User Organizations as a Demand Management Option: Potentials, Problems and Prospects

M. Venkata Reddy
Team Leader, Consulting Engineering Services (I) Pvt. Ltd., Bangalore

Context and Rationale

In the wake of emerging economic reforms and structural adjustment programs in most parts of the world, the statistic models of development that are followed by the public sector are increasingly subjected to public scrutiny, and for which the irrigation sector is no exception. Since water is the crucial input for increasing crop intensity and productivity, the demand for it has been increasing year after year. Among the competing demands for water, irrigation accounts for 75 % of the contemporary world's total use of water. At present 40 % of all food production comes from 17 % of agricultural land that is irrigated and irrigation water provides employment for about 2.4 billion people (DFID 1997). Globally, the amount of irrigated agricultural lands has increased almost by 2.4 % in the 1970s, to an additional 1.4 % during the 1980s and the late 1990s. It is projected to increase further by 0.4 % per annum for the next 34 years (FAO 2000). The challenge, then, before the irrigation planners is how to manage this growing demand for irrigation, given the finite physical availability of water in each country.

Before we discuss about the suitability of different organizational options necessary for managing irrigation demand, it is better to understand the dynamics that warrant demand management, more importantly in the context of major irrigation projects. Irrigation projects are supposed to have been designed scientifically, based on sound engineering principles, to meet crop water requirements in a given project area, which is called a culturable command area (CCA) in irrigation parlance. The experiences and results distilled from empirical research on a wide range of irrigation systems have shown that the designers and planners laid more emphasis on sound engineering principles for designing and building dams and did not pay necessary attention to the much more important long-term institutional role of water distribution, allocation and management (DAM) aspects. It was, perhaps, perceived that the construction of dams, storing water and releasing it to the fields through a network of canals as end of the problem, taking the timeliness, dependability and equity in sharing water and the consequent flow of benefits are granted with water releases to the field. But in reality that has not taken place.

Inequitable distribution of water has almost become an accepted norm, leading to a total alienation of tail-end farmers, which has created scores of social and economic problems

(Reddy 1995). Irrigation projects should, therefore, be characterized not as hydraulic systems to be run according to engineering principles, but as socioeconomic systems, where all participants – farmers, managers and politicians – presently maximize their private interest with respect to the cost of social goods and activities (Caruthers 1987). Caste, class and factional ties and antagonisms become relevant in the delivery of any goods and services to the community. It is essential to underscore this point, for irrigation systems tend to be viewed as complete in all respects, as mentioned earlier, when the channels reach the fields. In a very important sense, this only marks the beginning of the problem and not its end (Srinivas 1984).

Reforms in the irrigation sector at present should, therefore, be on improving water distribution, allocation and management, which has hitherto been neglected or not given the required attention. Lack of clarity on the roles, rights and responsibilities of all the stakeholders on the one hand and their respective accountabilities on the other, seem to be the root causes for many of the shortcomings and problems in the irrigation sector, more importantly in major irrigation. The successful management of irrigation demand depends upon, among other factors, motivation, commitment, cooperation and mutual understanding of two groups of stakeholders namely, irrigation engineers and farmers. Both groups have developed strong mindsets over time, perceived as appropriate and necessary to optimize the benefits from irrigation. The primary task in the demand management process is, therefore, to transform the mindset of the engineers and farmers, which calls for a thorough understanding of the caste, religion and faction-related dynamics in the community and mobilize them to undertake the task of irrigation management. This is possible only through community-centric approaches, something a local organization or an NGO will be able to do effectively. This is because of the fact that the region needs to integrate the technical, institutional, managerial, social and economic aspects of water resources management. This new approach for sustainable water supply and demand management depends on local involvement, solutions, and knowledge within an overall framework of local planning and operation.

The government will have several advantages in promoting local or community involvement from the inception of a reform process. Normally small water bodies like tanks, natural springs and other such systems tend to be widely scattered and their management by the government becomes cost ineffective because of the huge transaction costs involved in the management and supervision of the day to day operations of the systems. Local communities can understand better the rural dynamics that provide information on customary rights and responsibilities in managing seasonal water demands for different crops depending upon the fluctuations in water availability due to the vagaries of the monsoon. The ability and willingness of the local communities to take on the management of the system and distribution of water depends, however, on several factors, such as organizational capacity for system management and resource mobilization, economic and social incentives to sustain participation and well articulated rights, responsibilities, conflict resolution and other related operational norms and procedures to take care of the demand for water, arising out of fluctuations in the supply due to natural factors.

How to balance demand and supply of water under constantly emerging and difficult conditions is the major challenge before the water planners and managers across the globe, especially in the less developed countries. The policies, institutions and planning procedures

in place at present to manage water are not well suited to ensure efficient and equitable distribution of water between inter- and intra-sectoral demands. This is because irrigation projects are constructed and managed by the government departments, because of their heavy capital requirements and the complicated technical inputs that are required. This government-dominated approach may be referred to as the supply-oriented management of irrigation systems. Due to a wide range of political economy factors, the government management of irrigation systems has deteriorated leading to several socioeconomic problems in the rural areas. The need for transferring management to user associations has, therefore, gained importance. For development does not start with goods; it starts with people and their education, organization and discipline. Without these, all resources remain as a latent, untapped potential (Schumacher 1975). Farmers who depend on irrigation water for their livelihoods have a strong incentive to manage that water very carefully. The government agency could never match the discipline that farmers impose on themselves when they manage their own system. Under the demand management approach, users through their associations make management decisions for distributing water, maintaining systems and collecting fees, while government plays a supportive role (Groenfeldt 1996).

The blue print approaches (top down) followed by the public agencies so far have not yielded the expected results in terms of equity, dependability and productivity of irrigation water. The success stories of community participation, which are few and far between, tend to vanish the moment the agency withdraws the incentives, whereas the participatory systems that have evolved through local initiatives and involvement, can be sustained for generations. This is because these participatory systems are built on local knowledge, wisdom, culture and locally available resources. It is in this context the user and community organizations become effective tools for the efficient management of water for irrigation and also for other purposes. This is due to the fact that the structures are based on strong social engineering principles, quite different from the public agency-centric ill-perceived operational rules.

Present Status of User Associations in India

Farmers' participation in irrigation management is not an alien concept in India. Historically, one could trace the trajectories of the evolution of local organizations and initiatives to harvest surface and ground water for irrigation (Reddy 1991). The existence of tank panchayats, spring channels associations (locally called *Kaluva Gonchi* in Andhra Pradesh), management of tank and canal systems (*Kudimarammath* in Tamil Nadu), *Kuhls* in Himachal Pradesh, where a typical community provide *Kuhl* services to 6 to 30 farmers, irrigating an area of about 20 hectares and diversion weirs (called as *Bandharas* in Maharashtra) just to mention a few, were all traditional water harvesting systems that were evolved collectively by communities based on local needs. The community was involved right from the design of the project till the completion of the physical infrastructure, and the projects identified clearly articulated roles and responsibilities for different stakeholders, and operational rules and regulations, in order to enforce user rights.

There are also informal conflict resolution mechanisms, including social sanctions for non-compliance with the agreed roles of individuals and rules of the association. For instance, the *khuls* were constructed, operated and maintained by the village community. At

the beginning of each irrigation season, the water tender or water man, who operates the system, would organize the irrigators to construct the head wall and repair the *khul* and make the system operational. The water man plays almost the role of a local engineer. Any farmer refusing to participate in construction and repair activities without a valid reason would be denied water for that season. Subsequently a religious sanction evolved, which was initiated by the community and followed strictly to date without any excuse or favor, irrespective of a person's social and economic status. Such practices are many across the country, called by different names in different states (for details see Sengupta 1991).

Similarly, *eris* (tanks) in Tamil Nadu, were maintained by the local communities. Some historical data available from Chengalpattu District indicates that in the eighteenth century about 4 to 5 % of the gross produce of each village was allocated to maintain *eris* and other irrigation structures. Some lands, called manyams, were assigned to the village functionaries (*Neerugantis* or water men) to maintain the tank system and distribute water. This was the practice even in Karnataka and Andhra Pradesh. This can be termed as the era of the farmer-nature friendly irrigation systems evolution. These systems have been owned, operated and managed by the local institutions effectively and efficiently for generations. Even to this day they are as efficient as they were at the time of starting, maybe even 100 years ago in some cases. With the advent of British rule, and subsequent political economy considerations in the post-independence period, on-farm water problems and reliable supply of water led to enormous expropriations of village resources by the state, which in turn gradually disintegrated the traditional society, its economy and polity.

The traditionally evolved participatory culture seems to have been gradually diluted, due to a whole range of natural, social, economic and most importantly political factors, especially during post-colonial or post-independence period. For instance, tank systems, especially in the southern parts of India, which had a long history of community management, the government took over the responsibility of managing such systems after independence. Given the bureaucratic culture, they were unable to provide timely assistance to maintain the tank infrastructure. And as a result, physical infrastructure deteriorated over a period of time, leading to a gradual reduction in storage capacities of tanks and the consequent reduction in the area irrigated under tanks. Furthermore, due to natural factors like reduction in the runoff (due to changes in rainfall pattern), the widespread implementation of watershed programs in tank catchment areas, siltation and weed infestation of feeder channels, and also encroachment by the neighboring farmers, the frequency of water filling and tanks surplus had come down drastically. The tanks, which used to have a surplus every year, are not filling now even once in 5 years, in some cases not once even once in10 years and in some others even longer periods. The shift from more dependable water availability to uncertain and undependability has had a negative impact on farmer's interest in tank management, and had also resulted in the gradual disappearance of the traditionally evolved demand management strategies. The state governments now have realized the importance of and the need for reviving or restoring community management of tank systems and initiated steps to handover tanks to the user groups.

The process of reinventing the wheel of community management is in progress in several states, like Karnataka, Andhra Pradesh, Orissa and many others. The tank systems are being rehabilitated to the originally designed standards and handed over to the communities,

by building the required capacity to operate and manage them on a sustainable basis. The capacity building includes identifying cropping pattern and planning suitable to different levels of water storage in the tanks to ensure effective demand management. The initial indications of this approach are quite encouraging, in spite of some threshold problems and teething troubles.

Groundwater development and lift irrigation offer a wide range of opportunities to tap water for irrigation purposes. Traditionally, dug wells were constructed by the farmers, either individually or in groups, depending upon the size of their landholding, and water lifted through animal-drawn water-lifting devices. These practices are widely prevalent in South India and also in Maharashtra, Rajasthan and other states. For instance, an open well with multiple owners called 'Saza *Kuva'* (*Saza* means partner and *Kuva* means open well) is an important source of irrigation in the Aravalli hills in Mewar, eastern Rajasthan. The construction is generally taken up by a group of farmers with adjacent landholdings, and water is shared on the pro-rata basis of the size of the holding. Protection of well and annual repairs and desiltation is taken up collectively by all the partner farmers. Similar practices are found in Andhra Pradesh. Farmers manage the groundwater in the wells by resorting to an appropriate cropping pattern, depending upon the monsoon and the consequent depth of water available in the well. Water is shared on the basis of the landholding. This is allocated in proportion to the land area owned by the farmer with well as the source of irrigation (Reddy 1994).

Similarly, spring channel irrigation associations in Andhra Pradesh that flourished once, have now become dysfunctional because of the reduced flow in the channels that is created by frequent droughts in several parts of the state. Some of them are, however, still functional with the same efficiency and effectiveness with which they had been working for more than 100 years. The traditional systems evolved through users' initiatives have stood the test of time and continue to function in diverse forms across the country. Because of natural constraints and limitations however, some of them could not be sustained. Even otherwise, the contribution of farmer- managed irrigation systems per se in the country, to the total irrigation potential is very limited. Though the contribution of groundwater irrigation is significantly more, it is mostly owned and managed by the resource-rich farmers.

Given the status of traditionally evolved users' associations and their contribution to the total irrigation requirements, the emphasis now is on farmers' participation in irrigation management in the agency-operated large and medium projects. This is because management of water distribution in large surface irrigation systems in India rests with the Irrigation Departments of the State. Most of the irrigation systems are supply-based, designed for a given cropping pattern, with estimated crop-water requirements. The literature available on irrigation impact clearly brought out the mismatches between the expected and actual impacts of irrigation on economic, social and environmental conditions. The need for and the significance of farmers participation in irrigation management under the agency owned and operated large surface irrigation system was realized all over the world. The attempts were, however, not systematic and sustainable. Except for a few isolated attempts, sustainable efforts have hardly been made due to a variety of political economy factors.

The Irrigation Commission 1972 has expressed concern about the need for the creation of an efficient and effective utilization of potential irrigation. It has, therefore, recommended an institutional set up at the state level to coordinate the activities of different departments

as well as those of the user farmers. Based on the recommendations of the Commission, Command Area Development Authorities (CADAs) were constituted at the project level. This is, in a sense, a landmark beginning in India to provide scope for farmers' participation in irrigation management. But not enough attention was paid to the farmers' participation per se in the command areas. As a result, the demand management strategies were hardly adopted in these areas. This has led to inequitable distribution of water, depriving the legitimate right of the tail-end farmers to use irrigation water, and paved the way for the consequent social and environmental problems. For instance, water-related squabbles and litigations among farmers have increased, as have environmental problems like waterlogging, salinity, alkalinity and related health hazards to the rural communities.

Special efforts were, therefore, made in the 1980s in several states in the country to develop demand management, a non-structural approach, in the agency-operated canal command areas. For instance, the warabandi system of water distribution, which was effectively implemented in Punjab, Haryana and Western UP, was also introduced to the Andhra Pradesh and Karnataka later. While it was sustained in the northern states, the impact of the warabandi system in Andhra Pradesh and Karnataka was short-lived. Same is the case in many other states, including Maharashtra. However, Maharashtra made an attempt to organize village level committees for water distribution in the Girna project. But the village irrigation councils established in the project could not function properly and therefore could not be maintained (Lele et al. 1994). Institutional sustainability depends upon establishing sets of ordered relationships among people, which define their rights, creates awareness on the rights of others, and on each others' privileges and responsibilities. Unfortunately, the institutional approaches adopted by several states, have not been sufficiently grounded in social realities; instead they are mostly based on a short-sighted political economy considerations.

The big-bang approach adopted by the Andhra Pradesh to establish Water Users Associations covering all the irrigation systems – major, medium and minor – had raised high hopes of setting direction to enforce participatory irrigation management (PIM). The Government of Andhra Pradesh had passed an Act namely 'Andhra Pradesh Farmer Managed Irrigation Systems Act, 1997' to facilitate the transfer of irrigation systems in the state. While some studies have shown the impacts as promising and encouraging (Jairath 1999), some others have brought out the limitations entailing the successful and sustainable functioning of WUAs (Reddy et al. 2007). The present status and features of irrigation management transfer in India can be seen in Tables 1 and 2. The institutional structure and policies of WUAs are not uniform; they differ from state to state. For instance, in Andhra Pradesh it is based on a three tier structure, i.e., outlet, distributory and the project, with clearly demarcated rules and responsibilities. Though the tier system is introduced in other states, the operational area is fixed. In Maharashtra, Gujarat and Tamil Nadu the operational area is fixed as 500 ha, whereas it is 10,000 ha in Bihar. While O & M responsibility is entrusted to WUAs in all the states, the water tax collection rests with the agency. And in some states the choice to collect money for O & M from the users is left to the WUAs. However, the systems were not rehabilitated fully to the originally designed standards, before handing them over to the farmers or associations.

Table 1. Water users' associations (WUAs) in India.

States	Number of WUAs	Area Covered (ha)
Andhra Pradesh	32	17,388
Assam	30	15,000
Bihar	1	12,197
Gujarat	477	48,500
Karnataka	196	38,400
Kerala	3,432	137,280
Madhya Pradesh	67	62,800
Maharashtra	118	48,095
Orissa	52	27,589
Tamil Nadu	276	13,800
West Bengal	10,000	37,000
Total	14,681	458,049

Source: Palanisami and Paramasivam (2007)

For instance, in Andhra Pradesh O & M grants were promised to WUAs every year. This has prompted the farmers associations to look for government grants even after the systems were handed over to them, instead of exploring different sources of revenue generation for their day-to-day operations. The participation is in a sense incentive-induced. Incentive here is government support for O & M. "It was reported by some farmers that Rs.50,000/- can be spent by the association for canal repairs and maintenance without calling for any tenders or other formalities. This according to them is an incentive, especially for office bearers of the association. If the funds are not made available, the interest in the association will be eroded making it non-functional." (Personal discussions with some groups of farmers in Anantapur District of Andhra Pradesh).

The available literature shows that most of the studies of WUAs in different states have mainly focused on understanding the transfer processes and not necessarily on their benefits and sustainability, particularly in terms of an equitable and dependable supply of water to all the farmers, irrespective of their farm location in the service area of WUA (Singh 2000). Some of the studies have brought out the efficiency of WUAs under private owned systems, especially in groundwater and pump irrigation systems (Shah 1993) highlighting relative advantages. Some other studies have revealed that the WUAs have limited success in terms of participation as well as impact (Brewer et al. 1999; Parthasarathy et al. 2000). While the impacts or experience at the aggregate level are generalized and documented, micro-level observations based on the ground realities in different socioeconomic and environmental settings are not executed systematically.

In order to ensure that WUAs, especially in the agency-managed large irrigation projects, function effectively on a sustainable basis, local dynamics associated with the operation and management at the farm level should be integrated right from the design and

formulation stages of the associations. Furthermore, there is an absolute need for integrating the main system management with farm level management strategies. This is because farm level problems often result from water allocation and distribution problems at the main system level, which is beyond the farmer's control. Unless main system management is organized and improved, a key factor for the success of WUAs, on-farm water problems cannot be resolved. More attention should, therefore, be paid towards this aspect, which hitherto has not received the required attention.

Table 2. The status of irrigation management transfer in India.

State	WUA Organization	Transferred Responsibilities	Water Supply	Water Distribution
Andhra Pradesh	Three tiers: • Village (outlet) WUA • WUA for distributory channel Command Project Committee	O & M below the outlet Maintenance of distributory Collection of government irrigation fee	Assured Water Supply through WUAs	Full power, including punishment of rules breakers
Bihar	Three tiers: • Village (outlet) WUA • WUA for distributory channel Command of over 10,000 hectares • Project Committee	Distribution of water to the outlets Maintenance of distributory Collection of government irrigation fee	No power	Full power, including punishment of rule breakers
Haryana	Outlet level WUAs	08 M below the outlet Collection of government irrigation fee	No power	Responsibility limited or no power of punishment
Maharashtra	Contact (Cooperative WUA for minor canal, about 500 ha)	08 M within the WUA areas Payment of fee on volumetric basis to the agency	Assured water supply through contract	Full power
Gujarat	Contact (Cooperative WUA for minor canal, about 500 ha)	O & M within the WUA areas Payment of fee on volumetric basis to the agency	No power	Full Power
Tamil Nadu	Three tiers: • Outlet WUA about 500 ha • System level joint management	Maintenance within the WUA areas Advice on operations at all levels through WUAs and JMCs	Influence over water supply through JMCs	Limited responsibility. No power to punish rule breakers
Kerala	Three tiers: • Outlet WUA • Branch canal JMC • Systems level joint management	Advice on operations at all levels through JMCs	Influence over-supply of water through JMCs	Limited responsibility

Source: Brewar et al. (1999), quoted in Reddy et al. (2007)

Capacity of WUAs for Demand Management

A brief overview of the status of WUAs in the traditional small irrigation systems and the agency-managed large systems presented above leads us to critically examine the possible ways and means of building the capacity of WUAs to meet the emerging and contemporary needs for demand management. While the scope for and scale of operations in small-scale systems is limited, the focus needs to be more on the agency-managed large-surface irrigation systems. It is clear that WUAs in the agency-managed systems are mostly operating on pilot basis except in Andhra Pradesh. The impacts observed so far are limited. Some of WUA are promising and some others are far from ground realities. There seems to be no option, other than WUAs to manage demand for irrigation water, particularly given that the agencies are gradually becoming less and less effective in managing irrigation water supplies, due to a variety of reasons (some of which are mentioned below (see Box.1)).

Box 1. Why State Agencies Are Becoming Less Effective in Managing Irrigation Water Supply?

- Lack of timely and periodic maintenance of water distribution network, including hydraulic structures, has led to non-compliance with the originally designed water delivery schedules at different points of the canal distribution network;
- Violation of the cropping pattern and the consequent non-realization of water duty assumed in the project design;
- Inequitable distribution of water has almost become an accepted norm, resulting in total alienation of tail-end farmers, which has created scores of social and economic problems;
- Productivity of irrigated crops has been much lower than the expected levels;
- On-farm development (OFD) is poor and unscientific;
- Environmental degradation due to increasing waterlogging, salinity and alkalinity problems in the canal command areas have converted hitherto fertile and productive soils into unproductive quagmires;
- Due to low water tariff and an even lower recovery rate, even the operation and maintenance (O & M) costs are not recovered, to keep the distribution system in good condition.

Farmers basically are not interested in keeping irrigation engineers totally off the field and become their substitutes. And it is neither possible nor advisable. All that farmers want is a timely, dependable and adequate supply of water to optimize productivity. However, the water distribution network that has been planned and designed by the irrigation engineers is based on certain water duty assumed for a crop or set of crops. In doing so, they seem to have taken for granted and treated as rational, and therefore expected behavior, the tendency of farmers to follow the designed cropping pattern in a given irrigation project. Any deviation from the designed cropping patterns creates problems of inequity. But in reality, the designed cropping pattern has been hardly followed, and the indiscipline in water use has increased. This has resulted in a 'laissez-faire' system of water use, which the rich and influential farmers exploit to their advantage.

The primary task of ensuring the sustainable functioning of WUAs as effective agents of demand management entails a transformation of the mind-set of the engineers and farmers to meet the requirements of the prevailing situations. This calls for the identification and establishment of a mutually agreeable and facilitative interface between the irrigation department and farmers or WUAS. One of the important aspects that merit attention for establishing an interface is the water distribution system improvement or rehabilitation, as none of the distribution canals and hydraulic structures have the originally designed standards. It must be considered and noted that farmers, to start with, do not generally posses technical skills and financial resources to restore the system to the designed standards, without which

efficient distribution and utilization of water remains an elusive concept. The spread and scale of the proposed system of rehabilitation should, to the extent possible, take local conditions and stakeholders' views and suggestions about the ways and means of restoring the system, including the placement of irrigation structures, to ensure efficiency and sustainability are taken into account. This helps to create a sense of accountability and ownership of the system among the farmers, a prerequisite for institutional sustainability, when the system is handed-over to the association.

The traditional wisdom and past experiences show that an institution borne out of users' interests endures for generations, while those created by an external agency (top down blue-print approach) are invariably short-lived with limited success. A set of conceptual themes, like defining water as an economic good, decentralized management, delivery structures, user principles and levels of stakeholders' participation need to be well articulated, informed and implanted in the mind-sets of the irrigation engineers and user farmers. The status of water availability for irrigation, after taking other competing demands into account, should be made clear and the limitations to increase water supply beyond the designed capacities need to be explained to the farmers to prepare their mind-set. The responsibility of supplying a mutually agreed quantity of water at the interface cut off point – a distributory or an outlet, as the case may be – from where farmers or the WUAs take the responsibility of management, should be the exclusive duty or responsibility of the irrigation department. The WUA should be vested with the right to demand for the quantity of water they are entitled to, under the normal monsoon conditions. The absence of commitment to honor this agreement by both the parties makes the WUA unsustainable.

The WUA establishment process should be participatory, based on a logically framed stepwise approach, where entry and exit points for water users, irrigation engineers and allied agricultural extension agencies are clearly spelt out. The concerned stakeholders and agencies must be reconstituted to take charge of the new roles with responsibility, accountability and commitment. The proposed new role models for farmers and government agencies need to be supported by well-articulated, systematic and location-specific change processes that ensure the operational feasibility of the new strategies and plans, in order to facilitate their effectiveness. The reform processes should be broad-based and maintain a balance between political exigencies, social needs and ground realities. It is, therefore, essential and necessary to consider the social mobilization and stakeholder analysis as the beginning or an entry point for the building users' association to manage irrigation water. In order to ensure a built-in sustainability of the new paradigm, the past experiences in the agency-managed large irrigation projects, the socioeconomic contexts where the alleged adverse effects have taken place and the field realities should form the basis and not the formal perspective approach, hitherto followed by the line departments.

The role of farmers or WUAs should be clearly articulated and discussed in the social mobilization process to ensure mutual acceptability. The issues may include, among others, water use priorities, crop planning, sharing of system rehabilitation and maintenance costs, selection of operation and management interventions, with a built-in flexibility to meet the location-specific conditions and requirements. The role and usefulness of a common sense approach, besides a techno-centric professional approach, needs to be given due consideration in order to promote and ensure sustainability. Otherwise, the subsidy-driven approaches to establish WUAs will invariably be short lived and the dependency syndrome among farmers becomes perpetuated.

Some Successful Cases of WUAs

A brief overview of the critical factors necessary for the successful organization of WUAs, especially in the agency-managed large irrigation projects, has been presented in the preceding section. Given the necessary and sufficient conditions for sustainability, it may be useful to examine some of the existing systems. The traditional systems evolved by the farmers, have been maintained in several parts of the country. But the coverage and scales of operation are meager, when compared to the needs of demand management in the contemporary scenario of irrigation projects. Though efforts had been made to transfer irrigation management to the user farmers in the 1950s in some of the countries, it became a national strategy in most of the developing countries only in the 1980s and 1990s. Organized and systematic efforts to transfer irrigation management to the farmers have started first in the Philippines in the early 1980s, particularly the farmer-managed irrigation systems. The strategies and modus operandi were, however, not exactly what they required in other parts of the world, more importantly in the Indian context.

Different countries have followed different strategies. Even within the countries, the approaches and methods were different. The initial success stories reported and publicized seem to be short lived, because of weak organizational foundations. The water rights and corresponding responsibilities of the WUAs and its members were not defined, and also there was no enabling legislation or legal backing to make them functionally effective. Hence this apparent lack of a comprehensive policy resulted in about 225 WUAs, in the mid-1990s, that were created in major and minor irrigation projects, becoming defunct. Keeping the above scenario as a backdrop, an attempt has been made to present some of the existing systems as examples of better WUAs in different socioeconomic and cultural contexts.

In India, the success stories are many among the smallholder traditional irrigation systems. In drought-prone districts of southern India, particularly in Andhra Pradesh there were many groundwater open-well irrigation systems that operated on a time-sharing basis. The gradual decline in groundwater and consequent drying up of shallow open wells has led to the disappearance of a participatory culture (Reddy 1994). The resurgence of some of the systems is, however, worth mentioning as an illustrative example. Anantapur is one of the backward districts in Andhra Pradesh, where participatory open-well irrigation systems were in plenty. Because of natural factors and constraints over a period of time, most of them have disappeared. In recent times some NGOs have tried to revive, and rebuild such practices. For example, an NGO called the Rural Integrated Development Society (RIDS) has tried to organize farmers for the demand management of groundwater for irrigation in one of the villages called Madirepalli, through social regulation. It began in 2003 when the area was hit by a severe drought. There were about 139 tubewells in that village, of which 75 have dried up. Nevertheless, the rat race for digging tubewells continued. The indebtedness among the farmers was on the increase due to failure to strike water, and the investment in the tubewells became unproductive. At this point of time the NGO (RIDS) entered the scene and became a catalyst to rebuild the participatory culture that once existed in the village. Historically, Madirepalli had a track record of sharing surface water flowing in a stream, through a traditional 'Gonchi' system (see Box 2).

Due to resource pressures and other attitudinal changes, the system, which was dormant, if not extinct, needed rekindling. RIDS played the much needed catalytic role. The community was motivated through several rounds of meetings and discussions. There is no irrigation

project in the vicinity of the village, nor any reliable surface water resources. The only sources of water for crops, livestock and drinking are the rains and the groundwater. As a result, there has been a heavy pressure on the wells. RIDS prepared a water balance sheet (supply and demand for water) for the village, and placed it before the villagers. The road map was clear – either to go ahead with indiscriminate digging of tubewells and end up in debts and misery or to be wise and share the available water with those who did not have. The initial reluctance of the owners of live tubewells did not last long. The hard facts – that there was not enough water for every one in Madirepalli and that if every other farmer dug out his own tubewell, the water in the live wells would also run out soon – were gradually realized by every one. Subsequently, 'water- haves' and 'have-nots' agreed to come to terms in sharing the available groundwater.

Box 2. 'Gonchi' Systems for Surface Water Sharing

'Gonchi' refers to collective community efforts in bringing water from a stream and distributing the same equally to irrigate a stipulated 'ayacut' area. This system has been in practice in parts of Andhra Pradesh for well over a century. A users association manages Gonchi. The association lays down norms for use and maintenance of the system. One of the major activities is desilting of various channels through which the water is brought and distributed. Water is blocked by constructing a temporary structure and then diverted from the main stream, this helps to take up repairs all along the channels. Users contribute labor or compensate with wages towards the operation.

A natural stream called "Akuledu Vanka" serves a few of the Madirepalli farmers. It receives a reasonable quantity of water, besides seepage from the Tungabadra high-level canal, when water is released into the canal. Villagers have built a separate diversion canal to allow the stream water to flow into their fields by gravity. Generally, paddy is cultivated for one season in these fields.

Water is distributed by placing wooden gates called 'anthams 'across the flow. The water flow is monitored by a designated person called Neerugant; who is compensated for his service by providing a designated share in the harvested crop. The functioning of this system is governed by the rules and norms set by the users association. Violation is curbed by fines and strictures.

Source: Sreenath Dixit et al. (2007), LEISA, INDIA, March 2007, Vol.9; No.1

Villagers agreed to follow the regulations for use of groundwater. The resolutions were passed in the 'Gramasabha', and the following social regulations were accepted by all.

(a) No more tubewells in the village henceforth;

(b) No more growing of high water-consuming crops like paddy;

(c) Every one in the village would do his/her best to protect and augment groundwater resources;

(d) Farmers having water in their tubewells to share a reasonable quantity (enough at least for 0.5 acre) of water with fair neighbor;

(e) Use water saving devices like sprinkler and drip systems for irrigation.

All these resolutions have been written on the walls of the village 'Chavadi' (a community centre where villagers gather). These regulations are in force in Madirepalli since 2004, and the impacts are tangible. There is no drinking water issue even in the drought years. The cultivated area has increased from 339 acres in 2003 to 516 acres in 2006, though there was a marginal increase in the rainfall from 255 mm to 297 mm in the respective years. This is due to sharing of water between haves and have-nots, ban on cultivation of paddy and using sprinkler and drip systems. Farmers, 33 in number, who irrigate their 113 acres, have shared water with another 33 farmers, who were able to irrigate 66 acres of dry land. This has become a model village to spread water literacy in terms of awareness on conserving and sharing the available water.

Another surface irrigation system managed by the farmers is functioning effectively in the same district. There are no recorded evidences to show as to when it was started. Some village elders say it is more than 100 years old. The beauty of the system is that, the same rules and regulations which were evolved by the founders are followed even today, without diluting even a single aspect. The source of water for the systems is a natural spring located about 6 kms from the village. Water flows through a ravine called Kutalamadagu *nala* up to the village tank. The tank has a separate sluice to allow the water to the farmer's fields coming under Kutalamadagu *nala*. The association has fixed a proportional distribution weir to ensure an equitable distribution of water. This has been prepared by the farmers themselves, without any engineering help. *Neeruganti* (water man) will operate the system. The committee will meet before the start of the irrigation season and decide the cropping pattern to be followed by all the member farmers, taking into account the availability of water. Nobody can violate the cropping pattern decided by the committee. Maintenance of the main nala and field channels is the collective responsibility of all the farmers, by contributing labor in proportion to the land owned by individual farmers. Social sanctions are built into the system management rules and regulations. All the farmers should obey and follow the rules strictly. There have been no problems at any time in managing the system. It continues to be the model for the participatory management of water (Reddy 1989).

The story of WUAs and their sustainability in the major irrigation projects of Andhra Pradesh is different. For example, farmer's organizations known as 'Pipe Committees' were first started in one of the major irrigation projects in Andhra Pradesh in 1976, namely the Sriram Sagar Project. The Pipe Committees worked effectively with several advantages to the farmers. Subsequently the 'warabandi' system of water distribution was introduced in the 1980s, as a tool for the demand management of water, resorting to the rotational supply of water. This has brought about a lot of discipline to water use and ensured equitable distribution of water even to the tail-enders. But the success was short lived due to a number of socioeconomic problems and also because of the lack of a strong institutional base. The same is the case with the WUAs that started after the enactment of A.P Farmers Management of Irrigation Systems Act in 1997. Though WUAs are legally constituted, their effective functioning and advantages to the farmers are very few and far between.

Gujarat is known for successful functioning of water users' cooperative societies. In the Ukai Kakrapar Irrigation Project, one society, among others, which was formed in 1979, seems to have been working effectively. The society covers four villages with a cultivable command area (CCA) of about 421/hectares. Water is supplied in measured quantity from fixed outlets and the society pays for the quantity of water drawn. Maintenance of the field channels and other structures is the responsibility of the farmers. Farmers contribute labor and also money, if and when required to undertake small repairs. Volumetric supply of water as per the agreement with the society appears to be the main reason for the successful functioning of the society (Pant et al. 1983). Another success story widely quoted in Gujarat is the Mohini water user's society. One of the main reasons for the successful functioning of the society is the homogeneity of farmers. A majority of the farmers belong to one caste. This could be one example to show that homogeneity of caste or community, among others, is one of the factors for sustainability of WUAs and their effective functioning.

Maharashtra is yet another state where water cooperative societies have a long history. Some of the indigenous systems like Bandharas (small diversion weirs), locally known as 'Phad systems', are very popular in Nasik and Dhule districts. They have been successfully working for centuries and are effectively functioning even now. The decision is taken collectively at a meeting of the farmers before the commencement of the crop season, to decide the crop pattern, allocation and rotation of water. Farmers misusing water or not following the rules will be fined. The canal systems running for several kilometers, is maintained by the beneficiary farmers. Contribution to meet O & M expenses are collected either in kind or in monetary terms. Water men, inspectors and watchmen are appointed by the society to regulate and distribute the water supply to the farmers.

'Pani panchayat' is another noteworthy success story quoted widely. The sustainability of an institution created by local initiatives depends mostly, among other things, on the committed leadership of either a group of individuals or single individual. This is a unique system developed in the village of Ralegaon Siddhi in Maharastra, under the leadership of a noted social worker, Anna Hazare. All the households in the village are entitled to a share in the available water, irrespective of the household owning land. This is the household-based equity and not land-based equity. This has happened due to the leadership of Anna Hazare. Though it is acclaimed as the best system, its replication has not taken place. Attempts to replicate the same in some places have not been successful enough. That means, it is purely leader-centric. Unless and otherwise a leader like Hazare is available, this cannot be replicated. Same is the case with 'Tharun Bharat' in Rajasthan. Because of the commitment of Rajendra Singh, it was possible to turn the desert ravines into green pastures. He fought against several odds and problems created by the government, mobilized farmers, sustained their interests and showed the tangible results, so as to motivate farmers and develop their commitment. It is, therefore, important to underscore the necessity of credible leadership to build WUAs on a sustainable basis.

In Karnataka, there are farmer-managed lift irrigation schemes along the Krishna river bed that have been functioning successfully for several years. For example, the Kalpatharu Lift Irrigation Society in a village called Siruguppi in Athani taluka of Belgaum District is run by the farmers very successfully. This is a drought-prone area and even finding drinking water was said to have been one of the biggest problems in the village. Some village elders say "people were reluctant to give their daughters in marriage to this village, because of the

scarcity of drinking water." Such was the condition of water availability in the village, though it is about 3 to 4 kms away from the Krishna River.

The farmers were told by the neighboring Maharastra farmers (the village is located in Maharastra border), they are lifting water from the Krishna River for irrigation purposes. A group of farmers visited some of the villages in Maharastra where river pump systems were in operation and discussed with the Maharastra farmers and observed the system operation. Then they called for a meeting of like-minded farmers and discussed the proposed lift irrigation schemes. After ironing out all the initial apprehensions about their technical capabilities for putting the system in place and other related financial issues, they resolved to go ahead with the registration of the society and named it as 'Kalpatharu Lift Irrigation Society'. The initial seed money was raised through personal contributions from the member farmers and the rest of the money was borrowed from a banking institution. An open well at a distance of about 2 kms from the river bed was constructed, and a pump in the river bed was installed to lift water from the river. A big tank, in an area of about 1 ½ acres, was constructed to store water. First, water was to be pumped from the river to the constructed open well, and then from the open well to the tank for storage. Water stored in the tank was to be distributed to member-farmers through the underground pipes, by gravity flow. The entire water collection system from the river to the well and on to the tank was operated through under ground pipes. The piped water distribution system has been laid in such a way that every farmer is provided with a gated inlet to take water. The water inlet is locked and will be operated by the waterman, appointed by the society, on the scheduled day and time of the farmers' turn to take water.

Water entitlements of all the members, their roles and responsibilities, water tax to be paid, clauses of penalty for violation of rules and taking water out of turn or wasting, rights of way for farmers to transport inputs to and outputs from the farms to the village, have all been written down and the by-laws were framed accordingly. The farmer who donated land for construction of the tank will be given water to his remaining land free of cost to the rest of his life. Irrigation schedules, depending upon the nature and type of crops they plan to grow, will be prepared and circulated to all the member farmers. The waterman will operate the distribution systems; the concerned farmer should be present in his field to take water on the scheduled day and time. The waterman will open the lock and allow the water to flow through. After irrigating the said farmer's field, the pipe outlet will be locked and the next farmer in turn will be given water. Farmers have been operating this system for over 20 years and even now it is functioning as effectively as it had been when it first started. The demonstration effect of these systems is very wide. Many societies have come up now after seeing the success and operation of these systems and are themselves functioning well. The environment of the village of today is completely changed. The drinking water problem has been solved and the village micro-climate itself has changed because of the greenery all through the year; thanks to the irrigated agriculture, facilitated by the lift irrigation society.

Participatory irrigation management (PIM) per se has not been successful enough in India, though it has become a wide spread strategy in Asia, Africa, and Latin America. The governments are trying to reduce their role in the large irrigation projects and promoting the participation of primary stakeholders in a number of piloting areas. The results from Maharastra, Gujarat and in a few other states seem to be encouraging. But the scaling up of these success models needs, among others things, political will to introduce a few tough policy interventions to turn over the system to the user association. Otherwise, taking off from the piloting stage is likely to evolve into a mirage.

In various countries where PIM has been adopted as a national strategy, there has been a mixed trend of results. The transfer processes have been relatively smooth and fast. The costs of self-managed irrigation systems have become relatively less. In this context, one of the most successful examples is Mexico (see Box 3). The financial crisis of the 1980s has compelled the Mexican Government to enforce a number of structural adjustment programs. The transfer of management responsibility of irrigation districts to the farmers was a significant reform. This was adopted due to absolute necessity. The government made it clear to the communities that they have to either take on the management responsibility or suffer the consequences due to unreliable water supplies in poorly managed irrigation systems. This tough stance taken by the government made farmers to accept the responsibility of managing their respective irrigation systems.

Box 3. The Mexican Experience

The Mexican Government adopted carrot and stick approach. The carrot was management autonomy and the transfer of mechanized equipment from the agency to the farmers association. The farmers would become the owners of this equipment, and would be free to set their own rules for cleaning the canals, water distribution norms and procedures, and the appointment of the required technical staff. The canal would be theirs on 20 years concessions, which in practice is a transfer of ownership. They have also used a 'stick'. If farmers refused to take over management, the government could offer no assurance that the canal network could be kept in repair. The government in effect threatened to default on its conventional understanding with farmers regarding levels of subsidy in the irrigation sector. Many farmers, particularly the commercially-oriented ones, could not accept the risk that the irrigation infrastructure might collapse. They preferred to take over the management, and with a few exceptions, they have not looked back. They are paying much more for their water without the government subsidy. But the reliability and responsiveness of their new management structure is well worth the prices they pay. For them it has been 'Win' situation, and for the government as well.

Source: Groenfeldt and Sun (1996). Hand Book on participatory Irrigation management. World Bank/EDI, Washington. DC.

The first irrigation district was transferred to the users in 1990. By 1995, more than two-thirds of the country's 3.2 million ha network consisting in 80 irrigation districts, had been transferred to 316 irrigation associations (Groenfeldt 1996). The work involved countless meetings at various levels, from discussions with leaders of producers and marketing associations to one-on-one discussions with users. The transfer program was initially focused on the most productive irrigation districts, with the most commercially-oriented farmers. The important criterion for selecting districts was the potential of the user organization to become financially self-sufficient, with users paying the fees to cover the costs of operations, maintenance and administration.

A few illustrative examples cited above underscore the diverse range of socio-cultural factors, political economy dynamics, institutional and organizational capabilities contributing to

the sustainability of different types of irrigation associations. While the traditional associations borne out of the relentless efforts of a few committed local leaders, collective efforts of a community, revival strategies facilitated by NGOs etc., stood the times of test and remained as islands of participatory approaches, the agency-sponsored blue-print top-down approaches, are yet to take off from the piloting phase. The irony here is the need for and importance of users' participation for demand management is gigantic in the agency built, operated and managed large irrigation systems. The present efforts to implement PIM in major irrigation projects is, however, less than a scratch, in the given gigantic task, in terms of scaling up the spread and operation.

Areas Where WUAs Can Manage Water Demand

This is a very broad and difficult question to tackle in the context of India, which is of continental dimensions in spread, endowed with a diversely ranging resource base, socioeconomic and cultural differences, political economy considerations and above all, dominating self-interest of the elite class in rural areas. The strategies should, therefore, be broad based to develop the culture of 'consumerism' cutting across the given socio-political diversities, taking the location or area-specific ground realities into account. While almost all the states have made a beginning to introduce the demand management strategies in the agency-managed large irrigation projects, the success and sustainability is yet to be seen. The prioritization of the regions for rekindling participatory culture as an effective tool for demand management should be based on the status of the resource (water) availability, extent of its utilization, past attempts made to promote user associations and other related factors. In northern states like Punjab, Haryana, western UP, the demand management strategies in the form of warabandi and other systems of irrigations have been implemented fairly well, when compared to southern states.

There are a number of traditional small-scale irrigation systems, as mentioned earlier, successfully managed for generations in the southern states. The demand management through user association in the agency-managed large systems has hardly made any impact. It is, therefore, necessary to promote, user associations in southern states, particularly Andhra Pradesh, Karnataka and Tamil Nadu, for demand management of irrigation water. The frequent inter-state water disputes in these states makes the need for demand management much more significant. Identification of surplus and deficit zones within an irrigation project, taking the existing cropping pattern and crop-water requirements into account, is necessary to plan for demand management. Benchmarking of water delivery status at different points of the water distribution network starting from main canals, distributaries and up to minors and farm outlets is essential. This helps to prepare a road map of water availability and the status of its utilization, which can be placed before the concerned communities to explain the implication of water use and change their mind-set.

Andhra Pradesh has an edge over other states for demonstrating user associations as effective agents of demand management since the state has been performing experiments to introduce participatory management system from the early 1980s. It was started with Pipe Committees and warabandi system, followed by a big-bang approach, under which all the irrigation systems were brought under WUAs. But the impacts are not clear and mixed as revealed by some empirical studies. Furthermore, the present government has taken up irrigation as the main agenda for development under the 'Jalayagnam' program, with a huge

investment. It would be more appropriate to study the existing systems in place for demand management, problems and constraints, if any, for their successful implementation.

The estimated water resource available in the state is about 108 bcm (billion cubic meters) of which about 57 % (62.3 bcm) is currently being utilized for irrigation and other purposes. The state comes under a water-stressed category with a per capita annual water availability of slightly more than 1,400 m^3. The total irrigation potential created is about 3.6 million hectares, of which almost 50 % is under major and medium projects. At present, efforts are being made to increase the irrigation potential by completing all the ongoing projects and starting new projects. There is, however, a wide gap-estimated to be at about 0.4 million ha, (22 % of the potential created) between the irrigation potential created and its utilization under the major and medium irrigation projects. This is mainly due to poor systems management and low on-farm water-use efficiencies. In spite of handing over the management to WUAs, the water use efficiency has not improved, and the potential created continues to be under utilized or misused. It is, therefore, important and necessary to reexamine the demand management strategies and formulate new paradigms by considering the experiences in different agro-climatic, socio-political, and cultural contexts.

It is equally important to conduct water balance studies and research on water use efficiency in the Cauvery Basin projects of Karnataka and Tamil Nadu. There are no scientific studies to estimate water requirements of the crops grown and water released or made available at different reaches and locations to judge whether water released at present is adequate or not. Creating an institutional paradigm in these regions to create effective and efficient WUAs will have far reaching impacts on the frequently arising water disputes between the two states. There are allegations and counter allegations about the use and abuse of water by the farmers, and wasting the scarce resource. Benchmarks about the water release and utilization at different locations in the basin should first be established before WUAs are put in place on an experimental basis. Taking the lessons and impacts of these pilot experiments into account, the scaling up of strategies can be worked out to sustain the proposed new paradigm of water management.

Constraints for WUAs in Demand Management

The task of creating effective community-controlled social organizations has become a widely advocated development strategy in many developing countries. While this strategy is espoused by some as a means for the disadvantaged groups to acquire a larger share of the benefits of development, others stress the importance of local organization in sustaining the productive use of land and water resources. This has led several states to experiment with building user organizations as one approach to reduce government expenditures for recurring costs of irrigation system management. Because, irrigation water rates, in general, do not even meet the costs of O&M. Even the low water rates are not regularly and fully paid by the farmers. The inadequate finance has led to lesser and lesser allocations for O&M in successive years and the consequent system deterioration has caused a decline in the delivery of services.

Community organizations are, therefore, inevitable to meet the challenges of water demand management in the future. This calls for designing irrigation systems that are responsive to farmer's needs, matching supply and demand as closely as possible, with minimum losses of water and providing for flexible cropping patterns. The ramifications of water resources

development over the years have given rise to a number of theoretical and empirical questions. It is said that environmental problems like waterlogging, salinity, alkalinity, water-borne diseases and other socioeconomic adverse effects are due to the disjunction between increasingly large-scale complex and modern irrigation network and still largely traditional peasant farm users of that system. The human dimension has almost remained outside the ambit of water resources planning and, therefore, led to a number of avoidable adverse effects. The institutional backup necessary to equip farmers to operate and manage an irrigation system, beyond the main system, has remained far from satisfactory. In order to maximize welfare it is necessary to analyze farmers' perceptions about the potential benefits from user associations and complex processes involved in the operation, maintenance and distribution of water under the newly built management paradigm.

The institutional approach for integrated planning and demand management of irrigation water through WUAs on a sustainable basis has gained adequate ground. As mentioned earlier, the institutions emerging at the grass roots levels on account of peoples' own initiatives to manage natural resources have endured for generations, while those built by the bureaucratic interventions have not been so sustainable. How does the collective action emerge at the local level? What factors contribute for its sustainability? These are the two important issues that need to be addressed. There are various schools of thought which explain collective action. One of the recent ones draw on the institutional economics of local forms of cooperative action to derive generalized principles for collective actions. This analysis uses a formal model derived from the theory of repeated games to challenge the dominant thesis on the unlikelihood of collective actions among rational self-interested individuals. Focusing on costs and benefits to individual actors, incentives and penalties, institutional support demonstrates the economic rationality of cooperation and possibility of cooperative equilibrium outcomes from competitive games (Ostrum et al. 1994; Sengupta 1991). Institutional economic analysis therefore, offers the possibility of the kind of prediction and generalization of theory of cooperative action, which WUAs require in order to generate predictable or excepted outcomes from planned inputs.

The empirical studies in India and at the global level on the effectiveness of community organizations for demand management of irrigation water, especially in the agency-managed large irrigation projects have brought out several limitations and constraints for their sustainability. They could broadly be classified as follows:

(a) Social dynamics of the primary stakeholders.

(b) Technical and design constraints of the irrigation systems.

(c) Institutional and policy constraints.

(d) Political economy factors.

The available literature has brought out clearly how the problems related to the aspects mentioned above have individually and collectively contributed to less sustainability of WUAs created in different irrigation projects.

Social Dynamics

Social engineering encompasses the attitudes, behavioral understanding, cooperation, leadership and other cultural factors of a given community to take up the system management. The agency-sponsored approaches do not normally take this aspect with the required seriousness. The top-down blue-print elite-centric approach of the bureaucracy may lead to immediate short-term gains due to construction and other incentives-induced participation in the initial period, but can never be sustained. Community mobilization, therefore, becomes central for building the new systems management. Awareness building about the relative advantages of WUAs, the roles and responsibilities of various stakeholders to prepare the mind-set of the community to take up challenges is very crucial. This is where NGOs come into the picture - to motivate the community. For, the agency will have neither the required man power nor the ability to do this, under the given bureaucratic set up. The evaluation studies carried out in some of the agency-managed projects have clearly brought out that majority of the farmers who were not aware of the concept of WUAs and its advantages.

Identification of leadership during the social mobilization process is most important as the success and sustainability of an institution depends upon the quality of leadership. There are a number of standing examples, historically and in the contemporary period, where committed leadership has proved to be the most crucial factor for the successful and sustainable functioning of an institution. Stakeholder analysis is necessary to identify the group interests and faction-related dynamics. The need for cooperation and collective approach and its advantages to different stakeholders, their roles and responsibilities to realize the expected benefits have to be clearly told to the community to promote a participatory culture. A road map of the irrigation system proposed to be handed-over to a community has to be prepared, highlighting the existing problems and short-comings in terms of water availability, inequitable distribution of water and irrigation-related squabbles, and then be placed before the community so that they can come out with their suggestions to improve the system management. This will create a sense of involvement and accountability, both of which are crucial for the sustainability of WUAs.

Technical and Design Aspects

Most of the irrigation projects are supply-based. The canals are designed to carry a particular quantity of water, for a predetermined cropping pattern, based on an estimated water duty, by taking the crop-water requirements (Crop delta) into account. The successful demand management depends upon, among other factors, farmers adhering to the designed cropping pattern. Next in line is the appropriateness and conformity of water duty assumed with the field situation. It is natural that there will be wide variations in soil characteristics across a given project, and the uniform water duty assumed may not work. This leads to inequitable distribution of water. What is required is a volumetric supply of water to the community, based on the potential area to be irrigated under a given outlet, minor or a distributory from where WUA takes water. The option about a cropping pattern to be followed should be left to the association. They should, however, be guided with the given quantity of water, what type of crops can be grown and what measures should be taken to ensure water use efficiency. Without a mutually agreed schedule of volumetric supply of water between the irrigation department and WUAs, the sustainability cannot be ensured.

Institutional and Policy Constraints

A paradoxical situation often observed is that the informal user associations work more efficiently than the formal association. Paradoxical because, the formal association created with all the necessary procedures and formalities do not endure, because of improper and inadequate legislative and legal back up, which gives room for political interference. Whereas informal institutions are socially embedded, based on local needs, culture, customs and practices. The legal backup provided for the formation of user associations should ensure a political base, where politics whether local, state, or national-do not interfere in the management. This calls for a strong political will, without which the institutions cannot be sustained.

Political Economy Factors

The agency-created user associations, as mentioned earlier, are mostly incentive-induced. In order to motivate the community, they give financial incentives like providing a grant for construction and repair works and other related subsidies. But the temporal and spatial limitation up to which such assistance will be provided and the scale of assistance are not made clear in the beginning. The community, therefore, expects the assistance to continue and a dependency syndrome develops. This happens particularly in the donor agency supported projects. The ways and means of mobilizing financial resources to meet minor expenses should be properly explained to the community and their capacity should be built. Lack of financial resources, after the withdrawal of support from the government, is one of the main reasons for malfunctioning of WUAs, after the initial success. Politicians try to push their elite clan during the incentive phase as the leaders, to develop user association. The moment that phase is over the politically-supported leaders withdraw, after however, spending the resources provided, and ask others to take up the responsibilities of management. In that situation nobody will come forward, because there are no financial or other resources to manage. This situation tends to create indifferences among members and makes the institution dormant.

WUAs in Demand Management: Potential and Prospects

The National Irrigation policy makes very clear the need for and importance of promoting water use efficiency in the country, more importantly in the agency-managed large irrigation projects. PIM has been accepted as a national policy and the legislation to transfer irrigation management to the users has already been passed in some of the states. But the ground realities observed so far are far from the expected outcomes from user associations. Many states to-day are facing a dilemma regarding the demand management of irrigation water. Dilemma because, on the one hand they are not able to meet the increasing costs of irrigation system management and on the other, the alternatives for taking up management tasks to reduce the burden on the government are found to be not effective enough. In order to reduce the growing dependency syndrome among the communities and to change their mind-set, promoting community organizations is the only alternative. The micro-level experiments of demand management through community organizations, both in the agency-managed large systems and farmer-managed small systems, the results are encouraging in terms of ensuring the equitable and timely supply of water. The replication and scaling up has remained as a challenge.

The scaling up is inevitable and, there is no scope for a second opinion about it. But what is required at present is to take the lessons from the micro-level experiments, identify

the constraints and adopt area-specific people-centered approaches by putting flexible policy options in place. The prospects for scaling up user associations depend essentially on the following factors.

(a) Awareness building about the importance of and the need for demand management among the community, by adopting systematic processes for mobilization, capacity, building-technical and managerial skills and cooperation.

(b) System improvement before handing over to the community is the second prerequisite. Most of the canals and irrigation structures have been damaged due to lack of timely and adequate maintenance. The system should be rehabilitated to originally designed standards and handed-over to the user association, because the community will not have the required technical skills and financial resources. The association members or stakeholders should be involved fully in all the processes associated with the system improvement and reconstruction. Their views have to be taken into account.

(c) It is essential to release the designed discharge of irrigation at the interface point for handing-over the distributory, minor or outlet, depending upon the status of water availability. The unit of operation should be a hydraulic boundary. Volumetric supply of water as per the mutual agreement is very crucial. Mechanism for dispute management-regarding water release distribution should be in place.

(d) The sustainability depends upon financial adequacy and stability. The responsibility of water tax collection and the proportion of sharing have to be clearly articulated, informed and recorded. There should be no room for confusion on this account. Awareness and capacity of the association to generate financial resources, other than water tax, through plantation along the canals bund, common lands and other related avenues has to be developed.

(e) Requisite legal back up for institutional sustainability has to be provided. Norms for decentralization of rights and responsibilities, water rights to the association from the irrigation department, water rights to the farmers within the association have to be clearly articulated with built-in penal clauses for not respecting the rights and consequent losses to the farmers due to crop failure.

(f) Integration of main system management with the tertiary systems handed-over to the community is essential to meet the on-farm water distribution requirements.

The sustainability and scaling up of WUAs depends largely on the organic linkages between various factors mentioned above. It is important to strengthen the distribution, allocation and management norms, procedures and plans to ensure effective demand management through user and community associations. This aspect should form as an integral and important component of an irrigation project's design in future. Irrigation projects should transform into social systems after completion of the construction phase.

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