up pilot projects; Prepare an action plan for training; spread awareness about PIM; give priority to rehabilitation in PIM etc. However, this time too, the states' response has been lukewarm.

3.1 Progress of PIM & Performance of WUAs

The analytical focus of IMT or PIM therefore has come to rest on the capacity of the new community-based institutions; the Water Users Associations located in a specific basin, to manage the allocation of a key resource – water; effectively, equitably and sustainably. The central process involved is irrigation management transfer whereby water users in the community assume a responsibility that has hitherto been exercised by the government. An analysis of this process requires a synthesis of several theoretical ideas highlighted in the literature discussion above. These include decentralization, community, participation, equity, rights, common property resource management, work and productivity, environmental impact, community and individual empowerment and institutionalization. Clearly, the common thread that runs through all of these concepts is institutionalization in the new sense of the word that embraces the development of new capacity, new norms of behaviour and a new consciousness of shared responsibility, in this case with reference to communities and their role in the management of a vital resource.

However, the initial conditions that led to a thinking of transferring the management from government departments to users are not only difficulties in water retailing but also the upkeep of the canal system at various levels - from reservoir to field channels. How then the key variable can only be institutions and the related process of institution building? Further, Institutions may be regarded as a dependent variable insofar as they in this case the WUAs, are molded by forces that are both external (e.g., government decentralization policy, capacity building measures by NGOs) and internal (participation, leadership, community needs). But the WUAs, once launched, themselves become independent variables shaping the effectiveness of the PIM program and its implementation, provided they are linked together. Key elements, such as productivity, rights, equity, and, conflict resolution depend on the successful operation of the WUAs.

To understand the performance of WUAs it would be useful to have an overview on the progress of PIM programme in different states of India. Overall, the irrigated area transferred to WUAs in India is about 14 per cent as against 45 per cent in Indonesia, 51 per cent in Mexico, 66 per cent in Philippines, 22 per cent in Thailand, 35 per cent in Turkey and 19 per cent in Sri Lanka. There are considerable variations between the states (Table 1) and within a state, between irrigation systems. It is evident that the progress of PIM in almost all the states has been tardy. While some states like Andhra Pradesh, Madhya Pradesh and

Chattisgarh, have adopted an Act and made *participatory* management *compulsory,* others for instance, Gujarat and Tamil Nadu, have through incentives and NGO support tried to build grassroots consciousness toward water users associations (For details on PIM in Gujarat, see Parthasarathy, 2000). Currently, however, states in the latter category like Gujarat are also in the process of enacting legislations that would make PIM the only way to manage irrigation water! Gujarat for example, has traditions of user cooperatives and offer interesting lessons from its pilot phase of PIM programme that commenced in 1996[2].

3.2 Targets and Achievements

Irrespective of the policy frame for implementation of participatory management - building irrigation management transfer from grassroots or through a legislative Act; targets, stated or otherwise, are an inevitable part of the programme[3]. As mentioned, most systems whether large or small, have serious problems relating to water distribution and use-efficiency. Therefore, just a shift in the responsibility of the day-to-day management could be a necessity but certainly not a sufficient condition to improve the performance of the system. Further, the evolution of water distribution protocols that are temporally or spatially sensitive cannot be achieved in the short run, unless enabling environment is created (for a discussion see section, water rights). Given these constraints, the slow physical achievement of management transfer programme (Table 1) in its six years of existence is explicable.

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[2] Following a seminar at Water and Land Management Institute (WALMI), Anand in 1994 a Government Resolution in July 1995 authorized the creation of 13 pilot projects in different major and minor irrigation projects. The implementing agency in six projects was an NGO; in the remainder, government officials undertook the transfer programme. The main feature is a gradual approach. The PIM in Gujarat envisaged a complete turnover of O & M to a WUA (called as *piyat mandali*), even as the canals remained government property and major repairs continue to be the responsibility of the irrigation department. Thus, the day-to-day functioning of the system passed on to the users associations.

[3] Partly, this practice could be traced to the traditions of the government method of management (however, NGOs are no also exception as they too have internal or donor recommended targets to achieve) and partly to the fact that targets facilitate monitoring.

In the case of Gujarat for example, the target set for the PIM programme in 1997 was to 'turn over' 50 per cent of the 1.5 million hectares of command area of its extant irrigation schemes to WUAs by the year 2003[4].

Table 2 shows the area under PIM and area transferred to WUAs in two contrasting schemes. First is the case of Dharoi that is water scarce and the second is of Ukai-Kakrapar, a relatively water-abundant project. It is obvious that in the water scarce system, the proportion of area transferred to WUAs to the total command area is higher than in the water abundant system. The scissor shaped curves of target and achievement (Figure 1) shows a sharp divergence in the area covered in Ukai-Kakrapar command. From 1996-97 onwards the physical achievement of PIM in transferring management to the users through forming WUAs has been on a steady decline, while the targets rise sharply. As expected, the rate of anticipated growth in transfer of areas to WUAs by the department and the growth rate of actual transfer is interesting too (Figure 2).

Similar to Dharoi project, in Ukai-Kakrapar command too, the bulk of WUAs formed is in the tail reaches. The reasons for this skewed distribution is apparent. First, as mentioned earlier, the transfer programme has been one of managing day-to-day administration of water with little influence on supply. Secondly, the distribution rules are so traditional and invariably fixed by the department there is, therefore little scope for the WUAs to innovate and redesign the water rotation schedules. There are some notable exceptions of course. Thalota WUA in Dharoi command area in North Gujarat was formed with the help of Development Support Centre (DSC), a NGO based in Ahmedabad. Thalota used its water rights to introduce a new rotation during the first dry year when water scarcity was severe. Under this schedule, each farmer got water for one acre of land, irrespective of the total cultivated area. This ensured a minimum water supply for all. While this methodology might be appealing from distribution-based-equity point of view it surely has tradeoff with the objective of maximizing productivity and production. Third, it is relatively easier for a WUA to distribute a limited and fixed quantity of water in a few numbers of watering (as is the case with Thalota) than arranging distribution of variable quantity of water in large number of watering. Lastly, yet importantly, the PIM programme commenced with an objective of “improving the scarce resource” and hence its training programmes

[4] An additional 1.8 million hectares of land would be under the Narmada command over a period of time that is also to be brought under PIM.

and capacity building exercises have been geared toward water distribution and not water management. As a result, in head reaches or in areas endowed with relatively more water, neither there is enabling policy nor the WUAs have capacity to handle problems of drainage, waterlogging and other environmental effects. There is thus a huge divergence between the grassroots need and the policy provisions. Bringing this gap is one of the challenging areas before the transfer programme presently.

Obviously, the conception, adoption and implementation of the programme have two components. First, the administrative aspect wherein questions on the commitment, perceived loss of power among department staff when management is transferred are oft-cited reasons for the slowness in adoption and implementation of PIM programme[5]. Second is the aspect of the participants who take over the management. Though there are many evaluation studies on the performance level of users in the management (WUAs) or their readiness / reluctance in taking over irrigation management[6], there are very few attempts to illustrate as to why there is apathy among governments[7] in transferring the

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5 This is generally true for other people-centered programmes like watershed or joint forest management.

6 Many studies have tried to understand the level, extent and impact of participation of member-farmers and executive committee members in WUA activities and the formation of WUAs itself (see for instance, Brewer et. al., 1999, Parthasarathy et.al. 2001, van Koppen et.al. 2002). As office-bearers as well as elected/selected representatives of the member-farmers, participation of the committee members in the WUA activities is expected to be higher than the participation of ordinary members. However, the extent of participation of committee members, though varied, is very low. Partly, the composition of committee - generally dominated by large and affluent farmers is argued as reasons (Parthasarathy et.al, 2001 and van Koppen et.al., 2002). Interestingly, small and tenant farmers were found to be actively participating in the R and R works under the PIM programme in Andhra Pradesh. Tenant participation is negligible in Gujarat though small farmers were found be active in the R & R works. The strong stakes of tenants and small farmers in irrigated agriculture and their high dependency on canals are found to be reasons (see for details, van Koppen et. al. 2002). Among member-farmers, not only their participation in works and in decision-making process was low (Appendix Figure 1) but even their awareness about the WUA and its activities were of concern (Appendix Figure 2).

7 A Distinction should be made between the apathy of a government and that of the government staff. Generally the apathy among the staff is allegedly due to the fear of losing power, less scope for rent-seeking and corruption, etc. These aspects are

management and control to people. While it appears that the governmental indifference in implementation of the irrigation management transfer is due to the participatory approach, it is evident that there are obligations to be fulfilled by the government before transferring the system. In many cases, extensive repairs or renovation and in some cases modernization is required on the canal networks. For the whole of India, it is estimated that 21 million hectares of irrigated area from major and medium projects require renovation / upgradation / restoration. The total investment involved is estimated at Rs. 20,000 crores to Rs. 30,000 crores over a period of 20 years (Planning Commission, 2000). Indeed, repairs and rehabilitation is a prerequisite to improve the water use-efficiency, which at present is estimated to be only 38 percent to 40 percent for canal irrigation and about 60 percent for ground water irrigation schemes (Planning Commission, 2000).

The question then is whether and how much the states can spend additionally on repair and rehabilitation of the irrigation schemes to make them attractive for users to take over and subsequently manage. Obviously, this is a major constraint in the PIM programme in almost all the states of India. Tables 3 and 4 indicate the outlays and expenditure for major and medium irrigation schemes by center and states during the recent plan period. It is interesting to contrast these expenditures against the performance. The ultimate irrigation potential through these projects has been assessed at 58.46 million hectares, however only 32.95 million hectares could be created. Table 5 provides the details of the physical achievement of major and medium irrigation schemes during 1992-97 (eighth plan) and anticipated achievement up to 2000 (ninth plan). Evidently, most of the states could not utilize the potential created during the plan periods. To a certain extent, the low level of performance could be a dampener for the states to avail of institutional finance assistance like that of National Bank for Reconstruction and Development (NABARD) to the states for irrigation development under Rural Infrastructural Development Fund (RIDF) (Table 6). Clearly, funds made available by NABARD for irrigation sector in different installments show a decline[8].

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kept outside the purview of this analysis. However, apathy of a government could be due to various factors discussed.

[8] Overtime NABARD has increased priority for roads and other sectors.

The budget expenditure on irrigation of the states has steadily grown over the period 1985/86-1999/2000, though there are significant variations between the different regions of India (Figure 3). It is interesting to see that in some of the states where PIM is in progress (Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu and Gujarat) the budgetary expenditure has been either rising or the level is maintained in constant terms over the period 1988/89 – 1999-2000 (Figures 4 and 5). This implies that unless fresh avenues are found the scope for increasing the government allocation to meet the newer demands for funds due to PIM is limited.

The latest year for which the data are available (Figures 6 and 7) show that there are considerable variations in the per hectare expenditure of the budgetary amount among the states that have committed to PIM programme like Andhra Pradesh (Rs. 2294), Tamil Nadu (Rs. 729), Karnataka (Rs. 3268), Gujarat (Rs. 2255) and Maharashtra (Rs. 5471). Given the high commitment of funds already, it is not surprising that for newer programmes like PIM, not adequate funds could be earmarked nor was it feasible for the existing programmes, like command area development (CAD) programme or Accelerated Irrigation Benefit Programme to absorb the costs.

3.3 Financial Implications of PIM

The additional demands for the PIM programme essentially stem from repair and rehabilitation costs, plus software costs of training and capacity building within the department and of the office-bearers of the WUAs. With the help of World Bank assistance Rs. 118.1 crores (U.S $ 28.1 million) was provided in 1998 by the Government of Andhra Pradesh toward minimum rehabilitation works. This enabled the Government to spend approximately Rs. 250 per hectare on *actual* maintenance works excluding the staff salaries[9]. Not only the World Bank evinces keen interest in reverting the irrigation system management to users, there are other donors like, the European Economic Commission, OECF-Japan, k f w Germany, the Netherlands, UNDP, Canada and Germany. Details on these funding are given in Table 7. It is however, intriguing to observe the rate of utilization of these funds for different programmes by the state governments.

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[9] Prior to World Bank assistance, the government was allocating Rs. 99 per hectare for repair and maintenance works each year, out of which, Rs. 86.73 were used for paying irrigation department staff salaries and in meeting some fixed overhead costs.

One of the obvious difficulties has been the change brought about by some of the states in the traditional methods of implementation of irrigation programmes, for instance, construction of field channels and lining of the canal networks in WUA areas. Since long it has been assumed that the farmers in large systems would take up responsibility of construction of field channels and management below the outlet level (Stone 1984, Chambers 1988). However, the experience across different systems and across states in India disputes this. As a result, almost all governments experience shortage of funds to carry out the necessary repair and maintenance works of the systems prior to turnover. In some WUA areas in Gujarat, the actual cost of repair and rehabilitation work under PIM was Rs. 1485, Thalota and Rs. 3265, Digas (Table 8). Much of these expenses were due to lining of canals and construction of field channels. Assuming an average rehabilitation expenditure of Rs. 1797 per hectare on canals prior to turnover under PIM, a sum of Rs. 2695.4 million would be required to work on the existing 1.5 million hectares of command area in Gujarat (For details, see Parthasarathy, 2000). It is obvious that the budgetary provisions are already high in Gujarat and it is not clear how the PIM programme would be implemented at the state level.

The alternative to demands on government funds is recovering the costs through user charges. The experience so far, has been that the government has neither been able to ensure timely payments from the farmers nor was it able to charge an economic price for water. Also, the necessity of dealing with individual farmers has made water charge collection a costly exercise resulting in low recovery rate. In Gujarat for example the average annual recovery has been 65 percent of the total assessment and the total assessment for the year 1994 has been Rs. 12 crores. It is thus obvious that in whatever multiples the water charges are raised, it would cover only a fraction of the total cost of R&R and O&M expenses of the IMT programme. In fact, recovery as water charges constitutes only one-third of the total O&M expenditure in the current rates (for a detailed discussion, see Parthasarathy, 2000). Though water charges might constitute a small proportion of the total operation and maintenance of the canal network for the government, water charges is the important source of finance for managing the WUA. Obviously, the adequacy of this source of income depends on the WUA's ability to charge a rate that leaves enough balance after paying the charges to the irrigation department. Most of the WUAs in areas where irrigation department levies and collects the water charges have recognized the importance of charging a higher water rate than the government. However, where irrigation water fees are levied and collected by the revenue department as part of land tax

(like in Andhra Pradesh), the inclination for WUAs to even consider collection of water charges is remote, let alone charging a differential rate to generate surplus. Strangely, the PIM policy though provides liberty to the WUA to fix water rates there is little incentive (other than reimbursing 50 percent of government water rates to the WUA) for the WUA to actually embark upon what could be a potentially conflict-ridden decision.

Some of the WUAs formed in Gujarat have fixed new water rate that is higher than the department's (For a detailed discussion see, Parthasarathy 1999, 2000). What is of concern is that the analytic of pricing of water appears to be complex. Partly the complexity is due to the presence of other sources of irrigation in the command area and partly as result of the conventional view that water is not only a free good but also it is the government's responsibility to supply water to the fields. As mentioned, the PIM policy and the programme have focused on the water scarce areas/ system. However, in many cases, like in North Gujarat, the systems have rarely provided more than three watering even in winter seasons. It is therefore pertinent to analyze the relative importance of different sources of water. When analysed in a comparative framework, it is evident that the charges for canal water is based on area and crops, while the groundwater source charges on per watering basis. Thus, it is possible that when the number of watering from canal rises the utility value would increase and since the groundwater is costlier than canal waters, net gains in profits is also possible. However, farmers did not always view this in the strict profit or utility framework. This is because when the timeliness criterion is not met, the marginal utility of additional watering is not always positive. Therefore, an increase in additional water availability is only a necessary condition to test WUAs efficiency, the sufficient condition being efficiency in water distribution. This however, appears as a distant possibility, since the individual WUAs, formed in isolated portions of the command could do very little as far as supply of water is concerned. It is here the relevance of the discourse on common property resources is applicable and the issue whether the large-scale canal water management is amenable to user community management?

3.4 Susceptibility of WUAs to Variable Water Availability

The susceptibility of WUAs to water availability is partly due to lack of emphasis on federating them laterally. In most states, presently, there is an absence of linkage between any two WUAs in a given system (except in cases like Andhra

Pradesh where WUAs have been formed in all areas). Obviously, WUAs management of water supply is a function of the rate of utilization of water in other parts of a given system, especially in the head-reaches. For water management to be effective, the PIM programme has to address the issue of federations and their roles. Even in cases where WUAs have been formed in all areas of a system like Andhra Pradesh, the upper tier body of the federation namely, the Project Committee has not been formed. This is largely because of the political compulsions than economic compulsions of addressing the multiple demands from various stakeholders.

Given the fact that the canal irrigation accounts only for a part of the irrigated area say around 20 per cent of the irrigated area in Gujarat, most of the farmers do depend upon other sources of irrigation (Parthasarathy and Joshi, 2001). Unreliability of canal water even in water abundant areas has made farmers shift to more reliable sources of irrigation like tubewell, which ensures higher production. Many studies have shown that the output is higher with the use of groundwater rather than canal water (Dhawan 1990). In the context of the availability or the potential of other sources of irrigation in a canal command, particularly groundwater, the issue of multiple or conjunctive sources of irrigation becomes important. Yet, little planning and provisions are made even in Andhra Pradesh Act under which the irrigation management transfer is carried out at the local level by forming WUAs. In order to be efficient and sustainable, WUAs therefore, need to address this issue and the PIM policy and the programme should also offer an enabling environment both by providing information and technological support as well as a framework for use of conjunctive sources. Obviously then the PIM policy and the WUA formation should be positioned in a basin (or in cases irrigation project level) framework besides addressing issues below the outlet level like water distribution. This however, requires redefinition of some of the earlier thoughts and objectives of farmers' participation in the system management.

4. How the Scissor Blades Will Close?

4.1 Rationalizing Water Supply

As mentioned, most systems whether large or small, have serious problems relating to water distribution and use-efficiency. Therefore, just a shift in the

responsibility of the day-to-day management could be a necessary but not a sufficient condition to improve the performance of the system. Further, there is a need to evolve water distribution protocols that are temporally or spatially sensitive.

It is clear that the single most important factor that influences the performance of the WUAs – the crucial institution on which the PIM or IMT is built – is their susceptibility to the variable water supply and distribution rules. It is also well known that in order to obtain a favourable cost-benefit ratio at the project proposal stage almost all irrigation systems have an over estimated command area. To achieve a modicum of equity in water distribution it is therefore essential that the basic anomaly of distributing water equitably over an imaginary command area be corrected. In various systems, this is being tried out in a number of ways. One interesting method adopted, without limiting the command area is the rotational water supplies to different canal branches in different seasons / years. For example, the initial experiment in the cauvery system on command areas below Metur reservoir in Tamil Nadu and the recent one (2001-2002) in Dharoi in North Gujarat where the Left Bank canal network was provided with running supplies throughout winter season while the Right Bank network had a rotation period of fifteen days. There could be other methods too but all of them would necessarily take the form of rationalizing the supply of water, after taking in to account the growing demands for multiple uses.

4.2 Water Rights

So far in the PIM programmes, the issue of equity has not been adequately addressed. Almost always the issue of equity is construed as equivalent to addressing the problems of tail reaches in the command resulting in engineering solutions, like R& R works. Perhaps recognizing this inherent weakness, in some of the areas, WUAs effectively change the water distribution mechanism to appear effective. (The example of Thalota discussed above is a case in point). Some of the corrective methods being advocated however, look outlandish. For instance, supplying water first to the tail end portions of the canal and gradually serving the head reaches later. It is common knowledge that no farmer would wait to watch water flowing down the canal, sometimes more than three kilometers distance without appropriating. Even if this system is successfully adopted, increments in the water use-efficiency are doubtful on a sustained basis. To allocate water equitably among the cultivators in a command area,

however, is a question of more than addressing tail –end problems. A systematic way of addressing this issue is by recognizing the differences in water rights among the different landowners. Unless water is allocated by the WUA, adequacy of water remains an elusive problem. A right if defined as a recognized claim for water, cannot be guaranteed by the WUA presently, as the association has assumed responsibility only for distribution of water while the supply and allocation of water is still in the domain of the department. If so, what a right could imply is the question that has to be answered first.

It is indeed imperative that the sellers or distributors of water should formulate the rules of the game first. One example could be allocation of shares in the association or cooperative according to the land ownership in the command area. These shares could then be translated into number of watering depending upon the location of the plots, number of watering feasible in a normal year in different seasons and crop pattern envisaged in the plan. Thus, in a hypothetical situation, a farmer in the command area of an irrigation scheme that supplies four watering in a normal year for dry crops having a plot of one hectare land in normal topography could get 4 watering. Thus, one share in this case is equal to four watering. There are many possibilities for efficiency within this model. A farmer with smaller number of shares could decide to grow a higher water requirement crop and purchase the deficit portion of water shares. There could emerge water share market controlled or regulated by the WUA.

Admittedly, in such an eventuality the system appears to favour the large landowners. In the present system also this is true though, whether managed by the department or the WUA. Presently, a share in the WUA is only a membership to the association, which entails a vote and legitimacy to take part in the association's activities. It should be recognized that this membership does not provide a right to access to water or for its timely and adequate provision. In fact, as Figure 8 suggests that both in Andhra Pradesh and in Gujarat the location of plots of farm households in the different reaches of the canal portions are not random. In fact, the distribution suggests that large owners manage to have plots in the head and middle portions of the command and small owners in the tail end of the canal. This system is bound to impact upon the equity irrespective of who manages water distribution and therefore, newer institutions like WUA would have little interest to takeover and manage the system.

4.3 Financing of Turnover Programme

It is evident that there are obligations to be fulfilled by the government before transferring the system. In many cases, extensive repairs or renovation and in some cases modernization is required on the canal networks. The budget expenditure on irrigation of the states has steadily grown over the past two decades leaving little scope for demanding additional government funds. This implies that fresh avenues have to be found to meet the newer demands for funds due to PIM.

The additional demands for the PIM programme essentially stem from repair and rehabilitation costs, plus software costs of training and capacity building within the department and of the office-bearers of the WUAs. One of the avenues for fresh funds has been the bilateral agency and this has already been sought for by some of the state governments. In so far as these are in the form of loans, the outcome of the PIM programme does not seem to justify the cost of these funds.

The alternative to demands on government or borrowed funds is recovering the costs through user charges. But it should be recognized that this would cover only a fraction of the total cost of R&R and O&M expenses under the IMT programme; yet, water charges is the important source of finance for managing the WUA. Strangely, the PIM policy though provides liberty to the WUA to fix water rates there is little incentive (other than reimbursing 50 percent of government water rates to the WUA) for the WUA to actually embark upon what could be a potentially conflict-ridden decision.

4.4 Political Participation

In almost all states, the process of change toward PIM could be viewed as a process that was shaped significantly by the actions of individuals in strategic positions of influence. Conversely, where such change agents are absent, even the policy process has been slow to evolve and the implementation is in nascent stages. In both the situations however, policy makers and implementers on occasions faced opposition from within and outside the government while adopting the changes. The opposition from within the irrigation department was largely due to perceived loss of power as a result of decentralization of operations. In cases where there has been enthusiastic response, there was a palpable sense of helplessness due to lack of earmarked funds for the reform

measures (PIM) in states. Further, on the administrative side the differential response between policy formulators and implementers continue. This is partly due to separation between the decision-making and implementation that could be attributed to decision maker's own understanding of the influence of many factors like, political influence, vested interests, rent-seeking and so on. Formulation of policy and decision-making therefore should encompass not only the executive branch of the state but also the political arm. Given the peculiarity of the irrigation system and the conventional view of its role and impact on the society, it is indeed difficult to bring in reform without an explicit support of the political participation.

5. Summing Up

It was evident from the preceding discussions that the objects and accomplishments of the irrigation management transfer programme have been divergent with respect to many parameters that one analyses. Briefly;

a. area turned over to WUAs

b. awareness and capacity building measures of department staff and WUA office-bearers

c. extent of participation by office-bearers and level of awareness about PIM among WUA member-farmers

d. supply of water

e. conjunctive use of different sources of water

f. repair and rehabilitation works on the canal networks

g. budgetary provisions and finance allotted for the modernization and upkeep of irrigation system

h. water rates collection

i. evolving institutional mechanisms and legal provisions for an effective and efficient WUA management

j. emphasis on water management rather than water distribution.

All these objects have all fallen short of targets or desired levels or expectations outlined in the policy and various documents and studies. In fact all the components of the PIM programme and the irrigation sector resembled like the graph presented in Figure1 – an open pair of scissors, i.e. objectives and outcome moving in opposite directions.

The efficacy of users management of water resource is not in doubt; nor an argument is made for continued retailing of water by the government agencies. There is therefore a need to critically assess the shortcomings of the programme. This paper made an attempt in this direction. It is clear that there are critical areas the government, policy makers, various actors have to take note of. *Ceteris paribus,* this paper identifies four critical areas that appear to be necessary conditions for participatory approach in irrigation management transfer programmes to succeed.

Table 1: Target and Progress of PIM in Different States, India

State	Number of WUAs	Area Covered ('000. ha)	Net Irrigated Area ('000 ha)	Area Covered as % to Total Net Area
Andhra Pradesh	10292	4800.00	4395	91.6
Assam	2	1.00	572	0.17
Bihar	1	12.20	3624	0.34
Goa	39	4.59	23	19.96
Gujarat	476	19	3042	0.62
Haryana	554	110.80	2755	4.02
Himachal Pradesh	875	35	105	33.33
Jammu & Kashmir	1	1.00	313	0.32
Karnataka	193	138.38	2325	5.95
Kerala	3712	148.48	357	41.59
Madhya Pradesh (*)	1470	1495.00	6399	23.36
Chattisgarh (*)	946	1135.00	--	--
Maharashtra	142	55.80	2567	2.17
Manipur	62	49.27	65	75.80
Orissa	88	34.31	2090	1.64
Rajasthan	35	15.93	5588	0.29
Tamil Nadu	328	426.40	2892	14.74
Uttar Pradesh	1	0.25	11999	Negligible
West Bengal	10000	37.00	1911	1.94
Total (*)	29217	8519.41	Not available	14.93

Note: (*) Revised figures for Madhya Pradesh, Chattisgarh and total.

Source: 1. Mid Term Appraisal of Ninth Five Year Plan (1997-2002), GOI, Planning Commission, New Delhi, October 2000, P. 103

2. Statistical Abstract India 2000, Central Statistical Organization, Government of India, New Delhi.

Table 2: Distribution of Area under PIM by Location: Dharoi and Ukai-Kakrapar Project

(Area in Hectares)

Details	Head	Middle	Tail	Total
Dharoi Project				
No. of WUAs	**9**	**11**	**20**	**40***
Total command area of WUAs	2683 (25.5)	2819 (26.8)	5005 (47.6)	10507 100.0
IMT over	770 (14.1)	1543 (28.3)	3131 (57.5)	5444 (100.0)
Motivation and Registration	466 (14.2)	1138 (34.7)	1674 (51.1)	3278 (100.0)
Proposed	1447 (81.1)	138 (7.7)	200 (11.2)	1785 (100.0)
Total command area of the system				61,085
RBCCA to total command area of system (%)				78.7
IMT over to total command area of WUAs (%)	28.7	54.7	62.6	51.8
WUA command to RBCCA** (%)				**21.8**
IMT over to RBCCA (%)				11.3
Total command area of WUAs to total command area of system				17.2
Distribution of Area under PIM: Ukai Kakrapar Project				
No. of WUAs	**29**	**41**	**54**	**124**
CCA of WUAs (n=124)	8082 (17.7)	19408 (42.4)	18260 (39.9)	45750 (100.0)
Area under PIM (86)***	5906 (20.1)	11088 (37.8)	12349 (42.1)	29343 (100.0)
Area turned over (n=86)*	4114 (18.0)	8980 (39.2)	9803 (42.8)	22897 (100.0)
Area under PIM / total command area of WUAs	73.1	57.1	67.6	64.1
Area turned over / area under PIM	69.7	81.0	79.4	78.0
Total command area of the system	--	--	--	**3,31,557**
CCA / total command area of the system	--	--	--	13.8
PIM area / total command area of the system	--	--	--	8.9
Area turned over / total command area of the system	--	--	--	6.9

Figures in parentheses indicate percentage to total

* Includes WUA on Right Bank Canal Command Area (RBCCA) only. There are few proposed WUAs in the LBMCC like Lihoda, Pinchod, Unjha but the area covered under these WUAs are not known.

** RBCCA: Right Bank Canal Command Area

*** There are 38 proposed WUAs in Ukai-Kakrapar Project. Therefore details about the area under PIM and turned over are not available.

Source: 1 Data on Dharoi Irrigation Project were obtained from Dharoi Division Office, Visnagar and Development Support Centre, Ahmedabad.

2 Data on Ukai-Kakrapar Project were obtained from Surat Irrigation Circle, Surat.

Table 3: Financial Outlays on Irrigation Sector (First Three Years) of Ninth Five-Year Plan: Central Sector

(Rs. Crores)

Details	9th Plan Outlay	Actual Expen-diture 1997-98	Actual Expendi ture 1998-99	Outlay 1999-2000	Total 1997-2000 (3 years)	%outlay in first three years w.r.t. 9th plan outlay
Major and Medium irrigation	330.12	36.72	49.03	55.80	141.55	43
Minor irrigation	385.00	42.84	48.29	55.41	146.54	38
Command Area Development	860.00	129.26	174.90	177.00	481.16	56
Flood Control	716.13	67.17	74.57	81.79	223.53	31
Total	2291.25	275.99	346.79	370.00	992.78	43

Financial Outlays on Irrigation Sector (First Three Years) of Ninth Five-Year Plan: State Sector

(Rs. Crores)

Details	9th Plan Outlay	Actual Expenditure 1997-98	1998-99 Revised Outlay	Approved Outlay 1999-2000
Major and Medium irrigation	42629.22	7523.16	9273.12	12228.81
Minor irrigation	8977.03	1456.59	1746.81	2117.79
Command Area Development	2032.11	303.43	303.60	315.39
Flood Control	2212.12	351.87	573.21	662.36
Total	55850.48	9635.05	11896.74	15324.36

Source: Mid-Term Appraisal of Ninth Five-Year Plan (1997-2000)

Table 4: Plan Outlays and Expenditure for Major and Medium Irrigation Projects during the Ninth Plan

(Rs. Crores)

Year	Central Sector		State Sector	
	Approved Outlay	Actual Expenditure	Approved Outlay	Actual / Anticipated Expenditure
9th Plan	330.12	-	42629.22	--
1997-98	44. 69	36.72	8362.91	7523.16
1998-99	50.25	49.03	10024.03	9273.12
1999-2000	55.80	48.12	12228.31	11002.42

Source: Mid-Term Appraisal of Ninth Five-Year Plan (1997-2000)

Table 5: Major and Medium Irrigation Schemes: Physical Achievement During Plan Periods

(000' ha.)

States and U.T	Ultimate I Rrigation Potential	Achievement to end of March 1992		Achievement during 1992-97		Achievement upto March 1997		1997-98 Achievement		1998-99 Anticipated Achievement	
								Major & Medium		Major & Medium	
		Poten-tial	**Uti-lised**	**Poten-tial**	**Uti-Lised**	**Poten-tial**	**Uti-lised**	**Poten-tial**	**Uti-lised**	**Poten-tial**	**Uti-lised**
Andhra Pradesh	5000	2999.0	2847.0	46.10	36.80	3045.10	80	76.52	12.10	116.17	158.79
Arunachal Pradesh	0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Assam	970	176.0	111.0	20.67	27.17	196.67	138.17	4.20	2.00	1.30	1.00
Bihar	6500	2766.0	2295.0	36.50	29.20	2802.50	2324.20	4.33	4.33	27.10	22.10
Goa	62	13.0	12.0	0.02	0.07	13.02	12.07	3.50	1.00	0.02	0.02
Gujarat	3000	1246.0	989.0	104.00	214.00	1350.00	1200.00	17.14	20.62	16.08	20.00
Haryana	3000	2035.0	1791.0	43.79	42.62	2078.79	1833.62	1.66	1.66	3.49	3.49
Himachal Pradesh	50	8.0	4.0	2.55	1.59	10.55	5.59	0.30	0.15	0.15	0.34
Jammu & Kashmir	250	158.0	136.0	15.70	11.57	173.70	147.57	2.07	2.62	0.22	2.86
Karnataka	2500	1377.0	1192.0	289.02	279.70	1666.02	1471.70	45.44	36.35	35.17	35.17
Kerala	1000	416.0	367.0	97.31	97.31	513.31	464.31	32.23	30.61	14.00	14.00
Madhya Pradesh	6000	1962.0	1395.0	355.60	225.95	2317.60	1620.95	32.00	23.30	20.70	10.30
Maharashtra	4100	2030.0	1036.0	307.00	251.17	2337.00	1287.70	151.00	150.00	187.00	187.00
Manipur	135	59.0	50.0	4.00	2.00	63.00	52.00	1.00	1.00	12.00	10.00
Meghalaya	20	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97
Mizoram	0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nagaland	10	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Orissa	3600	1409.0	1326.0	148.75	116.66	1557.75	1442.66	34.57	54.14	40.39	191.30
Punjab	3000	2367.0	2309.0	145.86	142.25	2512.86	2451.25	12.62	22.85	5.01	5.01
Rajasthan	2750	1999.0	1887.0	274.88	201.39	2273.88	2088.39	58.90	46.46	11.50	98.70
Sikkim	20	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamil Nadu	1500	1545.0	1541.0	0.51	4.49	1545.51	1545.49	2.18	2.18	0.00	0.00
Tripura	100	2.0	2.0	0.30	0.30	2.30	2.30	0.85	0.85	0.20	0.80
Uttar Pradesh	12500	6789.0	5751.0	254.00	363.00	7043.00	6114.00	129.00	33.00	112.00	75.00
West Bengal	2300	1353.0	1258.0	79.68	57.28	1432.68	1315.28	53.41	43.22	50.00	40.00
Total States	58367	30709.0	26296.0	2226.24	2105.05	32935.24	28401.05	662.92	488.44	652.50	876.85
Total States & UTs.	58465	30724.0	26303.0	2229.75	2107.34	32953.75	28410.34	663.02	488.84	652.50	877.40

Note: The physical achievements during Eighth Plan as above are anticipated and are likely to change.

Source: Source: Mid Term Appraisal of Ninth Five-Year Plan (1997-2000)

Table 6: Rural Infrastructure Development Fund: Purpose-Wise Disbursements (As on 25.02.99)

(Rs. Crores)

Details	RIDF-IV	RIDF-III	RIDF II	RIDF I
Corpus	3000.00	2500.00	2500.00	2000.00
Sanctions issued	3118.28	2671.28	2597.76	1797.63
Type of projects				
Major irrigation	317.37	223.88	412.51	227.73
Medium irrigation	170.96	203.99	237.28	838.88
Minor irrigation	436.67	512.68	581.15	616.36
Total	925.00	940.15	1230.94	1682.97

Source: Mid Term Appraisal of Ninth Five-Year Plan (1997-2000)

Table 7: Details on Bilateral Assistance for Irrigation Development Received and Utilized

Sl. No.	Name of the Project	State	Date of Commen Cement	Date of Completion	Amount of Assist-ance	Utilisation of Assist-ance Upto 31.12.98	Col. 8 as per cent to Col 7
1	2	3	4	5	6	7	8
Assistance from the European Economic Community							
1	Tank Irrigation System (Ph II) in Tamil Nadu	Tamil Nadu	24.07.89	31.12.99	24.5 (ECU Million)	19.787	80.7
2	Kerala Minor Irrigation Project	Kerala	21.05.92	31.12.2000	11.8 (ECU Million)		23.5
3	Sidmukh and Nohar Project	Rajasthan	0.706.93	31.12.2000	45.0 (ECU Million)		72.8
4	Orissa Minor Irrigation Project	Orissa	03.07.95	31.12.2004	10.70 (ECU Million)		0.04
5	Tank Rehabilitation Project Pondicherry	Pondicherry	21.02.97	31.12.2003	6.650 (ECU Million)		--
United Nations Development Programme Assistance							
1	Automatic Operation of Irrigation Canal System	CWPRS, Pune	--	--	0.691		--

Japan							
1	Modernisation of Kurnool Cuddapah Canal	Andhra Pradesh	11.01.96	26.03.2003	16049 (Million Yen US$M)	90.01	0.6
2	Rajghat Canal Major Irrigation Project	Madhya Pradesh	25.02.97	31.03.2003	13222 (Million Yen US$M)	438.700	3.3
3	Rengali Irrigation Project	Orissa	12.12.97	05.02.2003	7760(Million Yen US$M)	644.322	8.3
France							
1	Hydroplus Fusegates on 8 Dams in Gujarat	Gujarat	10.12.98	10.12.2000	FF17.85 M	--	--
Netherlands							
1	Community Irrigation Project	Kerala	15.12.93	30.06.2000	DFL 11.02 M	DFL 1.39 M	12.6
2	Bundelkhand Integrated Water Resources Management Project	Uttar Pradesh	12.06.96	31.05.99	DFL 13.388M	DFL 1.352 M	10.1
Canadian Assistance							
1	Rajasthan Agriculture and Drainage Research Project (RAJAD)	Rajasthan	13.03.90	31.12.99	C$ 60.76 M	C$ 7.887 M	13.0
Germany							
1	Rajasthan Minor Irrigation Project	Rajasthan	29.04.87	31.12.98	2.70	DM 1.635 M	60.6

Source: Mid Term Appraisal of Ninth Five-Year Plan (1997-2000)

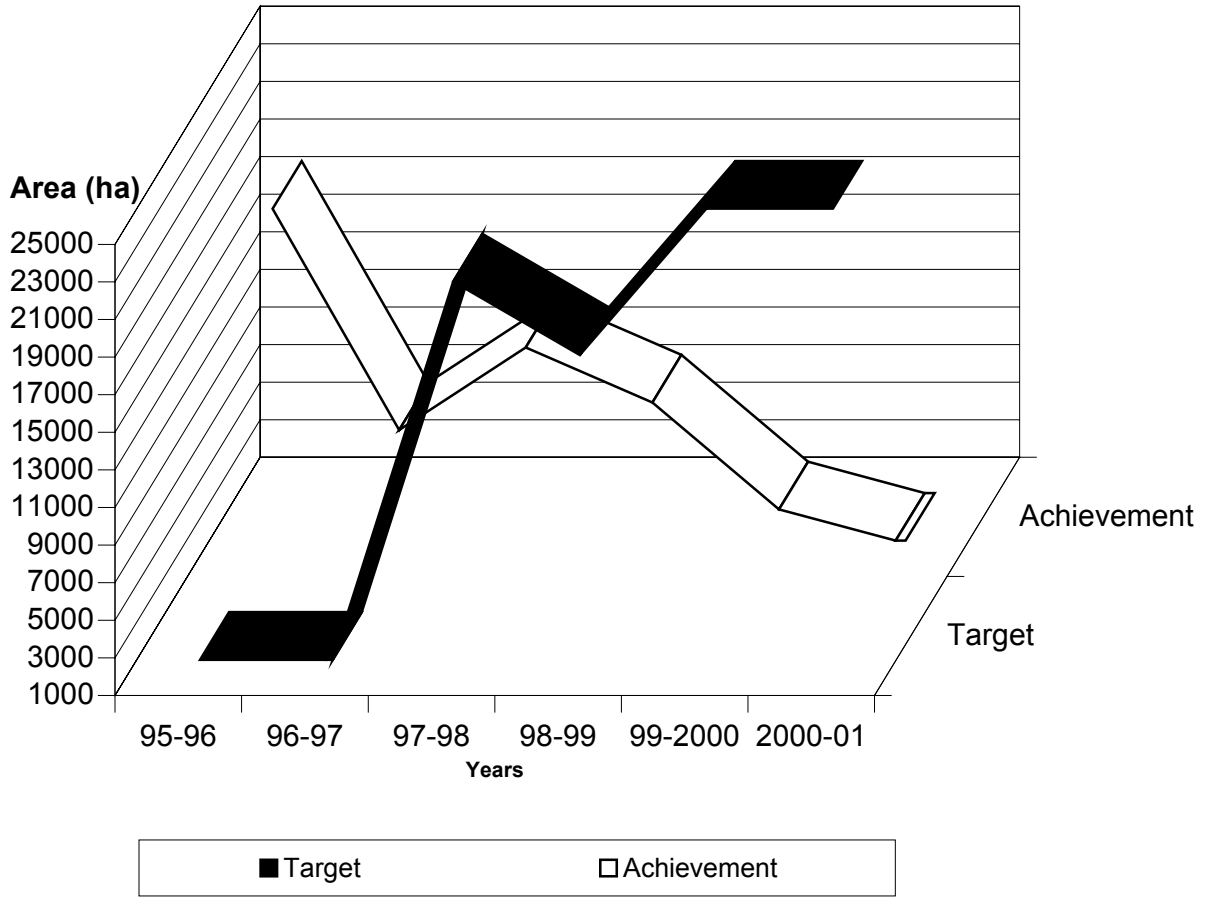
Table 8: Estimated Cost and Expenditure on R&R Work by Projects and Systems in Gujarat

Details	Thalota	Tranol	Kunjrav	Laxmipura	Digas	Chandrawadi
Name of the irrigation system	Dharoi	Mahi	Mahi	Dantiwada	Ukai-Kakrapar	Chandrawadi
Total command area of the system	61,085	212,000	212,000	45,755	331,557	--
Total command area of the project	224	356	296	246	921	463
Total no. of benefiting households in the project area	216	334	425	151	432	222
Initial cost estimate for R&R (1995-96)	1,24,050 (dept) 2,59,000 NGO)	10,01,817	398,240	9830	NA	22,53,839
Revised cost estimate for R&R (March 1999)	--	--	--	100,000	--	35,33,532
Actual expenditure up to March '99	332,546	7,48,475	343,100	10,000	30,07,379	14,88,134
Cost per ha. (as per estimate)	1156	2814	1345	407	--	7632
Cost per ha. (as per expenditure)	1485	2102	1159	41	3265	3214
Cost per household (estimate)	1199	2999	937	662	--	15917
Cost per household (Expd.)	1540	2241	807	66	6962	6703
% Difference between revised estimate and initial cost estimate	--	--	--	1017	--	157
% amount spent to initial cost estimate	128	75	86	102	--	66
Projected expenditure for R&R for 50 per cent of the command area (based on cost per ha) in Rs. '000.	3530	--	220480	9311	541268	NA

Source: Parthasarathy. R (2000)

Figure 1

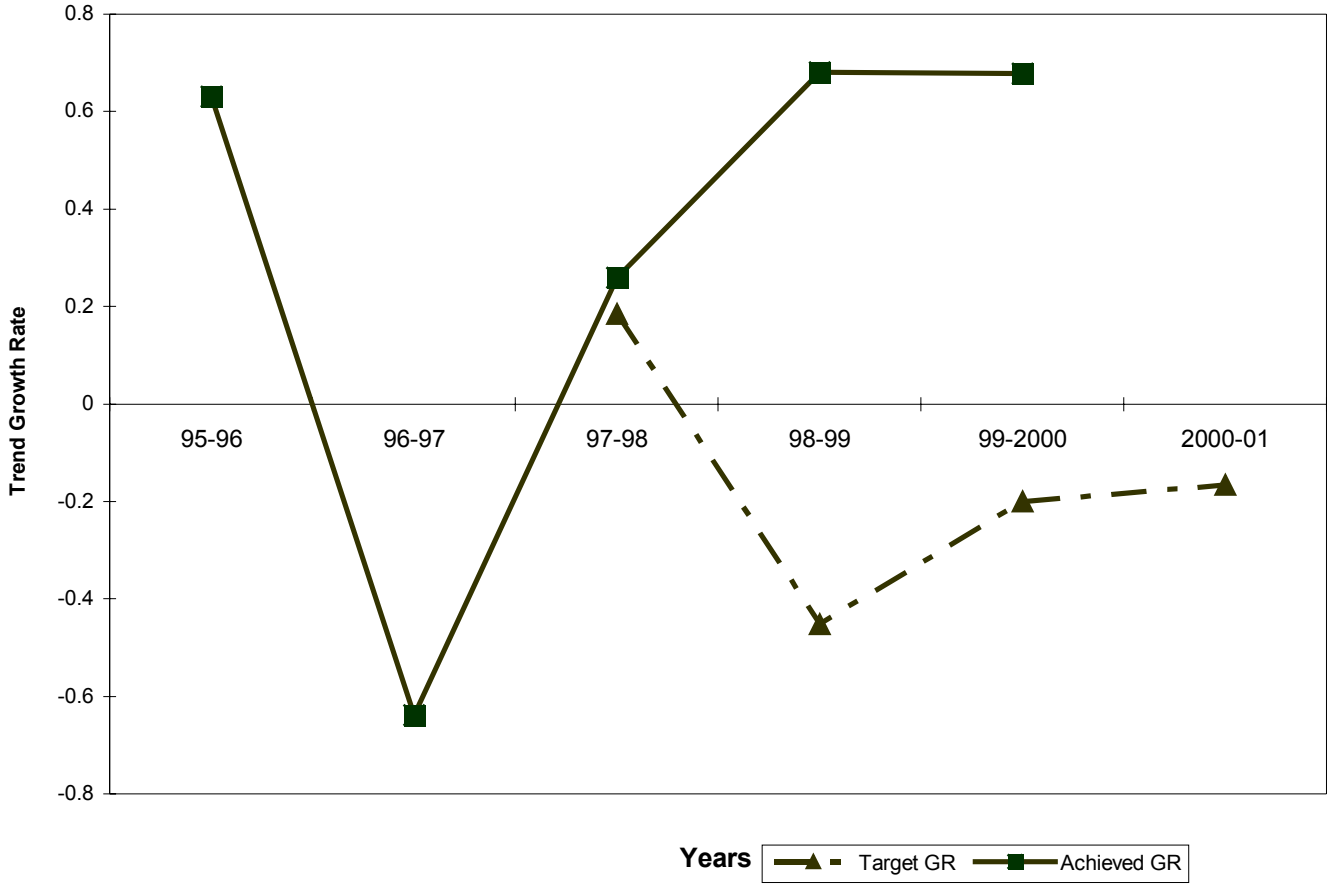
Distribution of Area Covered Under P.I.M: Ukai Kakrapar Project



Source: Surat Irrigation Circle, Surat.

Figure 2

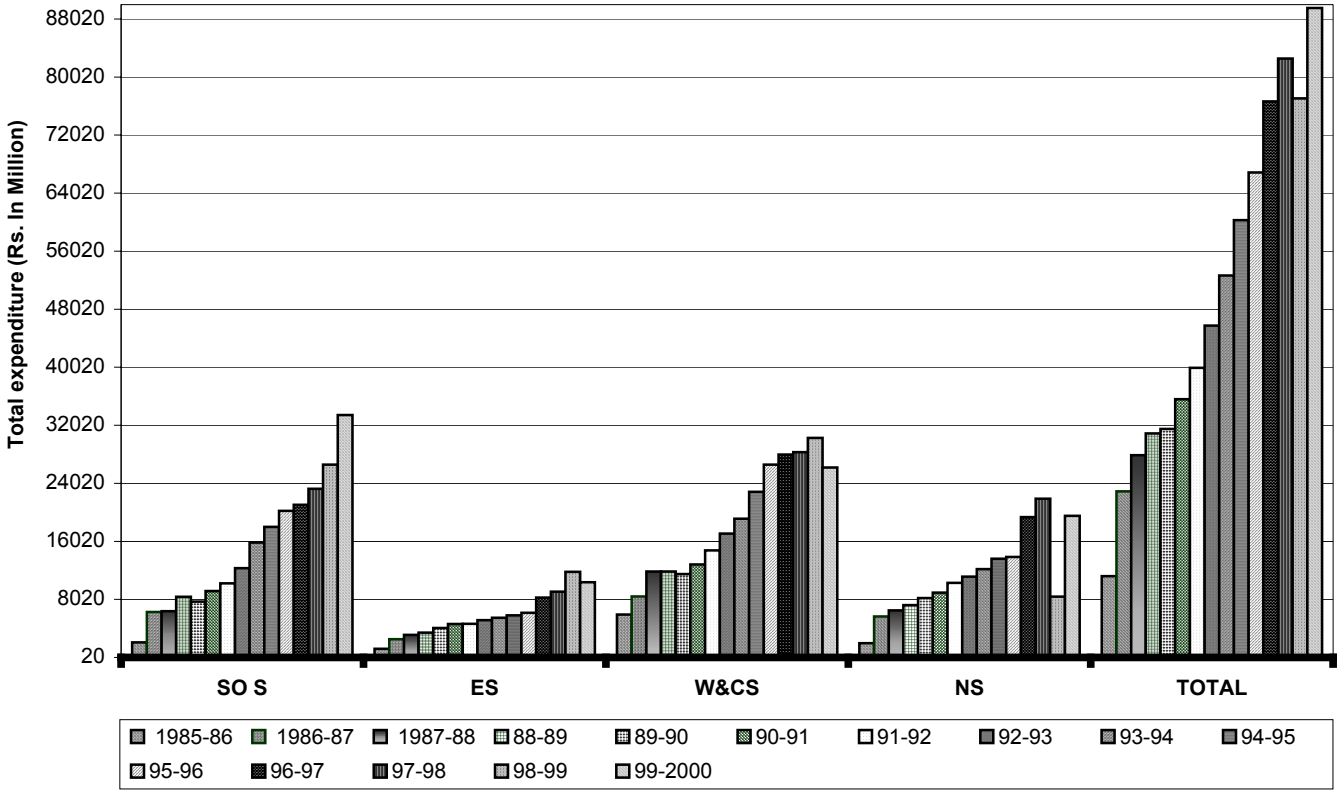
Trend Growth Rate of Targets and Achievements in Ukai Kakrapar Project: 1995-96 to 2000-01



Source: Surat Irrigation Circle, Surat

Figure 3

Total Expenditure on Irrigation and Flood Control by Major States of India, 1985-86 to 1999-2000

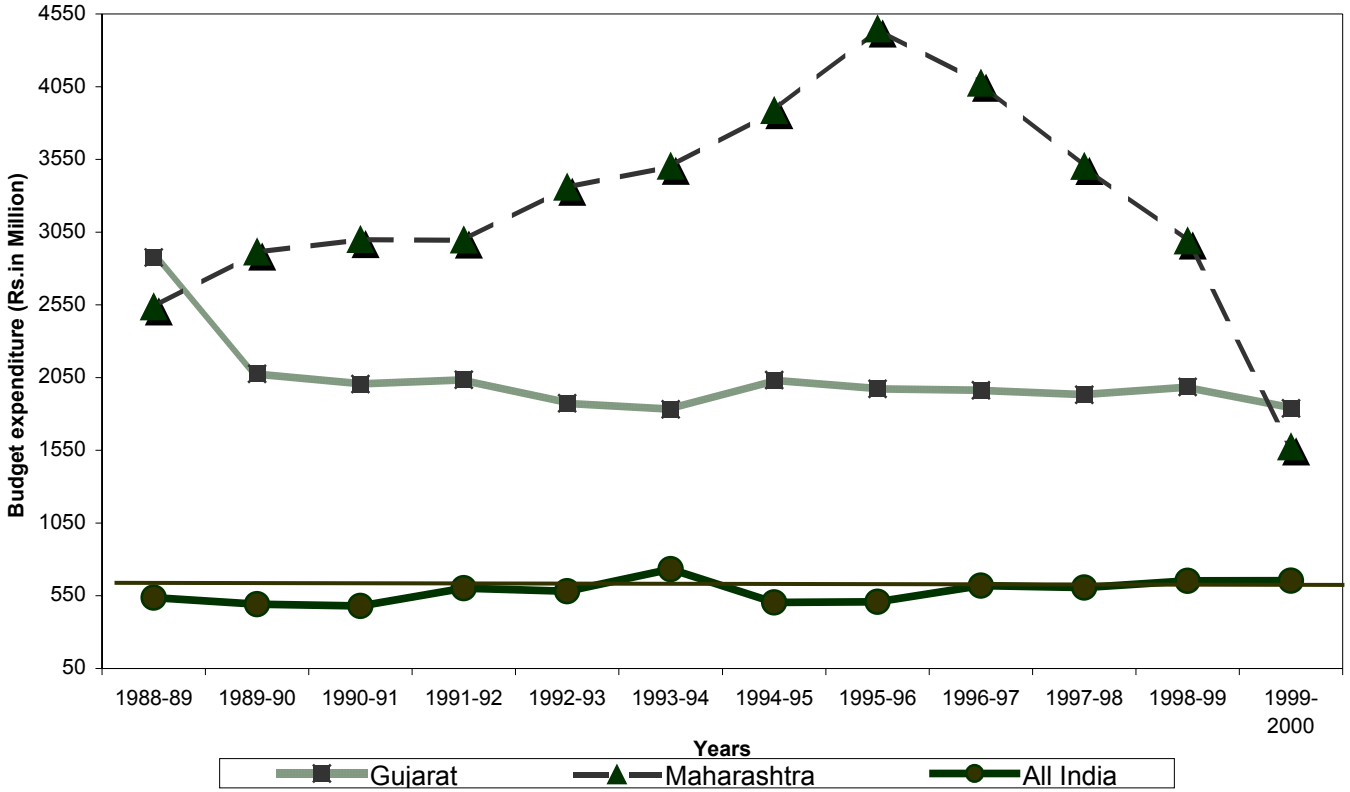


Note: For the year 1985-86 to 1998-99, revised estimate figures on Irrigation and Flood Control have been used. For the year 1999-2000, budget estimate figures were used.

Source: Different volumes of States and Government of India budget.

Figure 4

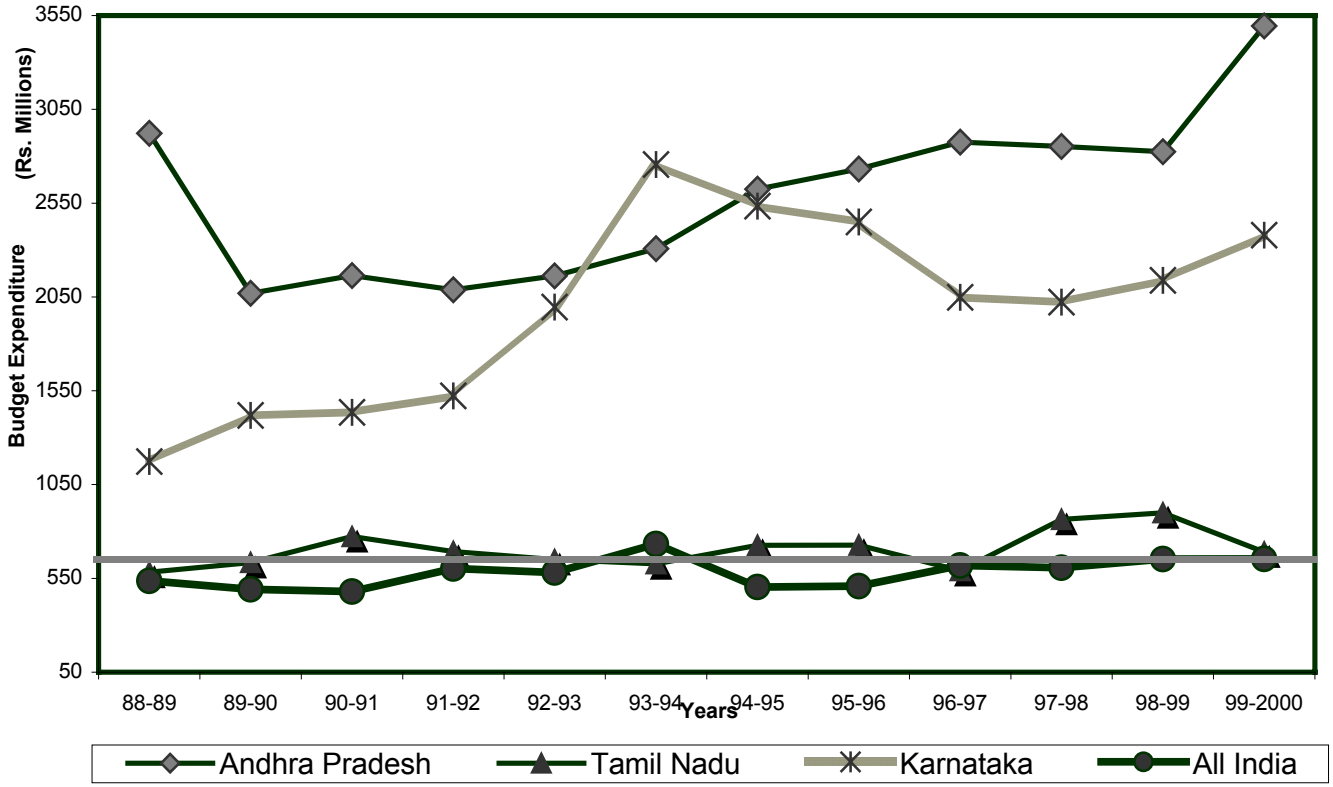
Budget Expenditure on Irrigation and Flood Control for Major Western and Central States at Constant Prices (Base 1988-89 = 100) from the Year 1988-89 to 1999-2000



Note: For the year 1988-89 to 98-99, revised estimate figures of expenditure on Irrigation and Flood Control have been used.
For the year 1999-2000, budget estimate figures have been used.
Source: Different volumes of States and Government of India budget.

Figure 5

Budget Expenditure on Irrigation and Flood Control for Major Sourthern States at Constant Prices (Base 1988-89 =100) from the Year 1988-89 to 1999-2000

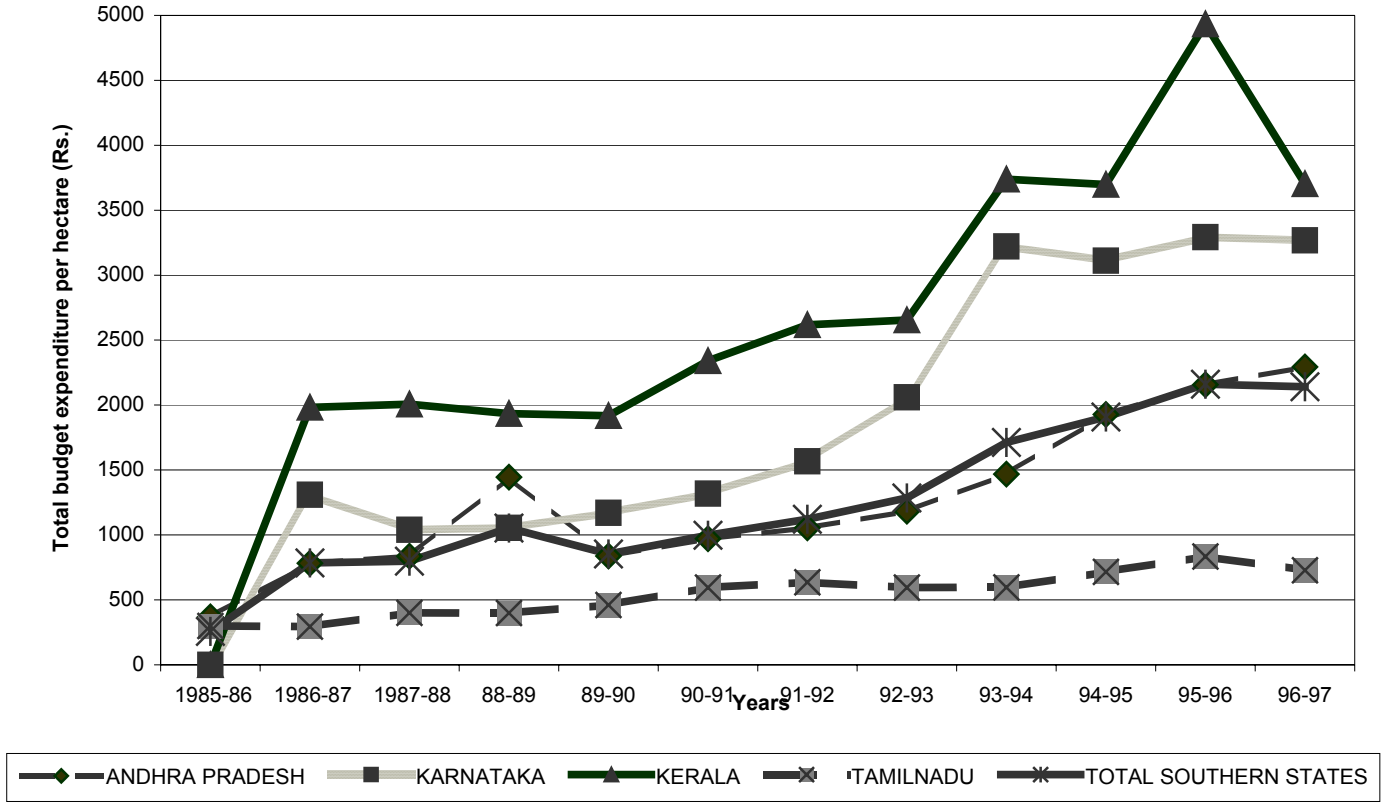


Note: For the year 1988-89 to 98-99, revised estimates figures of expenditure on Irrigation and Flood Control have been used. For the year 1999-2000 figures of budget estimates have been used.

Sources: Different volumes of States and Government of India budget.

Figure 6

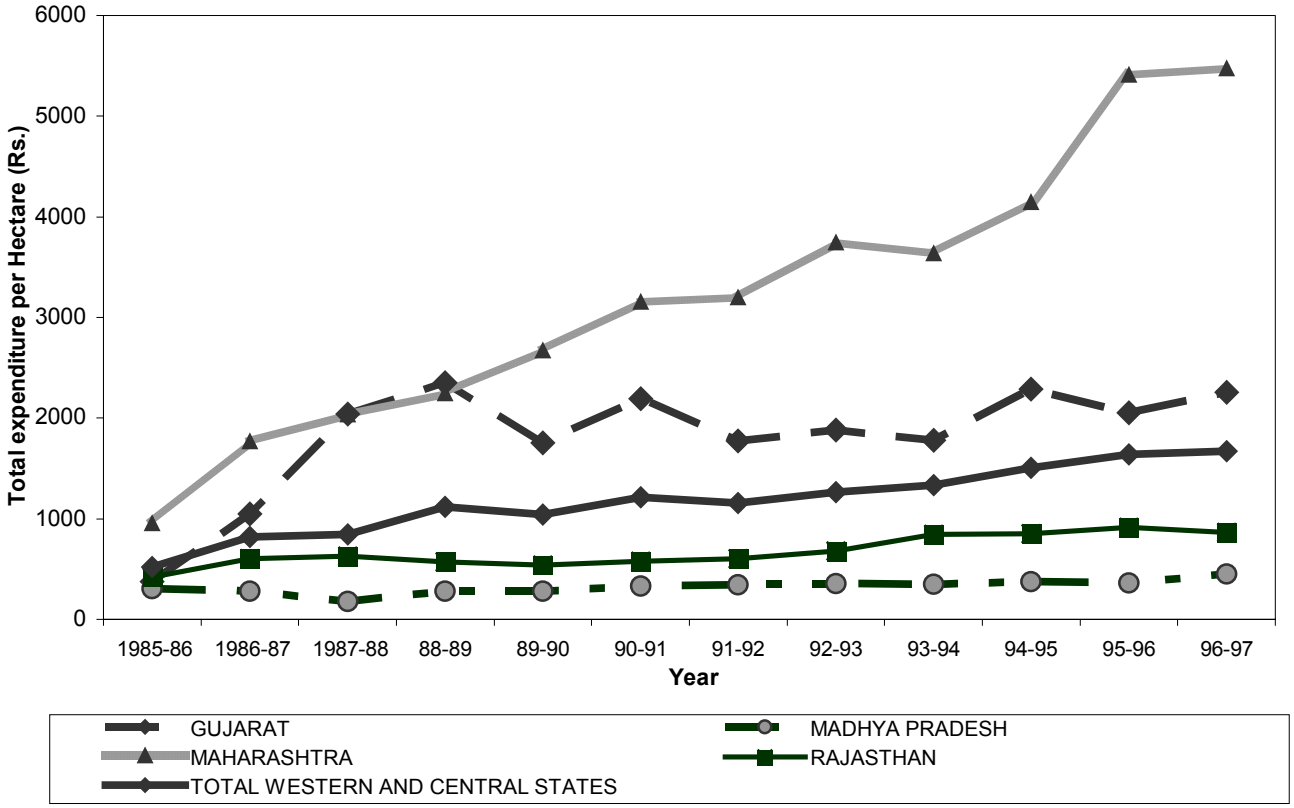
Budget Expenditure on Irrigation and Flood Control per Hectare of Irrigated Area 1985-86 to 1996-97: Southern States



Notes: For the year1988-89 to 1998-99, revised estimates figures of expenditure on irrigation and Flood Control have been used. For the year 1999-2000, figures of budget estimates have been used.
Sources: Different volumes of State and Government budget

Figure 7

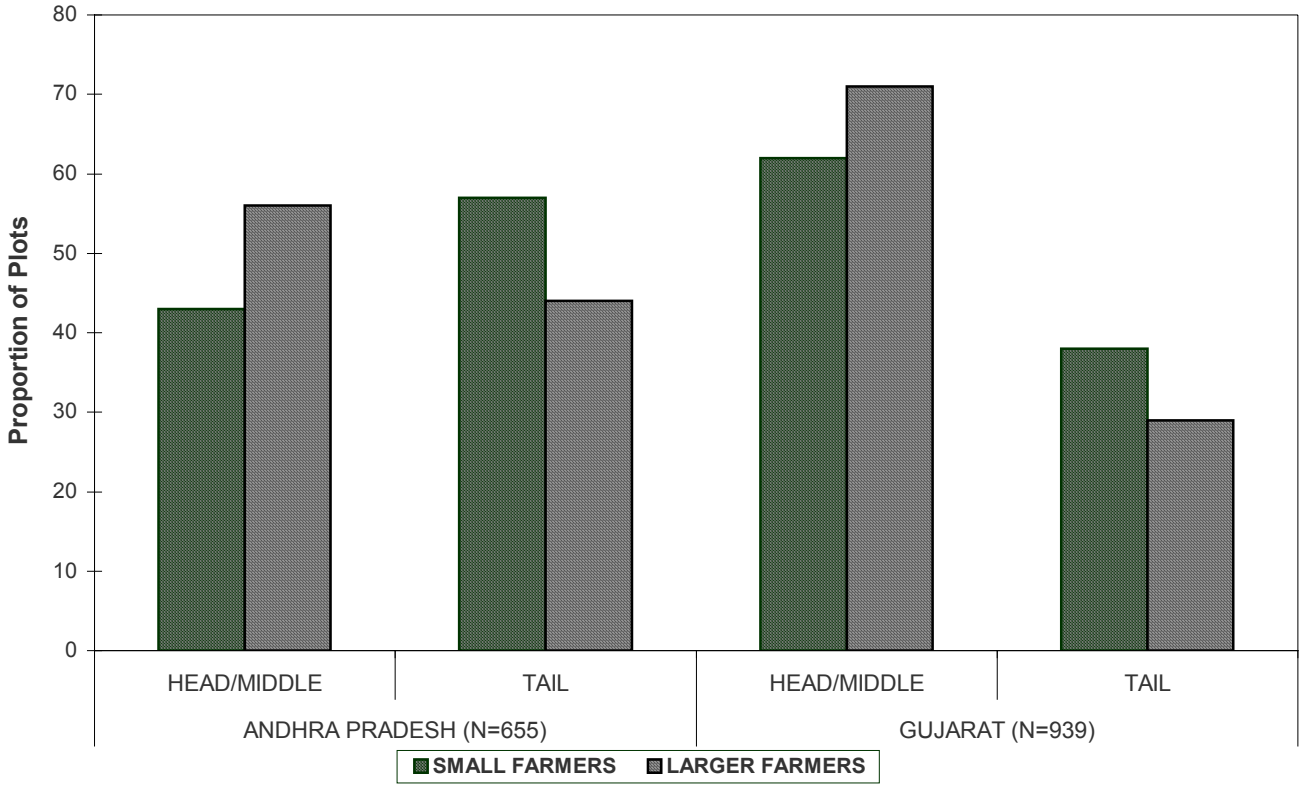
Budget Expenditure on Irrigation and Flood Control Per Hectare of Irrigated Area, 1985-86 to 96-97: Major Western and Central States



Source: Budget expenditure figures were obtained from different volumes of budget. Figures of net irrigated area were obtained from Weligamage et al., (2002).

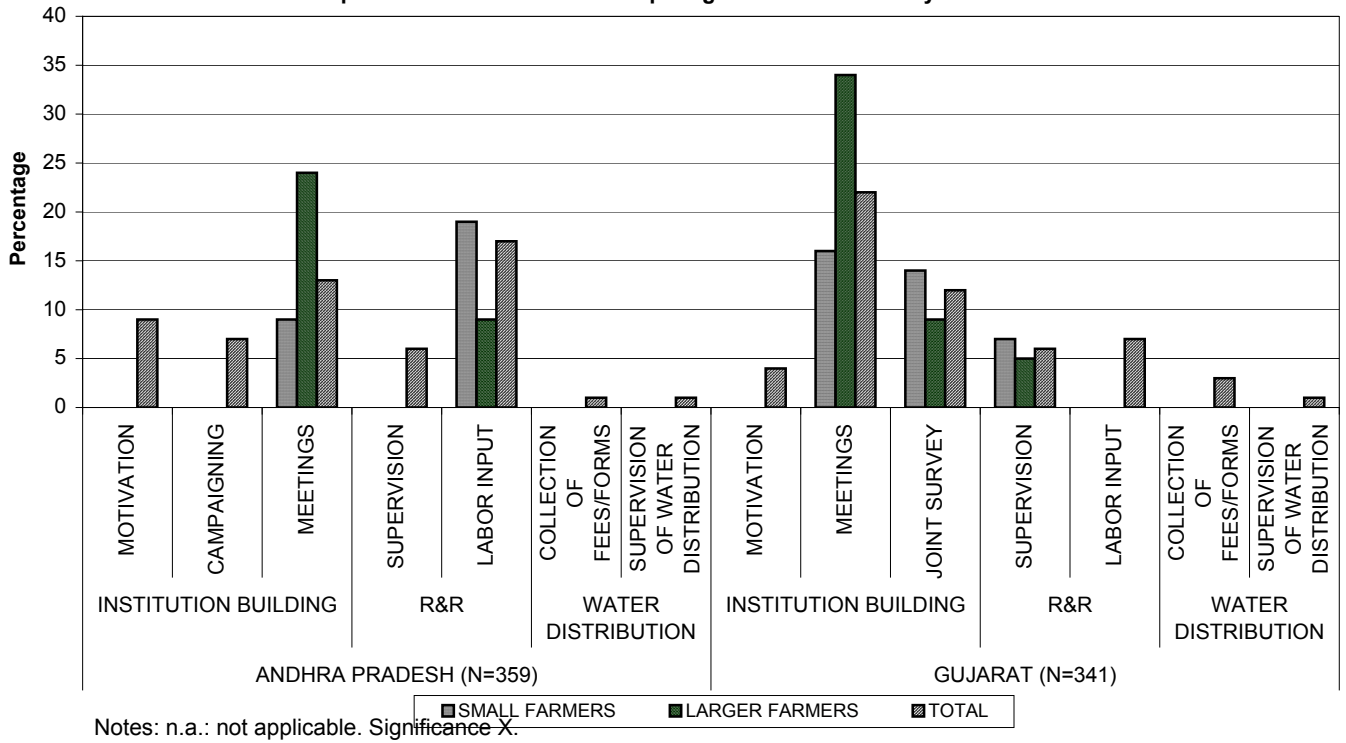
Figure 8

Proportion of Plots by Location and Farm size: Andhra Pradesh and Gujarat



Notes: Significance X2
Andhra Pradesh: Significant at 0.005 level and Gujarat significant at 0.005 level.
Source: van Koppen et al., (2002).

Appendix Figure 1
Proportion of Households Participating in WUA Activities by Farm size

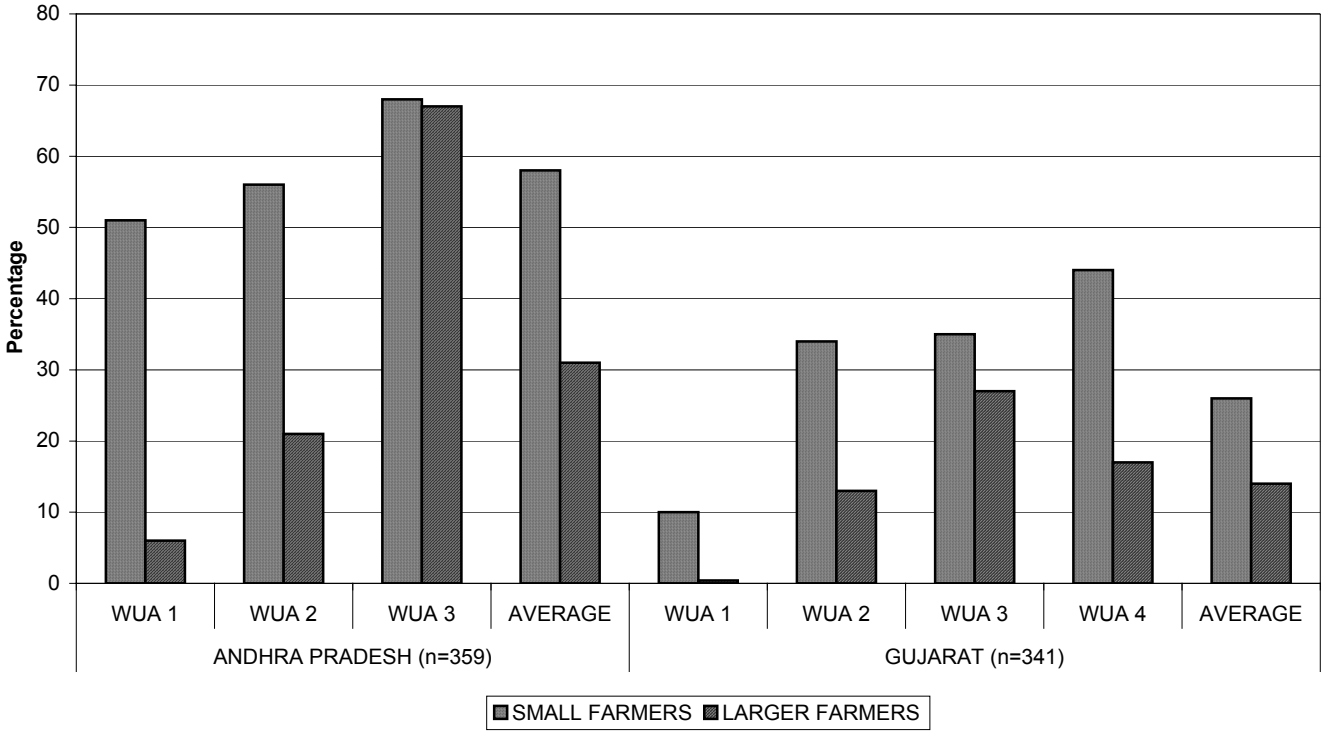


Notes: n.a.: not applicable. Significance X.
Andhra Pradesh: Meetings: Significance at 0.005 level, labour input: significant at 0.025 level.
Gujarat: Meetings: significant at 0.005 level. Joint survey, supervision of labour: not significant

Source: van Koppen et al., (2002).

Appendix Figure 2

Proportion of Households Unaware of the WUA, by Farm size

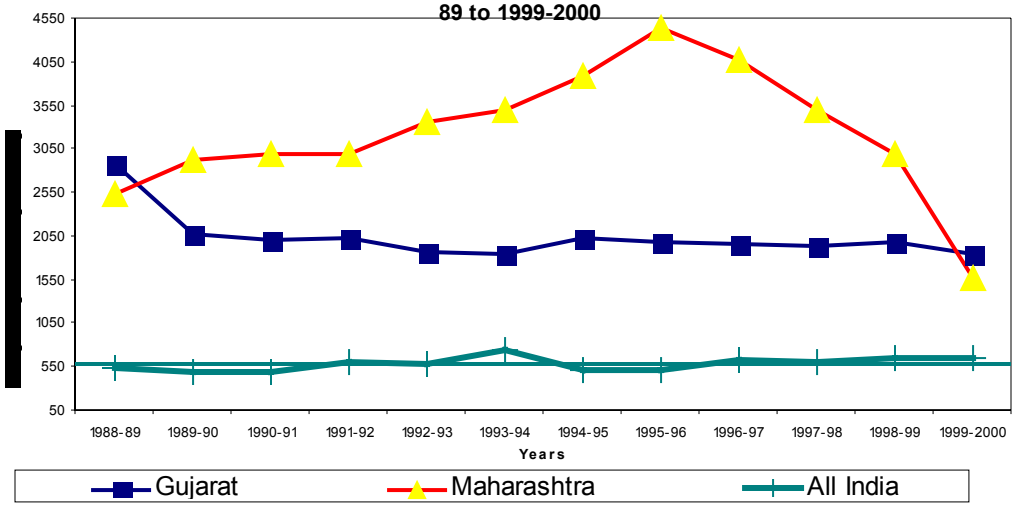


Notes: Significance X2.
Andhra Pradesh: WUA1, WUA2, total: Significant at 0.005 level. WUA3: not significant.
Gujarat: WUA2: Significant at 0.05 level, WUA3, WUA4: Not significant. Total: Significant at 0.025 level.

Source: van Koppen et al., (2002).

Figure 4

Budget Expenditure on Irrigation and Flood Control for Major Western and Central States at Constant Prices (Base 1988-89 = 100) from the Year 1988-89 to 1999-2000



Note: For the year 1988-89 to 98-99, revised estimate figures of expenditure on Irrigation and Flood Control have been used. For th
have been used.
Source: Different volumes of budget.

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