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Institutions and their Interactions: An Economic Analysis of Irrigation Institutions in the Malaprabha Dam Project Area, Karnataka, India

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INSTITUTIONS AND THEIR INTERACTIONS: AN ECONOMIC ANALYSIS OF IRRIGATION INSTITUTIONS IN THE MALAPRABHA DAM PROJECT AREA, KARNATAKA, INDIA

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Abstract

Institutions play a vital role in the efficient allocation of water. However, institutions using a 'top-down' approach generate distortions in the water management system. Similarly, moving away from supply-side oriented water management towards demand-side oriented one within the government-dominated command and control framework will not yield the desired results. In this context, we analysed institutions governing surface water allocation in the Malaprabha river basin in Karnataka and found that the so-called demand-side oriented institutional approach introduced by the government has not produced desirable outcomes. As an alternative institutional arrangement, we have proposed the tradable water rights system within the regulated framework.

The Issue

Empirical studies on natural resource management have demonstrated that the institutions and institutional structures devised by individuals, groups and governments to organise human activities influence the outcome of managing 'common pool resources' (CPRs) such as irrigation (Ostrom, 1994). New institutional economic theories postulate that institutions contributing to sustainable management of CPRs are generally efficient in nature because only the efficient ones can survive by way of crowding out all the inefficient ones (see Alchian and Demsetz, 1972) irrespective of the social outcomes. The institutions are not created for achieving socially efficient outcomes; rather, they are designed to serve the purpose of the individuals who have more bargaining powers (North, 1994). The evolution of the institutions, as the extreme version of the Coase Theorem suggests, explains why a particular type of institution that has come into being at a particular time can be most efficient in nature (Stigler, 1988). At initial stages of resource-use, the 'spontaneous order' among the individuals carrying out 'purposeful act' brings self-enforcing institutions into the evolutionary process (see Sugden, 1989), which, in many cases, are efficient – at least at the individual or group level. When the individual or group actions generate negative externality that affect the welfare of the third parties, the efficiency principle is not sacrificed because of the fact that mitigating the negative externality within the prevailing institutional domain becomes opportunistically costly. From the Coasian perspective, a higher level of transaction cost of controlling negative externality arises from lack of well-defined property rights that hinders costless negotiations between individuals in a society. In this case, the institutional options can be expanded by assigning well-defined property rights that minimise the transaction costs of re-negotiations so that a new level of efficient equilibrium of resource-use can be achieved (Coase, 1960).

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When property rights are vaguely defined or when the transaction costs of re-negotiations are prohibitively high, some argue that the direct intervention of the government is considered appropriate (Pigou, 1932). So, the central thesis of new institutional economics is that a combination of market, firms and government is required to manage the use of resources and a particular combination is the Pareto optimal one when the transaction costs of resource-use is minimised. New forms of intermediary institutions, such as, non-governmental organisations (NGOs), may also emerge to reduce any residual transaction costs. Therefore, the 'unbounded rationality' strand of new institutional economics claims that given set of institutions only the efficient institutions (or combination of such institutions) are frequently chosen by individuals (see Dixit, 2004).

In the case of irrigation water, selfish maximising individuals design their own efficient institutions collectively (see Ostrom, 1990) for joint benefits that *cannot* be achieved through individual efforts alone (Wade, 1988). In many countries where such collective action does not emerge to maximise joint benefits, the government takes the initiative through institutional arrangements such as water user associations (WUAs). These associations are not only governed by well-specified formal rules but also by informal constraints (North, 1991) that are site-specific. There is, therefore, interplay between these two forms of institutions, which makes the difference in the collective outcomes. This raises a fundamental question - why do only a few such efforts succeed while many others fail to bring in the desired outcomes. In other words, if efficient institutions out-perform inefficient institutions how can the existence of inefficient institutions of irrigation management in the different river basins, especially in the Indian context, be explained? One possible explanation would be that the nature of the institutions as well as the 'interaction' between them might not encourage co-operation among the group members to achieve collective benefits. When 'outside' institutional constraints are imposed on the existing institutional rules, the institutions may compete with each other and generate undesirable outcomes (Easterly, 2008, Dixit, 2004 and North, 1994). This may lead to a spiralling disequilibrium in the system and increase the social costs. Sometimes, even with same set of institutions the institutional outcomes may differ across regions due to differences in transaction cost. The 'top-down' approach of introducing WUAs in many of the canal systems in India did not produce any substantial additional pay-offs for the users (Marothia, 2005). Instead, they contributed, along with various other factors, towards the destabilisation of some of the prevailing institutions like the village panchayats, which managed irrigation water traditionally and more efficiently (Mahapatra, 2007).

Conventional neo-classical economic paradigm assumes that rational individuals in a relatively larger group may not have adequate incentives for nurturing co-operation to sustain the resource-use because of the high level of uncertainty involved in predicting the behaviour of fellow members. Thus, the resulting Nash equilibrium is a 'prisoner's dilemma' where no one prefers to co-operate even though they stand to gain from it. Olson (1965) suggests that smaller groups, where the transaction cost of monitoring the behaviour of the members is less, are capable of managing the CPRs more successfully[i]. In the absence of external intervention, the institutions devised by the groups ensure co-operation among the members. These institutions are influenced by the intrinsic as well as the instrumental motives of the members, such as, 'spontaneous order' (Sugden, 1989), 'reciprocal behaviour' (Cardenas, 2009; Cardenas and Ostrom, 2004) and the norm of 'tit-for-tat' (Axelrod, 1984). When these

motives do not ensure co-operation, it poses a major challenge in terms of making the individuals co-operate in a commons context. The public choice theory suggests that special interest groups such as, politicians and bureaucrats could design external institutions to supplement prevailing ones or to replace them. It will maximise their own private benefits but jeopardise the co-operative behaviour of the group members by increasing the transaction costs (Brady, 2000). More empirical studies are required on how the receiving parties adopt strategies in terms of either lobbying or credible threats to the policymaking bodies so that more group-oriented policies can be introduced, when the transaction cost is low. On the other hand, behavioural economics views the expected level of co-operation to depend on how rational the individuals[ii] are and whether their cognitive abilities allow them to optimise perceived transaction costs (Camerer *et al*, 2003). In reality, even the small groups where the transaction cost of uncertainty is negligible fail to sustain efficient resource-use. Therefore, apart from the transaction costs other factors may influence the institutional outcomes in a particular context and this issue will have to be empirically investigated. In this paper, we attempt to analyse 'qualitatively' the institutional arrangements for water management and their performance in the Malaprabha river basin, Karnataka, India.

The Institutions at State Level

Until the late 1980's, the development of irrigation in India was based on the notion that the difference between actual irrigated area and potential irrigated area was due to physical scarcity of water and therefore, the development of water resources was closely linked to the development of infrastructure. Since infrastructure required huge investment, the irrigation development as well as water management was handled mainly by State agencies setting the stage for 'path dependency' that guided irrigation management subsequently. At the State level, additional efforts were made in the command areas of the irrigation projects to improve water management and achieve agricultural development in an integrated manner. For example, the *Command Area Development Authority* (CADA) was created in Karnataka during the 1980s towards this end. In order to bridge the gap between creation and utilisation of irrigation potential, the CADA programme enhanced land development, as it is a key factor in efficient utilisation of irrigation facilities.

With the passage of time, however, most part of readily available 'cheap' water sources were harnessed and all possible least-cost options to augment water resources were utilised, especially in peninsular India. In the early decades, dams were built to counter the vagaries of the monsoon, to facilitate self-sufficiency in food production and reduce poverty. Irrigation water was highly subsidised to generate large-scale positive externalities through increased food production and reduced poverty. The underlying assumption was that the demand for water and food is highly inelastic and in order to keep the price of the food at a lower level, large-scale agricultural subsidy, including irrigation subsidy, was justified. The policies based on this kind of assumption failed to understand the fact that subsidised irrigation would lead to inefficiency in water-use and would not generate adequate resource for reinvestment. The resulting indiscriminate use of water would lead to inequality among the farmers because rich farmers extracted more water, adversely affecting the profitability of small and marginal farmers. Therefore, agricultural polices in general, and irrigation policies in particular, during the initial

period had been dominated by the supply-side oriented approach in which government agents determined almost all the components of these policies and completely neglected the preferences of the farmers. In the early 1990's, a new policy paradigm emerged wherein water was recognised as a "scarce and precious national resource" which had to be conserved, planned and developed in an integrated manner (National Water Policy, 1987 and 2002). In this regard, the policy focus shifted towards institutional arrangements for managing water with more emphasis on the demand-side aspects of management where emphasis was given to farmers' participation. *Participatory Irrigation Management* (PIM), advocated in the National Water Policy, 2002, is one such important institutional arrangement. The Karnataka State Water Policy (2002) also emphasised decentralised decision-making by creating *Water Uses Co-operative Societies* (WUCS) supported by the *Karnataka Neeravari Nigama Limited* (KNNL), CADA and *Water and Land Management Institutes* (WALMI). The new paradigm was aimed at transferring some of the important activities previously carried out by the government agents, such as, operations and maintenance, water distribution and revenue collection, to the farmers' associations. The fundamental issue with this approach is that all the above activities to be carried out by the WUAs, according to economic principles, should have been earmarked based on the 'comparative advantage' of different agents in the organisational structure of irrigation management. This suggests that the government agents might have deliberately transferred these activities to the farmers to minimise the transaction costs of water management at the government level. However, the economic motive of the government could be assessed only in terms of costs and benefits of those activities retained by the government and that of those transferred to the farmers. For example, if the operation and maintenance activities provide more room for government agents to seek rent then the government agents would prefer to retain these activities. The manner in which the government decentralised some of the activities raises the following questions: If water management by the farmers minimises transaction cost[iii], then why did this kind of efficient management not arise in the first place? If the transaction cost minimisation is an outcome of institutional process that evolves over a period of time, then what processes made the transaction cost of carrying out the above activities by the WUAs lower? Why were such processes absent when the same activities were carried out by government agents? Is there any empirical evidence to show that the decentralisation of the above activities had minimised transaction cost in absolute terms? Has the decentralisation mechanism just transferred the transaction costs from the government to the farmers without reducing the absolute size of it? Are the private benefits - occurring to government agents - of transferring the activities greater than the social costs to a large number of farmers? These are some of the questions that require empirical assessment but very difficult to answer due to practical difficulties.

The Karnataka State government also had taken initiatives to address the issue of low water tariffs by introducing revised irrigation water rates in 2002. This revision came after a gap of 15 years (Table 2). The economic value of water is reflected in terms of two aspects: the actual cost of meeting the demand-supply gap both at the government as well as at the user level; and the users' marginal willingness to pay (WTP) for additional water over and above the cost of supply. If the water price is fixed on the basis of its marginal economic value, then the pricing mechanism, in principle, will re-allocate the water to its most efficient use. If the price, on the other hand, is fixed arbitrarily by the

government agencies by using non-scientific methods then one can expect no re-allocation of water. Even if it takes place, it may not be socially efficient. The social cost of arbitrary pricing under the administered pricing regime will be greater than under a 'regulated market' regime. Moreover, economic theory suggests that inefficiency in the use of water would become dominant if the price fixed does not provide adequate incentives efficient use and disincentives for inefficient use (see Gneezy and Rustichini, 2000). The price fixed should reflect the true opportunity cost of water use, in principle; the preferences of the users reflect the true opportunity cost of water and the price based on true preferences is expected to re-allocate water in an efficient manner. Rather than government agents fixing the price arbitrarily, a conducive institutional arrangement has to be in place where the water transfer could take place based on farmers' willingness to pay and to accept compensation.

Although there has been emphasis on inclusive decision-making process at the national and state levels, the existing institutional arrangements can still fall within the 'command and control' approach, which is a 'supply-side approach' by nature. The State Water Policy 2002 intended to make the allocation process more efficient within the command and control system and in this respect, it tried to integrate various interests and develop a basin-level management unit. The centralised decision on the cropping pattern, penalty for crop violation and existing pattern of inter and intra-sectoral water allocation is evidence of the supply-side policies pursued by the governments. Moreover, the proposed institutional arrangements in the State Water Policy 2002 were already tried elsewhere (such as, River Basin Boards in Palar and Thambirabharani basins in Tamil Nadu) and they became dysfunctional (Venkatachalam, 2004). The fact is that an additional ineffective institution will cause more distortions. In order to make these institutions work effectively, a reform policy that includes appropriate incentives and disincentives to make the agents produce desirable outcomes is warranted. We will outline such a reform policy in a later section.

Participatory Irrigation Management in Karnataka

The Water Users Co-operative Societies (WUCS), which are similar to WUAs, were initially introduced as part of PIM, in Karnataka in the late 1980's on a pilot basis by involving the farmers in the management of water resources at the canal level. After a decade-long 'successful' experimentation, formalisation of PIM was recommended in 1999 and it was supported by the State Water Policy (2002) and the Irrigation Act (2000). The purpose of introducing PIM was embedded in the policy objective of 'efficient' management of water resources and resolving prolonged conflicts among various interest groups. In addition, the farmers were to be trained in administrative responsibilities, maintenance of canal, distributary procedures and to use water efficiently and economically (Table 1). The WALMI and CADA have been responsible for dissemination of knowledge so that information externalities can benefit all farmers. In February 2006, as many as 2,321 WUCSs were registered in Karnataka with 1,304 of them taking over the management (Nayantara, 2006) of water resources. An important point to be noted here is that if some institution is successful in some part of the system, economic theory predicts that this institution will spontaneously spread to other parts of the system as well provided the transaction cost of such institutional spread is low. The successful institution not moving to other areas suggests that *ceteris paribus*, the transaction cost involved in the movement is relatively higher. Apart from high

level of transaction cost, there may be other reasons such as, site-specific socio-economic-political factors, which would also affect the movement of the successful institutions. At the group level, factors that include elite capturing, heterogeneity, inequality and other behavioural issues influence the level of acceptance of successful 'outside' institutions (see Araral, 2009; Bardhan, 2001). Therefore, the government's deliberate attempt to replicate the successful institutions in other parts of the state seems to be economically illogical as well as non-scientific in nature.

Table 1: Hierarchical Structure and Main Functions of PIM in Karnataka

Tiers	Main Functions
Water Users Apex Level Federation	1. Make recommendations to the State Government on the policies to be adopted and the guidelines to be formulated regarding construction, maintenance and regulation of irrigation work. 2. The Water Users Apex Level Federation may give directions to the Water Users Project Level Federation, Water Users Distributory Level Federation and the Water Users Society to carry out the purposes of this Act.
Water Users Project Level Federation	1. To prepare an operational plan based on its entitlement area, soil and cropping pattern at the beginning of each irrigation season. 2. To identify and prioritise the critical maintenance works to be carried out at project level. 3. To monitor the maintenance works and ensure that they conform to prescribed standards. 4. To prepare water budgets and crop plans. 5. To promote economy in the use of water.
Water Users Distributory Level Federation	1. To prepare an operational plan based on its entitlement, area, soil and cropping pattern at the beginning of each irrigation season consistent with the operational plan prepared by the project level federation 2. To identify the critical maintenance work to be carried 3. To monitor maintenance works and ensure that they conform to prescribed standards 4. To monitor and regulate the use of water among various societies in its area of operation 5. To undertake periodical social audit 6. To promote economy in the use of water 7. To prepare water budgets and crop plans
Water Users Cooperative Society	1. Develop irrigation infrastructure by availing institutional finance; 2. Procure water in bulk on volumetric basis from the Irrigation Department or KNNL and distribute it to farmers. 3. Operate and maintain canals within its jurisdiction 4. Collect water charges and service charges from the farmers 5. Educate and train farmers to use water efficiently and economically 6. Prepare water budget and financial budget for each irrigation season; 7. Resolve disputes among farmers 8. Assist the Irrigation Department in implementing irrigation and drainage works 9. Make and forward an audit statement of all receipts and expenditure for the year ending to the concerning authority

Source: Nayantara (2006) and various government documents.

The Government of Karnataka formalised PIM by amending the Karnataka Irrigation (Levy Water Rates) Rules in 2002 which guided the formation of four levels of PIM (NIVA-CISED, 2008) (Table 2). As the transaction cost theory suggests, the nature and size of the hierarchy of an institutional structure has to be determined by the size of the transaction cost associated with it. In other words, an efficient hierarchical structure should minimise the overall transaction cost. In certain cases, the

activities earmarked for a particular organisation in the hierarchy may be carried out at a lower cost by another organisation in the same hierarchical structure. For example, irrigation infrastructure to be developed by the WUCS may be developed at a lower cost by the Water Users Distributary Level Federation due to economies of scale. Similarly, some of the activities listed in the hierarchical structure can be carried out in a cost-effective manner by institutions/organisations not included in the structure. For example, dispute resolution can be effectively dealt with by the traditional farmers' communities in an 'informal manner' rather than formal channels (Sokile and van Koppen, 2004). Individuals resolve their conflicts 'outside the formal dispute resolution mechanism' if the resulting pay-off is more (Dixit, 2004). Similarly, the River Basin Boards, once created, can handle different activities under a 'single window system', avoiding a lengthy hierarchical structure. In certain cases, appropriate market-based instruments with 'proper regulation' will resolve some problems quickly and at a lesser cost than other institutions/organisations. For example, facilitating water transfer within a market-oriented framework could re-allocate water in an efficient and environmentally friendly manner, without requiring huge infrastructural development such as large dams. However, merely creating an institutional structure or replicating an institutional arrangement without proper scrutiny will not improve efficiency in water use. Therefore, we doubt that such a structure created by the Karnataka government under PIM is based on any sound principle of economic efficiency.

Table 2: Status of water rates (in 1985 and 2000)

Sl. No.	Crops	Previous status (1985)	Current status (2000)
		Water rate per acre (In Rs)	Water rate per acre (In Rs)
1.	Sugarcane	150.00	400.00
2.	Paddy	75.00	100.00
3.	Cotton	40.00	60.00
4.	Wheat	22.00	60.00
5.	Groundnut	24.00	60.00
6.	Sunflower	--	60.00
7.	Jowar, Maize, Navane, Ragi	20.00	35.00
8.	Semi dry crops	--	35.00
9.	Cereals	--	35.00
10.	Tobacco	24.00	35.00
11.	Other crops	--	35.00

Source: Karnataka Irrigation (Levy of Water Rates) (Amdt) Rules, 2002
Note: For sunflower, cereals, semi-dry and other crops no water rates existed till 2000

Role of WUCS in Karnataka

The WUCS are the grass-root level institutions and they have various responsibilities, including operation and maintenance of canal infrastructure within their jurisdiction. The WUCS are also authorised to procure water from the KNNL and distribute it to farmers on payment of water charges. A part of the revenue is retained by the WUCS as administration costs. Since most dam projects, like the Malaprabha, are largely gravity-fed canal irrigation systems, water rates are charged at a flat or a fixed rate (as opposed to marginal cost pricing). The flat rate is based not on the amount of water used but on other aspects that include the land area cultivated, yield and type of the crop (Turner *et al*, 2004). The most common form of water charge is based on land area, as it is easy to administer and suited to

continuous flow of irrigation (Johansson, 2000). However, such a pricing technique is not based on actual water used, socio-economic status and farmers' willingness to pay (WTP) and is also not necessarily consistent with economic expectations and straightforward notions of price and costs (Turner *et al*, 2004). In the Malaprabha basin, revenue collection is low in absolute terms (Table 3). It should be noted that the farmers are willing to pay more for improved irrigation as demonstrated by empirical studies in the Indian context (Biswas, 2008). It is claimed, however, that the low revenue collection is due to the unwillingness of the officials to collect revenue from farmers. Another interpretation is that the farmers who are upset with poor service refuse to pay the existing tariff and officials may be reluctant to collect revenue from such farmers. Later, we will discuss how redesigning existing institutions and introducing innovative institutions in the river basin improves service and increases revenue.

Table 3: Year Wise Demand for Revenue Raised and Collection Realised in Malaprabha Dam Project.

Year	Demand Raised (Rs In lakhs)	Amount Collected (Rs In lakhs)	Percentage to the Demand
1985 Rates			
1991-92	510.82	50.23	9.83
1992-93	471.42	39.34	8.34
1993-94	510.51	29.80	5.83
1994-95	517.64	25.40	4.90
1995-96	381.93	66.22	17.33
1996-97	325.18	51.03	15.69
1997-98	443.68	46.86	10.56
1998-99	211.17	120.89	57.24
1999-00	368.15	39.94	10.84
2000 Rates			
2000-01	517.40	43.20	8.34
2001-02	341.49	15.14	4.43
2002-03	435.00	82.32	18.92

Source: KNNL, Belgaum

As part of the activities to be carried out, the WUCS are also required to maintain the canal infrastructure under their jurisdiction. The WUCS and the government enter into a Memorandum of Understanding (MoU) in which the condition of canal network to be maintained, repair works to be carried out and amount of water each WUCS is entitled to are defined through negotiations. In principle, the KNNL has to undertake repairs of the canals before passing them onto the WUCS; but in most cases the responsibility of maintenance is passed onto the WUCS before such repairs are complete (Nayantara, 2006). The KNNL is also supposed to help the WUCS by providing technical assistance in terms of how the repair is to be undertaken. This is to be executed by way of holding meetings with WUCS' presidents and secretaries and the members of CADA and KNNL. These representatives of WUCS are to learn the various aspects of efficient management of irrigation water and to disseminate the knowledge to other farmers; however, field research carried out by the first author of this paper suggests that in reality very little knowledge is disseminated and even that limited knowledge does not get reflected in terms of improved management practices. In a nutshell, the KNNL's approach supports the view that the government is trying to pass its own transaction cost on to farmers under the umbrella of PIM.

Challenges of WUCS

In order to evaluate the functioning of the WUCS, we focus on the ones in the Malaprabha river basin in Karnataka. Malaprabha is an important tributary to the River Krishna that originates in the Western Ghats. The Malaprabha Dam was constructed in 1972 near Manoli in Belgaum District, Karnataka. It is designed to have a catchment area of 2175.6 sq.kms and total irrigable area of 2,20,028 ha (Govt. of Karnataka, 1991). There are two major canals off taking from the dam site, the *Malaprabha Left Bank Canal* (MLBC) and the *Malaprabha Right Bank Canal* (MRBC) respectively. The MLBC was constructed after modification of the original plan in 1969 so that water could be supplied to more villages. As an extent of enforcement of PIM, 236 WUCSs were functioning in the Malaprabha Project area by 2005-06 (Nayantara, 2006); however, this does not indicate the success of PIM in the study region. Firstly, our qualitative assessment shows that the water use practices in the WUCS' jurisdiction have not changed adequately. The design of the Malaprabha dam is to facilitate a fixed cropping pattern in terms of 40-20-40 for kharif, two-season and rabi crops respectively. At any given time, only 60 per cent of the land area is to be cultivated while the remaining 40 per cent is to be left uncultivated or cultivated under rain-fed crops (Govt. of Karnataka, 1991). The crops to be cultivated are mainly irrigated-dry crops, including jowar, pluses and cotton, but it was observed that there had been gross violation of this cropping pattern. For example, on both the MLBC and the MRBC, we observed that sugarcane, a highly water-intensive and a penal crop is being widely cultivated (NIVA-CISED, 2008). In addition, it was also observed that the farmers along the main canals irrigate more than 60 per cent of their land area, which is a crop violation. The violations are widespread as there is hardly any mechanism available to check them. Indeed, a few farmers in the tail end regions of MLBC admitted that they were unaware that their current practice of siphoning water directly from the main distributaries using diesel-powered pumps was illegal. Thus, this not only indicates that there is poor communication between the government and the farmers but also that even if there is communication, the monitoring and punishing the violators is an extremely costly affair. Currently, the WUCS do not have control of the gates of the canal nor do they have measuring devices to monitor water discharge. Monitoring by KNNL officials could check the overuse of water (NIVA-CISED, 2008) but there is no incentive for these officials to do so. In short, the supply based on the original plan falls short of the current demands.

The infrastructure maintenance is poor and can be attributed to lack of manpower and skilled workers to maintain the canal infrastructure. Though a large amount of money has been invested in the project[iv], cost recovery is very poor[v]. This implies that there is very poor water delivery service and funding may not be sufficient for actual improvements[vi]. The government usually assumes that the infrastructure is in good condition and ready to be handed over to the WUCS. However, based on the field survey of the tail end regions of MLBC it was observed that the gates were rusted or broken, the sub-distributaries were choked with silt and rubble and were not conducive for efficiently transporting water to the fields. The WUCS feel that they are not trained to maintain the canals and hence, they recommend that the KNNL staff take up the responsibility of maintaining the canals (see Nayantara, 2006), which is like reverting to old practices. The success of PIM rests on the participation of farmers in training workshops organised by CADA and meetings between the WUCS representatives and KNNL staff. It can provide a platform for the marginal and small farmers to express their needs and

requirements. This is particularly important in terms of reducing inequity in water distribution. Under the Irrigation Act of 1995 (sub-sections 1-A and 1-B) the WUCS can be held legally responsible for not providing water on an equitable basis. However, the WUCS are entrenched in politics and the important positions in the WUCS offices are held by a few who are already powerful and have political support - as we observed in the tail-end region of MLBC. The powerful farmers are the ones who can wrongfully take water from other farmers without much repercussion. Even if the small and marginal farmers want to raise objections, they may be bogged down by the long process of the judicial system. Even if there is a platform for the small and marginal farmers, it is mostly on paper and 'elite capturing' may be a dominant issue under the PIM regime.

In the face of growing demand for water from other sectors in the basin, especially from urban areas, the opportunity cost of water used by the agricultural sector is increasing rapidly. Currently, the increasing demand for drinking water is being met by exploiting groundwater resources (NIVA-CISED, 2008). The Government of Karnataka is addressing the problem of water scarcity in the Malaprabha River Basin by proposing to undertake inter-basin water transfers - transferring water from the west flowing Mahadayi River. If the proposal is followed through, it will add 7.56 TMC of water to the Malaprabha River. This proposal, however, is expected to submerge about 557.28 ha, of forests and cultivable lands apart from settlements in the villages (Kohli, 2004). The proposal has faced criticism from the media and the environmental lobby since the ecological, social and livelihood consequences of such diversions cannot be accounted for. In addition, the Mahadayi enters Goa where it is known as Mandovi River and hence inter-state political issues need to be addressed before accepting the proposal. Currently, both the states are caught in an inter-state conflict over the issue. No doubt, additional water in the Malaprabha River will reduce the drinking water crisis in Hubli-Dharwad substantially; however, the implication of the net benefits from the project (which has not been estimated scientifically so far) will be different if the social cost of the diversion is taken into account as well. Although this issue is not directly related to irrigation, it shows that the water currently available in the Malaprabha River is not adequate to meet the demand for water from various sectors. Therefore, without improving irrigation efficiency with adequate incentives and disincentives bringing additional water to the basin would be another form of wasting public resources.

The qualitative analysis of the existing institutions reveals that the PIM in Karnataka has not performed satisfactorily. We found that most of the success in peninsular India was reported by the studies focusing on few successful cases of decentralised water management institutions while a large number of failures were not reported adequately. The replication of few successful cases has not produced the expected outcomes because there is no clear mechanism in place to link performance with incentives. As economic theory suggests, inefficiency would be the dominant outcome if the current water rates were different from the true scarcity value of water (Meinzen-Dick and Mendoza, 1996). Even with perfectly working institutions efficient use of water cannot be guaranteed because water might still be allocated from a low-value-use to another low-value-use, rather than from low-value-use to high-value-use. This implies that simply imposing an outside institution on existing ones will not produce expected results; rather, it may even make the things worse. Now an important issue is how to design institutions that will make the reallocation of water more efficient? As we have already argued,

new institutional arrangements with appropriate incentives and disincentives embedded in the preferences of the users will have to be designed and implemented in the river basin. For example, water allocation should be based mainly on the farmers' willingness to pay (WTP) and willingness to accept (WTA) values by retaining the decentralised decision-making framework. The authors, based on the field research in the Malaprabha basin, estimated the economic value[vii] of improvements in canal water supply in the tail end region of MLBC for the year 2005-06. The farmers were willing to pay an average of Rs 223 per acre per year if water for 30 additional irrigation during one cropping season, is made available. More than 74 per cent of the farmers stated that they would use the additional water to cultivate maize. In addition, up to 50 per cent of the farmers interviewed were willing to pay at least Rs 173 for improvement in canal water supply that is about 4.9 times higher than the current water rates. How can this WTP value be put into practice? In the following section, we present the outline of an alternative, market-based institutional arrangement that could be introduced to address the problem of water scarcity and water reallocation in the Malaprabha River Basin in the coming years.

Introducing Market Based Instruments as an alternative institutional arrangement: A case for Tradable Water Rights

In recent times, it is recognised that the command-and-control (CAC) policies, such as the ones operating in Karnataka, do not produce the desired results in the irrigation sector. These CAC polices and institutional rules are based on what the government agents think is appropriate in terms of water pricing and allocations. These policies do not take into account the behaviour of the farmers, influenced by the underlying socio-economic and institutional factors. Therefore, there is a huge gap between what the farmers prefer to have from the projects and what the officials want to deliver (Venkatachalam, 2008). As the Austrian school of economic thought suggests, the process of discovering the farmers' preferences is a costly affair for the governments and therefore, the governments very often adopt 'rule of thumb' on farmers' preferences while formulating social policies. As the supply-side policies do not yield any expected results in terms of efficient, equitable and sustainable use of irrigation water, there is a need to look at various other institutional paradigms to achieve these objectives.

Of late, there have been conscious efforts in many countries to shift from CAC policies and rules to more flexible 'market based instruments' (MBIs) in reallocating water not only within the agricultural sector but also across agriculture and non-agricultural sectors. One of the more commonly used MBIs in case of irrigation water is the tradable water rights. In literature, there is argument in favour of the introduction of markets for irrigation water to induce economic efficiency and allocation efficiency (Venkatachalam, 2008; Reddy 2004; Griffin, 1998; Holden and Thobani, 1996). This argument is based on the success of formal water markets under similar scarcity conditions in Australia, Chile, Mexico and South Africa in ensuring efficient and sustainable water use in irrigation. Conversely, it has been argued that administrative allocation of water even with adequate institutions in place may lead to inefficient water use (Holden and Thobani, 1996). In addition, groundwater markets have emerged when the state-operated water supply systems failed to meet the increasing demand. However, groundwater markets in India are purely private markets and are not adequately regulated by the state. Such markets may be detrimental, especially to the poor, if groundwater market is controlled by a

monopoly (Meinzn-Dick and Menzoa, 1996). With proper regulation in place, these markets are capable of producing better results than the ones governed by CAC policies.

There is ample empirical evidence to show how informal water markets emerged to play a major role in water allocation during the period of scarcity (Schoengold and Zilberman, 2007). The most basic requirement in terms of creating markets for a scarce commodity is to establish property rights (Nabli and Nugent; 1989). The MBIs in case of canal irrigation can be in terms of 'tradable water rights'. Under the tradable water rights system, the willing sellers sell excess water from their allotted quota to willing buyers at a market-determined price, which is fixed at a point where marginal WTP and marginal WTA converge. However, a centralised authority, such as a river board or even an existing authority such as the KNNL, is required to co-ordinate the activities of sellers and buyers in order to avoid any adverse consequences of sale of water. The water authority is responsible for the initial allocation of water rights based on land size/crop being cultivated by the farmers. The right to trade water is purchased from the central authority. In the case of poor farmers, these rights can be initially assigned on the basis of their WTP values which may even be zero. This is an important step towards achieving efficient management as the farmers can then trade amongst themselves to reallocate the water more efficiently. This would not only be an incentive for the farmers to reduce wastage of water but also remove the burden of monitoring their water use. This incentive-based system would influence the farmers to adopt conservation strategies to generate surplus water for sale. The needy farmers on the other hand would able to buy adequate water for cultivation. The water transfer occurs without a huge investment that could be a burden in the absence of tradable water rights.

There is an argument that in India large-scale informal water extraction activities and small land holdings would hinder the effectiveness of water transfer through formal markets (Shah and van Koppen, 2006). Rosegrant and Binswanger (1994) argue that rather than issuing tradable permits to individual farmers, these permits can be issued among established WUAs that can trade permits among themselves through market negotiations. This would not only save resources needed to establish new institutions to facilitate water trade but also reduce the transaction cost of monitoring water use because peer monitoring is possible among farmers within the WUAs. However, one may argue that tradable permits within the WUAs have already failed in many basins and may not yield productive results. The point to be noted here is that the tradable water rights system brings an innovative incentive mechanism into the operation of WUAs and therefore, one can expect this system to improve the performance of the WUAs. In many river basins, the informal WUAs are more effective and can be strengthened with inputs from informal associations to produce better results (Sokile and van Koppen, 2004). Another argument that can be used against the implementation of tradable permits is that initially the government would have to make a huge financial investment. However, the past trend in financial investment and grants to the major and the medium irrigation projects across the country and in Karnataka suggests that the financial commitments[viii] are already very high and a financial commitment will not be an additional burden in implementing tradable water rights (see Mienzen-Dick and Mendoza, 1996). The experiences of other developing countries have shown that the introduction of tradable water rights also bring economic equity among the farmers (Mienzen-Dick and Mendoza,

1996). Appropriate institutional arrangements can be made to include the landless farmers as well in the tradable water rights scheme.

Conclusion

In this paper, we have discussed certain institutional issues involved in managing surface water, especially in the context of the water scarce Malaprabha river basin in India. We have seen that the wisdom of water management based on the supply-side approach gradually moved towards a demand-side approach by decentralising management decisions. However, this demand-side approach has not produced concrete results since it has been partially implemented and that to, within the already existing inefficient CAC method. As part of this demand-side approach, the Government of Karnataka had adopted the principle of PIM by involving farmers in the decision-making process through the WUCS. However, our qualitative analysis suggests that PIM has not achieved its primary objective of increasing efficiency in water use because of the demand oriented approach has not been adequately supported by other efficient institutions such as the MBIs. The failure of PIM and the WUCS demonstrates that the 'top down approach' of imposing outside institutions on existing ones produces results that are economically distortive in nature. When new institutions are introduced, they destabilise existing institutions that may be relatively inefficient but working smoothly at the local or regional level. When the new institutions also fail, it may generate a non-linear impact on the system because of multiple institutional failures. Hence, we proposed an alternative institutional arrangement that moves away from the current CAC regime towards a market-based tradable water rights system. Introducing 'market-based tradable water rights system' with appropriate regulation for water allocation will produced improved results. Though there are problems with the tradable water rights system (Bauer, 1997), the advantages are many. They are: a) Existing institutions, such as WUCS, can be used to facilitate water transfer and therefore, no additional cost is involved in creating new institutions under the tradable water rights regime. b) Since water allocation takes place based on the WTP and WTA values of the buyers and sellers, respectively, water is always transferred from low-value use to high-value use. c) Since even the small farmers can participate in the water trade, equity issues can be effectively addressed.

Any kind of institution will tend to fail, if it is not properly regulated. The success or failure of innovative institutions like tradable water rights system depends mainly on how effectively the institutions are governed by the governments, the non-governmental organisations and the user associations, apart from the individual users participating in the process.

Notes

[i] However, why such kind of groups did not emerge at the very beginning itself is a question for further research.

[ii] For example, if the individuals are 'docile' then their behaviour would reflect high degree of altruism and therefore, would bring in more cooperation (see Knudsen, 2003).

[iii] Although minimising transaction cost is an important aspect, there are other objectives of decentralisation such as more political and social power to the farmers so that they can exercise more control over the irrigation process. We, however, argue that in institutions that are working well, such as markets, the farmers can trade among themselves efficiently and effectively.

[iv] For Malaprabha River Basin alone, the estimated cost for 2001 was Rs 704 crores. For all the major and medium irrigation projects in the same year was Rs 18,072 crores (GoK, 2003)

[v] The water rate collected in 2001-02 was Rs 15.14 lakhs whereas the demand was Rs 339.86 lakhs

[vi] During the field survey, the officials stated that the last 6 kms of the MLBC and 58th distributary of the MLBC are still under construction however, water from the reservoir has not reached beyond the 51st distributory of MLBC since its inception and neither is there much probability of supply in the future, indicating financially wasteful and politically motivated decisions of the government. Admittedly, according to the KNNL officials, if the water was managed efficiently, then there are high chances that water would reach beyond the 51st distributary but not up to the last distributary and extreme tail end.

[vii] These values can be derived using valuation techniques available in the economic valuation literature. These methods are broadly classified into Revealed Preference methods and Stated Preference methods. In a study conducted by the authors in the tail end region of the MLBC, a stated preference method was used – Contingent Valuation Method. The economic value of an improvement in canal water supply in terms of additional 30 irrigations between August and February each year was estimated.

[viii] For the financial year 2004-05 the Malaprabha River Project was allotted Rs 113 crore. In the Xth plan, the financial outlay of almost Rs 13,277 crore for all the major and medium projects in Karnataka.

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