Water Policy 15 (2013) 223–242

# How does participatory irrigation management work? A study of selected water users' associations in Anand district of Gujarat, western India

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**Abstract**

Measuring the performance of water users' associations (WUAs) is a complex task. Literature associates a large number of parameters with their success and failure. This paper presents an in-depth study of two WUAs that are considered to be functioning well by the irrigation department in Anand, India. It discusses some new issues and innovations being tried out in Anand, namely: (1) incentives and disincentives for WUA membership; (2) outsourcing of irrigation service fees (ISF) collection by the WUAs; and (3) expansion of the scope of WUA activities beyond irrigation, with a potential impact on financial viability. The paper discusses degrees of success in WUAs in this context and tries to draw out lessons that may be widely replicable.

*Keywords:* Incentives for membership; Irrigation service fee collection; Participatory irrigation management; Water users' association

## Introduction

Participatory irrigation management (PIM) is a distinct model for irrigation management, which involves farmers being organized in the form of a water users' association (WUA) for the management of their irrigation systems at the local level. It transfers to the farmers the partial or total authority and responsibility for decision making about issues like financing and maintaining irrigation infrastructure, fixing and collecting (irrigation service fees, ISF), diverting and/or distributing water equitably, managing water-related disputes, allocating water rights or planning crop calendars and so on. The WUA may operate at subsystem levels such as distributary, canal commands, tube well commands or the entire irrigation systems (www.inpim.org).

WUAs empower farmers to make their own decisions about water allocation and management (Khanna, 2007). PIM is supposed to bring better quality operation and maintenance (O&M), efficient water use, increased productivity and higher ability and willingness to pay (Small *et al.*, 1989; Small

doi: 10.2166/wp.2012.065

& Carruthers, 1991; Jairath, 1998, 1999; Bassi, 2007). It gives a sense of belonging to the farmers, following from which the system is well looked after and completed works are faster, lower cost and of better quality (Vaidyanathan, 2001). Palanisami (1999) notes that PIM engenders a sense of collective ownership and responsibility in the member farmers of the WUA, which brings much-needed harmony and unity to the village. Thus, the WUA is not only a new socio-political institution but also a symbol of village autonomy and less dependence on the government.

The experience of PIM in India has been mixed. Cases of success, as well as limitations, have been reported (Koppen *et al*., 2002; Marotia, 2002). In Gujarat, many studies have reported improvement in water distribution and higher collection of ISF (Singh, 1994; Pant, 1999; Parthasarthy, 1999; Bose, 2003; Mukherjee *et al*., 2003; Chaturvedi, 2004). However, many limitations of the implementation of PIM have also been discussed by Mitra (1996), Samad (2002), Jairath (1999), Kalro & Naik (2000), Parthasarthy (2000), Swain (2002), Bose (2003), Gulati & Narayanan (2002), Ballabh (2005) and many others.

## Issues causing failure of PIM

There are many complex problems with the functioning of PIM in India, owing to which its progress is lethargic. These problems emanate from various fronts and are concerned with implementation of PIM at the grass-roots level due to (i) the attitude of farmers, (ii) organizational inadequacy of WUA members, (iii) systemic issues originating from the irrigation department (ID) and (iv) operational issues in day-to-day functioning of WUAs. They are discussed briefly below.

Issues with the farmers are attitudinal in nature, comprising the following attributes: their suspicion, lack of initiative, over-dependence on the government and reluctance to participate in the responsibilities of WUA (Gulati *et al*., 2005), a lack of 'felt need' for a WUA due to ample availability of ground water (Swain, 2002; Gulati *et al*., 2005), absence of charismatic leadership (Kolavalli, 1994; Gulati *et al*., 2005), insufficient knowledge of technical issues, lack of homogeneity in caste and class (Mitra, 1996), uniformity in economic status (Baland & Plateau, 1996; Ostrom, 1992), lack of unifying community organization like temples or cooperatives (Mearns, 1996), difficulty in scaling up owing to increasing transaction costs (Meinzen-Dick *et al*., 1997), inequity between up and tail enders (Bardhan, 1993), lesser adoption of lucrative crops bringing critical need for water (Gulati *et al*., 2005), and no involvement at all of the sizeable proportion of tenant farmers (ADB, 2008).

Organizational issues include long delays in the process of formation of a WUA, parallel functioning of WUAs and village level government (*Panchayati Raj*) institutions (ADB, 2008), lack of political support for WUAs (Vaidyanathan Committee, 1992), difficulty in enforcing rules, lack of synergy between the WUAs and the ID in providing training and capacity building to the farmers and insufficient involvement of non-governmental organizations (NGOs) therein (Gulati *et al*., 2005) and lack of supplementary sources of income for the WUA (Meinzen-Dick, 1984; Wade, 1988; Kalro & Naik, 2000).

Systemic issues comprise corruption in the ID (Ballabh, 2005), poor main system management leading to no effective control of the WUAs over the actual time and quantity of water availability (Bose, 2003) and no provision for allowing WUAs to withhold remittance of ISF to the ID in case they are dissatisfied with the quantity and timing of water supply (Parthasarthy, 2000).

Operational issues emanate from the absence of financial provision to meet operational costs, lack of knowledge about record-keeping and accounts procedures, lack of cooperation from other members, insufficiency of funds for O&M and delay in ploughing back these funds, absence of a mechanism

to monitor the quality of O&M (ADB, 2008), less recovery of ISF (Kalro & Naik, 2000; Gulati & Narayanan, 2002), particularly from influential farmers (ADB, 2008), lack of a stronger voice for WUAs in decisions regarding water allocation (Ballabh, 2005), inability to check unauthorized lifting (ADB, 2008) and inability to address inequities in water distribution and exclusion of the poor, small and marginal farmers in the decision making.

In addition to the reasons for failure of WUAs, the indicators of their success have been discussed in a cross-country analysis by Mukherjee *et al*. (2010), who list an improvement in ISF collection rate, financial viability of the WUA, the functional condition of infrastructure, the equitable distribution of water between head and tail, reliability and adequacy in water distribution, popular awareness and participation in WUA activities and reduction in frequency of disputes as essential characteristics of a successful and sustainable WUA.

## Rationale for the study

Owing to the fiscal constraints of the state governments, the growing needs of irrigation and an economic scenario favouring increased public participation in governance, it looks like PIM is here to stay. However, as in November 2009, the total number of WUAs in India was just 56,934, covering a land area of 13,420,170 ha (GoI, 2009). Therefore, it is essential to understand what could be the innovative approaches leading to the success of WUAs. This can be done by exploring the functioning of a WUA at the grass-roots level and drawing lessons which could be replicated on a wider scale.

## Objectives of the study

The present study aims to explore the functioning of selected WUAs in the Anand district and to understand the degree of success achieved by them on the basis of their performance in terms of (i) institution building, (ii) operational efficiency, (iii) participation of farmers and (iv) financial performance. It also aims to identify the practices adopted successfully by these WUAs and draw lessons that are replicable in a wider context.

## Methodology

Since WUAs are supposed to be most successful in instances where ground water is scarce, it would be interesting to know how WUAs in an area with little or no water scarcity are actually functioning. Hence, the Anand district of central Gujarat in the western part of India, which is covered by a canal network as well as having abundant ground water, was selected for the study. A list of registered WUAs in Anand district was obtained from the office of the Executive Engineer, Mahi Irrigation Circle, Anand. Of these, some were reported to be functional and termed successful by the ID officials, while some were reported to be already defunct or failed. It would be interesting to find out whether or not the WUAs termed successful by the ID were actually so, from the point of view of the envisaged principles of PIM. Hence, it was sought to study the degree and parameters of success in these WUAs. Thus, from the list of functional WUAs, WUAs functioning in Bhetasi and Jol villages were purposively

selected. Bhetasi WUA had a large command area, while Jol WUA had a relatively much smaller command area. Hence, a comparison of the functioning of these two WUAs, which have similar physical as well as socio-economic conditions, but unequal command areas, was sought.

Personal visits were undertaken to the selected WUAs. Primary data were collected in December 2011 through the Rapid Rural Appraisal (RRA) method. This included personal interviews with the key informants like the chairman, executive members and employees of the WUA, conducted with the help of a structured questionnaire. In addition, focus group discussions were held separately with members as well as non-members of the WUAs, situated at the head as well as the tail reach of the canal. Farmers belonging to both the Kshatriya and Patel community, the two most dominant, higher-caste farmer groups in the villages, were interviewed. Their opinions and experiences of the functioning of the WUA were recorded with the help of structured questionnaires as well as informal discussions. In addition, personal interviews were conducted with the officials of the Mahi Irrigation Circle office at Anand, in order to understand the official viewpoint on various issues.

Secondary sources of information included records of the Mahi Irrigation Circle office, Anand; District *Panchayat* (local government) office, Anand; and office records of the selected WUAs as well as *gram panchayat* (village level local government) offices in the villages of Bhetasi and Jol.

## Process of WUA formation in Gujarat

The process of WUA formation in Gujarat begins with preliminary discussions between farmers, the ID and NGO officials in order to promote the idea of PIM and motivate the farmers. Once the farmers express their intent to form a WUA, it is registered. After this, office bearers of the WUA are appointed and an MoU (memorandum of understanding) is signed between the WUA and the ID. This includes jointly agreed estimates about rehabilitation work to be done by the ID and its financial and physical targets. After this, rehabilitation of the dilapidated canals in the WUA command begins. The WUAs contribute 10% of the costs, while the ID bears the rest. If the work of repair and rehabilitation is entrusted to WUAs, one-third of the cost is allotted to them in advance. The instructions and procedures for purchase of material and quality control by the WUAs have been simplified. At the end of repairs and rehabilitation, the ID formally hands over irrigation management of the subsystem to the WUA. After this, the WUA is termed as 'formed' or functioning.

The primary responsibility of the WUA is to collect the ISF and deposit them with the ID, as well as take care of O&M and minor repairs of the subsystem under its command. A 20% rebate on water charges is given to WUAs as an incentive for payment within a stipulated time period. In addition, they can retain 30% of ISF collected towards expenses of O&M. Thus, they may retain a total of 50% ISF collected by them. They are also empowered to charge higher fees than those prescribed by the ID and retain 100% of the higher collection.

## Status of WUAs in Anand district

The Anand district falls under the Mahi Irrigation Circle, providing water from the Mahi-Kadana irrigation scheme. The status of WUAs in the district is shown in Table 1. Some WUAs do not reach the stage of signing the MoU, while other WUAs become defunct even after becoming functional. Thus,

Table 1. Status and land area of WUAs in Anand district.

| Status of WUA | Numbers | Land area covered (in hectares) |
|---|---|---|
| No. of WUAs registered | 29 | 8,180 (11.54%) |
| No. of WUAs with which MoU has been signed | 22 | 7,003 (9.88%) |
| No. of WUAs handed over and functioning | 19 | 5,879 (8.29%) |
| No. of defunct WUAs | 03 | |
| Total area under cultivation | | 70,877 (100%) |

*Source:* Office Records, Mahi Irrigation Circle Office, Anand.

there is a gap between the number of WUAs registered on paper and those that are really functioning. As seen from Table 1, the actual area under WUAs in Anand is a paltry 8.29% of total area under cultivation.

### *Study area*

Anand district is situated in an area of about 2,805 $km^2$ in central Gujarat, about 80 km south-west of Ahmedabad. It is famous for the 'Anand pattern' of dairy cooperatives and home to the 'Amul' brand. It comprises eight *talukas* namely Anand, Borsad, Petlad, Umreth, Anklav, Sojitra, Khambhat and Tarapur. It has a total population of about 18.5 lakhs, of which 74.91% is rural, residing in about 350 villages. The irrigation network comprises a 313 km long canal network from the Mahi irrigation system, as well as an abundance of ground water from about 559 tube wells. Socio-economic characteristics of the selected study villages are presented in Table 2.

The majority of the population in both Bhetasi and Jol consisted of Kshatriyas. While scheduled caste (SC) and scheduled tribe (ST) population was less in both the villages, other backward classes (OBCs) are in a sizeable number in Jol. Small farmers were in a majority in Bhetasi and Jol, while marginal farmers were also sizeable in number in Jol. Majority farmers in both the villages consisted of higher caste Hindu Kshatriyas like Parmars, followed by Hindu Patels, who also belong to a higher caste. In addition, Jol had 35 Muslim and five Christian farmers.

The results of a detailed study of the WUAs functioning in Bhetasi and Jol have been divided into four sections and are presented as follows.

## Process of institution building

### *Inception of the WUAs*

The Bhetasi WUA, called the Sardar Krushi Sahkari Piyat Mandali Ltd, was formed on the 8 km long Anklav sub minor emerging from the Navakhal sub minor, which covers three villages namely Bhetasi, Ambali and Anklav. On the 8 km stretch, there are around 50 gates, which are operated by three WUAs in the area. The Bhetasi WUA was registered in April 1992, initially with 11 members and the denomination of one share was Rs 100, but afterwards, it was reduced to Rs 10 per share, in order to attract more members. Its functions were handed over in November 1993. Its command area is 1,000 ha.

The WUA in Jol, called Shri Krishna Irrigation and Agricultural Development Cooperative Society Ltd, was registered on May 28, 1996. Initially, it was started with 60 members subscribing to a share of

Table 2. Socio-economic characteristics of the study villages.

| Characteristic | Village Bhetasi | Village Jol |
|---|---|---|
| Distance from district headquarter, Anand | 31 km south-east | 10 km north-west |
| Total geographical area | 1,800.93 ha in three sections namely Bhetasi Talpad, Bhetasi Bariya Bhaag and Bhetasi Vanta | 739.86 ha |
| Total irrigated area | 1,578.54 ha | 609.47 ha |
| Major rabi crops | Wheat, potato, tobacco, banana, lemon, castor and vegetables (bitter gourd, ladies finger, tindola, bottle gourd, etc.) | Vegetables (pattarvelia, bottle gourd), wheat, tobacco, rajgara, chikori, maize for fodder, potato, etc. |
| Major kharif crops | Paddy, bajri, banana, lemon, fodder crops and vegetables | Paddy, bajri, vegetables (pattarvelia, bitter gourd, bottle gourd, galka, etc.) |
| Major summer crops | Bajri, maize for fodder and vegetables | Bajri, maize for fodder and vegetables |
| Perennial crops | Banana, lemon, vegetables | Vegetables |
| Functioning tube wells | 22 | Nil |
| Functioning bore wells | Nil | 10 |
| Ground water table | 80–100 feet (24.38–30.48 m) | 80–100 feet |
| Electric motors functioning | 5–7 | Nil, water lifted through suction pipes |
| Oil engines | Nil | 6 |
| Irrigation through | Flow; lifted only in a small area | Flow |
| Connectivity | All-weather approach road | All-weather road |
| Number of families engaged in dairying | 1,350 | NA |
| Cooperative institutions | Cooperative dairy, a service cooperative and fertilizer distribution cooperative; 42% of members of the cooperative dairy were also members of the WUA | Cooperative dairy; 25 members of the cooperative dairy were also members of the WUA |
| Population | 9,300 | 5,493 |
| No. of households | 1,745 | 1,091 |
| General | 8,787 | 1,764 |
| Scheduled castes (SCs)* | 473 | 154 |
| Scheduled tribes (STs)* | 40 | 124 |
| Other backward classes (OBCs)* | Nil | 3,451 |
| Total farmers | 1,200 | 860 |
| Marginal | 540 | 330 |
| Small | 500 | 500 |
| Large | 160 | 30 |
| General caste (Patel) farmers | 120 | 224 |
| Kshatriya (Baria and Garasia) farmers | 1,080 | 596 |
| Other farmers | Nil | 40 |

*Source:* http://www.censusindia.gov.in/Census_Data_2001/Village_Directory/View_data/Village_Profile.aspx and Gram Panchayat Records of Bhetasi and Jol, as well as researcher's personal interviews with farmers and key informants.
*The scheduled castes (SCs) are groups of people who were historically disadvantaged owing to the existence of the caste system, while scheduled tribes (STs) refer to specific indigenous peoples who are backward and unassimilated with the mainstream. Other backward classes (OBCs) are defined as people other than SCs or STs who are economically and socially backward. These groups are recognized by the Indian Constitution.

Rs 50 plus Re. 1 as membership fee, that is Rs 51 each. The MoU was done in 1998 and the WUA was handed over on October 15, 1998. It has a total command area of 121 ha, irrigated entirely through flow.

*Purpose of formation*

The objective of the formation of the Bhetasi WUA was so that farmers could get water in time, water sharing conflicts and out of turn irrigation could be prevented and water use could be implemented on scientific lines, so that both water and land could be conserved. Another important motivation behind the WUA was that it enabled the farmers to get a rebate on ISF. This would give them a greater control over the funds of ISF and ensure that whatever they paid was actually used for the repairs and maintenance of their own subsystem.

The objectives of the Jol WUA were not in line with the ideals of PIM but a resulted from their desperate need to obtain water. Earlier, water could be easily withdrawn from the canal and payment was not strictly enforced. However, later, the ID began to take strict measures against them. Heavy fines were imposed, the amount of which accumulated over the years. Their outstanding dues were also recorded in their land documents, making it difficult to sell or transfer land. On the other hand, if payment was done through the WUA, they would be forced to pay every year owing to community pressure, instead of spending the money elsewhere. Besides, through the WUA, they could also get a partial refund of the ISF, which could be used for O&M. Hence, payment through the WUA seemed to be a better option. Besides, the WUA was expected to apply the rotation system in a better way.

*Rehabilitation*

Before the Bhetasi WUA was registered, the sub minor was poorly maintained. It was rehabilitated by the ID prior to handover. Since then, it has been maintained well by the WUA. In Jol, before the handover of the WUA, the ID had constructed a lined canal about 100 m length at the tail end of the subsystem. The tail end received water by gravity flow, so if water was released with great speed, that portion of the canal could overflow and inundate the adjoining fields. This could be prevented through lining. Other portions of the canal were left unlined and no repair work was done in those portions by the ID or subsequently by the WUA.

*Capacity building*

WALMI (Water and Land Management Institute), Anand, had been organizing meetings with farmers in Bhetasi since 1985, culminating in the formation of the WUA in 1992. Tea and snacks were also served during the meetings, which acted as an important attraction for the farmers who attended. Most members recalled that they were sensitized to the importance of a decrease in water wastage and more efficient use of water. They were attracted to the idea of PIM, as it was presented to them as a road towards the end of conflicts over water sharing, adequacy and timeliness of the irrigation service. The members of the Executive Committee (EC) of the Bhetasi WUA reported that at the time of inception of their WUA, officials from the office of the Executive Engineer, Mahi Irrigation Circle held monthly meetings with the farmers of Bhetasi and motivated them to join the WUA. A group of farmers was invited to and visited the Anand office of the Circle, where they were assisted in finalizing the Constitution of the WUA. The Chairman of the EC, who was present in that meeting, recalled with gratitude

the cooperation extended by the Executive Engineer during the period of registration, rehabilitation and handover of the subsystem. After the registration and MoU process was completed, officials from WALMI visited Bhetasi on two occasions, where they gave practical training to the WUA members regarding canal gate operations, water distribution, keeping records, collection of ISF and so on. WALMI also arranged a visit to a WUA functioning in Maharashtra, in order for the farmers to observe and learn from WUAs that were functioning there.

In Jol, it was reported by the EC Chairman that the Deputy Engineer from the ID held a meeting with the farmers of Jol at which the idea of a WUA was explained to them. After the farmers decided to form a WUA, guidance and support for the process of registration and MoU was given by the ID. However, no NGO was involved in the inception of the WUA. Capacity building of the farmers or executive members was not done in any way.

Water demand schedules are ideally supposed to be completed after a joint inspection of fields by the WUA members and ID officials, so that a proper crop and water use planning can be done. However, this was not reported to be the case in either of the WUAs, where water demand schedules were completed by the farmers themselves.

## Operational efficiency

### *Number of employees, accounts and record keeping*

The EC of Bhetasi WUA consisted of a chairman and ten members. The WUA employed one clerk to keep account books and assist during meetings. In addition, it took the services of four chowkidars (watchmen) appointed by the ID to keep a track of water use, to collect ISF on its behalf, for a commission of 10% of the ISF collected. They also kept a record of the number of waterings taken (for the crops). Accordingly, a bill for each farmer was drawn up. The WUA maintained a list of members, but did not have an up to date record of payment defaulters and outstanding fees owed by each one of them.

The EC of Jol WUA consisted of a chairman and nine members. The WUA employed one person to maintain accounts books and another to operate the gates of the subsystem. Both were paid Rs 3,000 per year each. The watchman employed by the ID kept a track of water used and billed the WUA accordingly. The collection of ISF was undertaken by the chairman himself. A special employee was not appointed for this purpose.

### *Control over water availability*

In Bhetasi, it was reported that after about 5 years, the ID regularly informed the WUA about water delivery schedule in advance and strictly adhered to it. Even the date of the rotational turn of member farmers was mentioned along with their names. If sometimes, water availability was insufficient or delayed, the WUA complained to the ID and could get the water released. In fact, at times, it had to request the ID to stop releasing water after rotational irrigation was complete. If it did not do so, water would continue to be released, resulting in overflow, seepage and waterlogging. Hence, it was incumbent upon the WUA not only to ask for water but also to demand it be withheld. However, for the last couple of years, information about delivery has not been provided at all. Water release was

unreliable and the WUA's complaints regarding this were not always heeded. This is because water availability had become scarce due to the late onset of the monsoon. The WUA was not able to remedy this situation with representions to the ID.

In Jol, for the last 2 years, water availability was reported to be insufficient and delayed and prior information about delivery was not available. Earlier, when water was abundant, the situation was better.

### *Water delivery to members and non-members*

In 2011, the Bhetasi WUA delivered water to 433 members and 567 non-members at an equal rate of ISF. Thus, in all, roughly 83% of the total farmers of the village were being serviced by the WUA. The Jol WUA too provided water to non-members at the same rate as that for members. The ISF was collected after the season was over and not in advance, as prescribed by the ID.

### *Equitable distribution at tail ends*

In Bhetasi, it was reported during a focus group discussion with member farmers that water availability to tail end members had improved after the formation of the WUA. While earlier, there used to be conflicts regarding water sharing, when the WUA was formed, it ensured that at least the member farmers at the tail end obtained water quite satisfactorily. However, non-members of the WUA, whose fields lay at the tail end, did not always receive sufficient water, except during the *kharif* season, when water was abundant, or when the farmer ahead of them decided not to utilize his turn. This made them wary and disinterested in joining the WUA.

In Jol, members as well as non-members of the WUA reported that sufficient water did not reach the tail end, except in the *kharif* season. The WUA did not take any steps to give sufficient water to the tail enders and stop the head farmers from using more water. The tail end sub minor was divided into two channels. One of the channels was closed when a road was constructed on it. Because of this, about eight tail enders were deprived of flow irrigation and they had to lift water through suction pipes. The WUA had represented this matter to the ID, but it had not yet been solved.

### *Impact on conjunctive use of water*

In Bhetasi, about 78% of the WUA command was irrigated through flow irrigation and the command of the Jol WUA was completely under flow. Hence, farmers preferred surface water over ground water for irrigation, as it turned out to be the cheaper alternative. Also, since both members as well as non-members of the WUA were delivered canal water, ground water irrigation only served as an insurance against the unreliability and uncertainty of canal water delivery. In the *kharif* season, there was an abundance of canal water, so that the need to draw ground water was infrequent. However, in the *rabi* season, many farmers grew potatoes, for which canal water was found unsuitable. Hence, ground water irrigation picked up during the *rabi* season. Thus, conjunctive use of surface and ground water was not practised much in the study villages, except in the event of unavailability of canal irrigation or for irrigating the potato crop.

*Repairs and maintenance*

The Bhetasi WUA took care of minor repairs in the subsystem from its own funds. However, if the repairs entailed a major expenditure, it was represented to the ID, which handled the responsibility. The WUA bore 10% of the expenditure on major repairs and the rest was borne by the ID.

The ID got the repairs done by appointing a contractor in consultation with the WUA, after following the due procedures of inviting tenders and so on. It was reported that the officials of the ID did not interfere in the process of awarding contracts. However, in this process, repairs were delayed on average by at least 3–4 months.

The members of the Jol WUA reported that the WUA did not carry out repairs and maintenance of the subsystem properly. Some members claimed that the WUA did not clean or de-silt the canal and the farmers themselves had to do these jobs. Only when there was a breach in the canal did it try to block it by dumping sand on it. They felt that the canal needed to be lined with cement so that water did not seep in and more water would be available up until the tail end, but the WUA did not do this, nor did it represent the idea to the ID to garner funds for its implementation. On the whole, the satisfaction of farmers with the repairs and maintenance undertaken by the WUA was better in case of Bhetasi than in Jol.

*Enforcement of rules*

Out of turn irrigations were not penalized by the Bhetasi WUA. However, it resorted to moral persuasion. Earlier, out of turn irrigations were more frequent, but as time passed, farmers accepted the system of rotation and at present, disputes are quite rare. Generally, neighbouring farmers knew each other well, so they chose to share water according to the need of the crop instead of competing for their turn in a watertight fashion. Another deterrent to penalizing out of turn irrigations was because of the lengthy procedure involved, which included the process of *panchnama* (recording statements of witnesses), lodging a first information report (FIR) (with the police) and issuing a legal notice. Member farmers of the WUA expressed their confidence in the rotation system because they were sure that the WUA would make water available to them according to their turn.

The Jol WUA made no attempt to administer rotation or penalize offenders on that account. However, the farmers themselves cooperated and shared water by turns.

*Enforcement of fines*

The Bhetasi WUA did not penalize the lifting of water by payment defaulters. However, recently it started serving legal notices to payment defaulters through a lawyer. Since the lawyer was an acquaintance of the chairman and the notices given were few, no payment was made to the lawyer on this account. However, if in future, more such notices are required to be given, the cost will have to be borne by the WUA. Mostly, farmers who did not pay came up with excuses that their crop had failed in that season, or they would pay later for the whole year. The WUA appeared to be flexible in this regard and accepted late payments, or payments in the next season or year. So, major defaulters were very few.

The ID also follows the practice of giving legal notices to payment defaulters and recording the overdue amount in the land documents, which inhibits the sale or transfer of land by the owner. Continuation

of this practice by the WUA implies that social pressure assumed to be effectively imposed by the WUA is not successful enough to motivate the farmers to pay their ISF.

The Jol WUA did not impose any fine or interest on non-payments or late payments. A non-paying farmer was also not prevented from drawing water from the canal.

*Conflict resolution*

In the Bhetasi as well as the Jol WUA, water distribution conflicts were not frequent. Farmers generally abided by their turn. There were no disputes with the WUA regarding non-payment of dues. The members opined that it was better that the WUA put pressure on them to pay the ISF. In this way, their fees did not accumulate over a long time and they did not have to pay a huge amount on a single occasion. However, this may be a sanitized response from the farmers. In reality, it appears that the lack of conflicts resulted from the lack of strict enforcement by the WUAs with regard to collection of ISF, enforcement of rotation or imposition of penalties for breaking rules.

*Collection of ISF*

In both WUAs, the ISF rates for members and non-members were the same and were not collected in advance as per the rule, but at the end of the season. Farmers opined that the WUA should be made to pay ISF only when sufficient water was made available. In Bhetasi, the collection of ISF was done by the *chowkidars* appointed by the ID on behalf of the WUA. They received a commission of 10% of the amount that they collected. If they were unable to collect the ISF, the WUA sent a notice to the farmer, through a lawyer. If ISF was paid after receiving the notice, the *chowkidars* only received 5% commission on the amount they collected. This system of employing ID personnel for collecting ISF was adopted right from the inception of the WUA. At that time, it was decided that the *chowkidars* would collect ISF on behalf of the WUA for 3 years and train WUA personnel in collection functions during this time period. However, this system continues even at present, because it was felt that social pressure was not always fruitful in collecting ISF and official authority exerted by the ID personnel could be helpful in ISF collection. ISF were deposited in the office of the Deputy Engineer of Irrigation at Borsad. Non-paying farmers generally made various excuses and delayed the payment until the next season or next year. The system of employing *chowkidars* from the ID was started during the initial period of the WUA, with the understanding that they would collect ISF on behalf of the WUA for 3 years and train WUA personnel during this period. However, this practice is still continuing.

The collection of ISF in Jol WUA was undertaken by the chairman himself without receiving any payment, as most member farmers resided in his neighbourhood and he was able effectively to exert social pressure on them, which prompted them to pay their ISF. He claimed that he was able to collect more fees than the ID. The Jol WUA had not taken any legal recourse so far to collect ISF.

*Satisfaction of members*

Members as well as non-members expressed satisfaction over the operation, repairs and maintenance done by the Bhetasi WUA. They felt that water distribution was done without any bias and as per the rotation system. The WUA was quick to respond to complaints regarding repairs. After the formation of the WUA, sufficient funds were available for minor O&M work like small repairs, cutting of grass,

cleaning of the canals, removing silt, cleaning outlets and taps and so on, and these tasks were performed regularly and satisfactorily. The members opined that the repair work done by the WUA was of better quality and more durable than that done by the ID. It was also done in a timelier manner. When the ID was in charge of O&M, repairs were very much delayed. The frequency of required repairs had also decreased after the formation of the WUA. If major repair work had to be undertaken, it had to be represented to the ID, because 90% of this expenditure was borne by them. Hence, major repairs were still delayed.

The satisfaction of members with the working of the WUA in Jol was found to be low. Members reported that the WUA did not carry out repairs and maintenance functions at all. It had not even bothered to replace the rusted gates of the canal, which had been used for a long time. It was only interested in recovery of ISF. Members had never been taken to other states/WUAs to experience/learn about PIM. The WUA had no control over water availability, could not help in getting more/timely water. The farmers believed that their WUA was still functional only because most members belonged to the same caste.

## Participation

### *Elections*

Elections in the Bhetasi WUA were not reported to be contested. Instead, every 3 years, the EC members were chosen unanimously by the members. The current chairman, a retired, aged gentleman from the Patel community, was reported to have been serving as chairman since 2005. Whether this could be termed as a lack of interest among other members or their satisfaction with the current state of affairs could not be said with certainty. However, a case of elite capture is quite improbable, as the majority of farmers in the command belong to the Kshatriya caste, while the chairman belonged to the Patel caste. Also, it appeared that he was highly respected among the members and owing to his retired status, he was an active leader of the WUA. In fact, the satisfactory performance of the WUA could be because of his active interest in its functioning.

The elections of the EC of the Jol WUA were held every 3 years, but were mostly uncontested and the members were elected by a consensus. At present, there are 11 members in the EC. The EC appointed the chairman and deputy chairman, again by consensus. All the members of the EC were Kshatriyas, the dominant caste among the WUA members.

### *Democratic practices*

The democratic processes and functioning of the Bhetasi WUA cannot be said to be strong enough. The members reported that meetings of the WUA were not arranged regularly. The EC only met when an issue arose. The meetings of the general body were arranged rarely, when there was some specific problem. The members did not report being bothered about it. It was reported that meetings were generally cordial and all members tried to discuss the issue in question and to bring about an amicable solution. A cordial environment was maintained and conflicts were resolved by persuasion instead of accentuating them by punishing anyone. It appeared that the members reposed their trust in the judgement of their aged and experienced chairman. However, there was no visible attempt to involve

everyone in decision making or training leaders who could take over the functions of the WUA in future.

In Jol, a general body meeting of the WUA did take place, but many members did not attend it because they were dissatisfied with the functioning of the WUA. If anyone went at all, the motivation was partaking of the tea and snacks, rather than taking interest in the functioning of the WUA. It was reported that not everyone was even invited or encouraged to take part in these meetings.

*Participation and acceptance amongst members and non-members*

From just 11 members in 1992, the Bhetasi WUA had grown to 433 members in 2011, while 567 non-members benefited from it. In fact, when the WUA completed 15 years from its inception, a function was held to commemorate the occasion. Not only members but also non-member farmers as well as officials from WALMI and the ID were invited to participate. They all were given a grand feast. It was suggested that a gift (memento) should be given to the members of the WUA on this occasion, but this decision was opposed by the non-members of the WUA. Their argument was: why should a gift be given only to members and not to non-members? They believed that even though they were not members of the WUA, they paid the same ISF as the members and should not, therefore, be discriminated against. Ultimately, in the interest of harmony in the village, the idea of giving a memento was dropped. Later it was decided that whenever a memento was to be given, it would be given to each and every farmer who drew water from the canal and paid his ISF. This shows that even the non-members of the Bhetasi WUA had a sense of belonging to the WUA, which made them in fact its *de facto* members.

The non-members of the WUA in Bhetasi opined that the WUA was functioning quite well. The reasons why they did not choose to become members were varied. Some non-members revealed that as their land was on an elevation, they could not get flow irrigation. They had to lift the canal water via oil engines, which turned out to be quite expensive as it would include cost of running the oil engine plus the ISF per watering. Hence, they preferred to buy ground water, which was cheaper at just Rs 40 per hour. They expressed a desire for the WUA to lift water using oil engines and provide this to them at the rate of flow irrigation. Only then would they be interested to become members of the WUA.

In addition, especially in the *kharif* season, there was abundant water in the canal. So, even though members of WUA had the first right to water, the non-members also received sufficient water, giving them no incentive to become members. Many member farmers grew potatoes, for which canal water was found unsuitable, so, they relinquished their turn to take canal irrigation and sufficient water was left over for the non-members. Also, non-members reported that they faced no discrimination in water distribution. Non-members felt that the only disadvantage to them was that they did not get the benefit of gifts/mementos which were distributed to the WUA members. They were also not taken on study tours organized by WALMI to WUAs in other states to learn new things. Most non-members expressed their desire to become members, as being a member was as easy as buying a share worth Rs 10. But since the WUA had lately stopped registering new members, they were not able to become members. There were a few tail end non-member farmers who said that they were apprehensive about becoming members of the WUA, because for a couple of years, water delivery was erratic; they thought that they might not get sufficient water even after becoming members of the WUA. Non-member tail end farmers complained that the WUA did not take up repair and cleaning work in the tail end of the subsystem, as member farmers were not located in that area.

From an initial membership of 60 in 1996, the membership of the Jol WUA had grown only up to 100 in 2011. Of these, 80 were small farmers, 16 marginal and four large famers. One member was from the Patel caste and one was from the *bania* (trader) caste. The rest of the 98 members belonged to the Parmar (*Kshatriya*) caste.

Members of the Jol WUA said that earlier they had preferred not to join the WUA. However, they found that the gateman of the canal refused to open the gates for non-members. Hence, they were forced to take membership. Non-members of the Jol WUA stated that they did not wish to become members of the WUA, since if water was available in the canal, they could get it even without becoming members, while if water was not available, neither the non-members nor the members could get it, so there was no point in trying to become a member. Apart from water, there were no extra benefits received by the WUA members which would attract the non-members to seek membership.

## Financial performance

### *Pricing of water*

In both WUAs, ISF were charged volumetrically by the ID, but the WUAs collected ISF per watering from farmers. Further, the ISF was supposed to be collected in advance. However, both the WUAs reported that they collected ISF after irrigation was over. Both the Bhetasi and Jol WUAs reported that the rates charged were those prescribed by the ID and not more than that. The irrigation water rates charged for canal irrigation through flow by the ID in Gujarat are shown in Table 3, while the rates for irrigation through lift are one-third of the flow irrigation rates.

### *Income from ISF*

In Bhetasi WUA, the collection of ISF on an average was reported to be around 65–75%. Patel (1999) notes that in the first year of the functioning of the WUA, that is 1993–94, the collection of ISF was 90% in the *kharif* season and 80% in *rabi* season. He further notes that in the second year of functioning, the collection of ISF had deteriorated to just 10–15% only, owing to internal conflicts within the EC. Hence, it can be said that the collection of ISF was highly fluctuating right from the inception of this WUA and even at present, the ISF collection has not been able to reach the initial high level which was found during the first year of the existence of the WUA.

The Jol WUA reported an average collection of ISF to the extent of 55–65%, which is less than the Bhetasi WUA.

Assuming that both WUAs deposited ISF on time and paid 10% of the amount as education cess[1], they could retain a net 40% of the ISF collected. Bhetasi WUA also spent a certain amount to collect the ISF (10% commission to the *chowkidar*), while the Jol WUA did not do so. Hence, the WUAs retained a net 30–40% of ISF collected for their expenses and obligations.

[1] A surcharge imposed by the government of India on taxable income of individuals, Hindu undivided families (HUFs), companies, firms, cooperative societies and trusts (identified as body of individuals and association of persons).

Table 3. Irrigation water rates for flow irrigation in Gujarat, India.

| Crops | *Kharif*/*Ravi*/summer and two seasonal crops | Perennial crops |
|---|---|---|
| Base rate (effective from 01/01/2007) | Rs 160 per watering, per hectare | Rs 300 per watering, per hectare |
| Annual increase | @7.5% pa | @7.5% pa |
| Additional | Plus 20% for the 'local fund' which goes to the *gram panchayat* under the Gujarat Panchayat Act 1993 | Plus 20% for the 'local fund' which goes to the *gram panchayat* under the Gujarat Panchayat Act 1993 |

### *Income from other sources*

The Bhetasi WUA had a reserve fund, share capital as well as an initial government (CADA) subsidy of Rs 450,000. These funds were put in fixed deposits in nationalized banks like the State Bank of India and Dena Bank as well as the Kheda District Cooperative Bank.

The Jol WUA had share capital, a reserve fund, a membership fees fund as well as a depreciation fund. These funds were also put in various fixed deposits with the Kheda District Cooperative Bank. In addition, the profits from the sale of urea and ammonium sulphate also added up in the WUA's income. In 2010–11, the Jol WUA made a net profit of Rs 1,855 from the sale of fertilizers.

### *Activities other than water distribution*

The canal in Bhetasi as well as in Jol runs through privately owned fields, hence any kind of tree plantation which could generate extra income for the WUA was not possible. Also, neither of the WUAs accrued any income from fishing rights in the canal and so on.

The Jol WUA started fertilizer sales in the year 2010–11 for the convenience of its members. Members could buy fertilizers from the WUA on a priority basis. Non-members could also purchase them, but only after the members' demand was satisfied.

### *Outstanding dues*

The total amount of outstanding ISF dues was not available for the Bhetasi WUA. It was informed that about 60–70 members were long-term defaulters, while the rest paid their fees with a delay of between one season to 1 year although the WUA did not have updated records. The WUA made a net loss in 2008–09, but since then, it has been making a net profit every year.

In the Jol WUA, the amount of outstanding ISF dues from farmers was Rs 146,355 at the end of 2010–11. A list of payment defaulters was not up to date, but the WUA officials did have information about them.

### *Financial health*

The Bhetasi WUA had a bank balance of Rs 192,224, while the Jol WUA had a bank balance of Rs 552,586 on the date of interview. The income and expenditure accounts for year 2010–11 of both the WUAs showed a good financial position as can be seen from Tables 4 and 5.

Table 4. Income and expenditure account of Bhetasi WUA (1 April 2010 to 31 March 2011).

| Income from | Rs | Expenditure on | Rs |
|---|---|---|---|
| ISF collection | 238,803 | Irrigation charges to ID | 26,146 |
| Interest income | 2,328 | Stationery expenses | 1,180 |
| | | Repairing expenses | 38,995 |
| | | Audit fee | 148 |
| | | Commission expenses | 23,286 |
| | | Meeting expenses | 250 |
| | | Salary expenses | 7,400 |
| | | Conveyance expenses | Nil |
| Net profit | | Depreciation allowance | Nil |
| | | Miscellaneous expenses | Nil |
| | | Office rent | Nil |
| Total income | 241,131 | Total expenses | 97,405 |
| | | +Net profit | 143,726 |
| | 241,131 | | 241,131 |

*Source:* Annual audited accounts of the Bhetasi WUA for 2010–11.

Table 5. Income and expenditure account of Jol WUA (1 April 2010 to 31 March 2011).

| Income from | Rs | Expenditure on | Rs |
|---|---|---|---|
| ISF collection | 56,754 | Irrigation charges to ID | 22,880 |
| Interest income | 3,122 | Stationery expenses | 1,255 |
| Profit from sale of urea fertilizer | 1,855 | Repairing expenses | 2,550 |
| | | Audit fee | 101 |
| | | Commission expenses | Nil |
| | | Meeting expenses | Nil |
| | | Salary expenses | 6,000 |
| | | Conveyance expenses | 1,600 |
| | | Depreciation allowance | 570 |
| | | Miscellaneous expenses | 1,500 |
| | | Office rent | 6,000 |
| | | Licence fee for sale of urea fertilizer | 2,150 |
| Total income | 61,731 | Total expenditure | 44,606 |
| | | +Net profit | 17,125 |
| | 61,731 | | 61,731 |

*Source:* Annual audited accounts of the Jol WUA for 2010–11.

As the WUA is allowed to retain about 50% of the ISF it collected, the amount of ISF should be nearly twice that paid to the ID as irrigation chargers. However, it can be seen from Table 5 that ISF collection by Bhetasi WUA in 2010–11 was roughly ten times that of the irrigation charges paid to the ID. This was because, owing to the legal notices given to defaulters, many of them had paid their outstanding dues in 2010–11, hence the ISF collection far exceeded the charges paid to the ID.

It can be clearly seen from Tables 4 and 5 that both WUAs made a net profit in 2010–11. This is quite surprising, given the fact that the collection of water rates is reported to be on an average of only

55–65%. Then how could the WUA show a profit? This was explained by the Chairman of the Bhetasi WUA in the following way: the Bhetasi WUA gets a rebate of 20% by paying fees on time. It also gets a net 30% of ISF for O&M, after paying education cess and commission on collections. However, the actual expenses of O&M are not so high, resulting in savings for the WUA. The employees of the WUA are few and they are paid modestly, keeping in mind the part-time nature of canal operation. Other routine expenses are also quite low. Hence, the expenses of the WUA are quite moderate. On the other hand, apart from the ISF, the Bhetasi WUA also earns interest from fixed deposits. All this adds up to a surplus for the WUA.

The Chairman of the Jol WUA also concurred with the above reasons and added that the income from sale of fertilizers by the WUA was also a welcome source of additional income.

*Findings from the study*

1. The case study of the WUAs functioning in villages of Bhetasi and Jol in Anand district of Gujarat revealed that there was a clearly 'felt need' for a WUA in both Bhetasi and Jol, albeit for entirely different reasons. However, this 'felt need' is the reason behind the formation and continual functioning of the WUAs.
2. The main purpose of organizing both WUAs was to achieve greater control over the ISF paid by them, as well as escaping strict measures being pursued by the ID in the case of Jol.
3. Capacity building undertaken with the active involvement in WALMI was instrumental in forming a WUA in Bhetasi, while the Jol farmers gauged that the ID was keen to get rid of its responsibilities and seemed to have agreed to form a WUA to escape the consequences of their non-payment in the past.
4. Neither WUA was always able to discharge their primary responsibility of distributing water in a timely, sufficient and equitable manner. This was partly because of systemic issues beyond their control. However, rotational water distribution and repairs and maintenance were done quite well in the Bhetasi WUA, while in Jol, it was not so. Understandably enough, the level of satisfaction amongst members as well as non-members of the Bhetasi WUA was high, while that of the Jol WUA was low. This could have an impact on the sustainability and acceptance of the WUAs amongst members.
5. The Bhetasi WUA undertook repairs and maintenance of the subsystem to the satisfaction of members, while the Jol WUA did not carry out this responsibility satisfactorily. Hence, while the Bhetasi WUA could be considered a water manager to a great extent, the Jol WUA was in fact nothing but an ISF collector.
6. Since the WUAs did not impose fines or penalties for non-payment, delayed payment or breaking of rules, conflicts between the WUA and the members were also reported to be rare. However, this could be termed as avoidance of conflicts instead of their absence.
7. Democratic process in both WUAs was far from vibrant. Elections in both WUAs were non-politicized affairs, not suggesting any elite capture but rather a lack of interest among members.
8. None of the WUAs had made an attempt to increase their membership, which could also generate additional funds via membership fees. This further illustrates their indifferent attitude towards achieving operational self-sufficiency.
9. The Bhetasi WUA exhibited a novel approach in taking the services of the ID personnel for the recovery of ISF on commission basis. Thus, social pressure was found to be inadequate to recover

ISF and some official pursuance was thought necessary. However, this also hints at the effectiveness of economic incentives in improving recovery performance.

10. In Jol, the chairman himself managed to collect ISF using social pressure on his fellow farmers. However, in this case also, an added economic incentive could supplement social pressure and add to the motivation for better performance in terms of ISF collection.
11. The system of record keeping and developing an institutional set up for recovery of ISF was a low priority in both the WUAs. This state of affairs could also be changed if the WUAs were made responsible for the entire amount recoverable using the ISF, instead of the present system of refunding 50% of whatever amount that has been collected as ISF.
12. The presence of outstanding dues in both WUAs implies that the WUAs could not be said to have operational self-sufficiency. In the absence of subsidy and rebate by the ID, their financial sustainability could be doubtful, even though both the WUAs showed a net profit in their balance sheets.
13. Both WUAs charged ISF prescribed by the ID and nothing more than that. However, both WUAs made a net profit. This could be because both the WUAs only paid irrigation charges on behalf of farmers who had paid their ISF. If the WUAs were made responsible for all the water distributed via them, including that to the defaulters, their profitability might be affected.
14. While the Bhetasi WUA had not generated new sources of income by undertaking any other activity apart from water distribution, the Jol WUA had succeeded in doing so by taking up sale of fertilizers. The profit from these sales could help in subsidizing the delivery of irrigation water at the WUA level.

## Conclusion

Financial incentive provided through partial refund of ISF for undertaking O&M, giving effective control over O&M expenditure and at the same time adopting strict measures for ISF recovery are three steps in the right direction to encourage the farmers to organize themselves into a WUA. Besides, the importance of capacity building of farmers during the inception of the WUA cannot be overemphasized, because it gives the required confidence to EC members and encourages farmers to support the WUA. Tangible benefits from the WUA in the form of greater control over water availability could be a way of enthusing farmers about their WUA and creating vibrancy in its functioning. However, systemic issues with regard to the reliability, amount and timeliness of irrigation water supply are the chief reason for the dissatisfaction of the farmers with the WUA and hence the weakest link in the pursuit of PIM.

As far as the functioning of the WUAs is concerned, more needs to be done in order to sensitize WUA office bearers towards their role as water managers and not merely ISF collectors. They should be encouraged not only to improve collection of ISF but also to take adequate care of the physical structures and be more responsive to the complaints of the member farmers. They should be legally supported in their task of imposing penalties for breaking rules or non-payment of dues. This would not only encourage the adherent farmers, but in time this type of compliant behaviour could also become a part of the social tradition, so that, in future, it could be easier for WUAs to make, amend and enforce rules.

There is a need to revisit the system of giving a rebate on whatever is the amount of ISF collected by the WUAs. Instead, they should be made responsible for the entire ISF due from their command. Their

financial incentives should be linked to their performance in this regard. This would force the WUAs to attempt to achieve operational self-sufficiency and generate supplementary sources of income instead of depending too much on the government for their sustenance.

Further, if monetary incentive is linked to ISF recovery, the cooperative disposition of WUA members/employees officials may be further strengthened, resulting in an urge to improve ISF collections. Social pressure supposed to be exerted by the WUA is not always effective. It would be strengthened if ISF recovery also had a legal compulsion for the payer and financial incentive for the personnel responsible for its collection.

## Acknowledgements

The author would like to thank UGC New Delhi for providing financial support for this study. Thanks are also due to Shri Shilp Verma, Research Fellow, UNESCO-IHE, Delft, as well as two anonymous referees for constructive comments on earlier versions of this paper.

## References

ADB (2008). *Irrigation Management Transfer: Strategies and Best Practices*. Report prepared by K.V. Raju, Pratima Dayal & Jaya Chatterjee for ADB India Resident Mission, Sage Publications, New Delhi.

Baland, J. M. & Plateau, J. P. (1996). *Halting Degradation of Natural Resources: Is there a Role for Rural Communities?* FAO and Clarendon Press, Oxford.

Ballabh, V. (2005). Emerging water crisis and political economy of irrigation reforms in India. In *Asian Irrigation in Transition, Responding to Challenges*. Shivakoti, G. P., Vermillion, D. S., Lam, W.-F., Ostrom, E., Pradhan, U. & Yoder, R. (eds). Sage Publications, New Delhi.

Bardhan, P. K. (1993). Analytics of the institutions of informal cooperation in rural development. *World Development 21*(4), 633–639.

Bassi, N. (2007). Participatory irrigation, management and livelihoods: case study of WUAs in Maharashtra. Paper presented at the 6th IWMI Annual Partners' Meeting, 8–10 March 2007, at Institute of Rural Management Anand.

Bose, R. (2003). The end? *Down to Earth 12*(1), 38–41.

Chaturvedi, V. (2004). *Financial Viability of Irrigation Co-operatives – An Exploratory Study in Gujarat*. Development Support Centre, Ahmedabad.

GoI (1992). Report of the Committee of Pricing of Irrigation Water. Planning Commission, September 1992, New Delhi (also known as the Vaidyanathan Committee Report).

GoI (2009). Central Water Commission, downloaded from www.indiastat.com (accessed 14 January 2013).

Gulati, A. & Narayanan, S. (2002). Subsidies and reforms in Indian irrigation. In *Water Policy Reform: Lessons from Asia and Australia*. Brennan, D. (ed.). Australian Centre for International Agricultural Research, Proceedings No. 106, Canberra.

Gulati, A., Meinzen-Dick, R. & Raju, K. V. (2005). *Institutional Reforms in Indian Irrigation*. Sage Publications, New Delhi.

Jairath, J. (1998). Irrigation rates: watery arguments. *Economic and Political Weekly 33*(16), 931–932.

Jairath, J. (1999). Participatory irrigation management: experiments in Andhra Pradesh. *Economic and Political Weekly 34*(40), 2834–2837.

Kalro, A. H. & Naik, G. (2000). Role of water users' associations in irrigation management in Maharashtra, India: two case studies. *Journal of Indian Water Resources Society 20*(3), 130–142.

Khanna, A. (2007). Inter-institutional relationship for irrigation management between WUA and PRI. Paper presented at the 6th IWMI Annual Partners' Meeting, 8–10 March 2007, at Institute of Rural Management Anand.

Kolavalli, S. (1994). *User Participation and Incentives to Perform in Indian Irrigation Systems*. CMA Monograph Series No. 180, CMA, IIM, Ahmedabad.

Koppen, B., Parthasarathy, R. & Safiliou, C. (2002). Poverty Dimensions of IMT in Large Scale Canal Irrigation in Andhra Pradesh and Gujarat, India. Research Report 61, IWMI, Colombo, Sri Lanka.

Marotia, D. K. (2002). Institutions arrangements for participatory irrigation management: initial feedback from central India. In *Water Policy Reform: Lessons from Asia and Australia*. Brennan, D. (ed.). ACIAR, Proceedings No. 106, Canberra.

Mearns, R. (1996). Community, collective action and common grazing: the case of post-socialist Mongolia. *Journal of Development Studies 32*(3), 297–339.

Meinzen-Dick, R. S. (1984). *Local Management of Tank Irrigation: Organisation and Operation, Studies in Irrigation No. 3*. Cornell University, Ithaca, NY. (Quoted in Institutional Reforms in Indian Irrigation, A. Gulati, R. Meinzen-Dick & K.V. Raju (eds), International Food Policy Research Institute, Sage Publications, New Delhi, pp. 227.)

Meinzen-Dick, R. S., Mendoza, M. S., Sadoulet, L., Abiad-Shields, G. & Subramaniam, A. (1997). Sustainable water users' associations: lessons from a literature review. In *User Organisations for Sustainable Water Services*. Subramanaim, N. V. & Meinzen-Dick, R. S. (eds), World Bank Technical Paper No. 354, World Bank, Washington, DC, pp. 7–87.

Mitra, A. K. (1996). Irrigation sector reforms – issues and approaches. *Economic and Political Weekly 31*(13), pA-31–A-37.

Mukherjee, A., Verma, S. & Rath, P. (2003). Participatory Irrigation Management in AKRSP (I) Supported Canal Irrigation Systems in South Gujarat – Impact on Tribals. IWMI Research Report, unpublished.

Mukherjee, A., Fuleki, B., Shah, T., Suhardiman, D., Giordano, M. & Weligamage, P. (2010). Irrigation Reform in Asia: A Review of 108 Cases of Irrigation Management Transfer: http://waterknowledgehub.iwmi.org/PDF/Irrigation_Reform_in_Asia.pdf (accessed 6 February 2012).

Ostrom, E. (1992). *Crafting Institutions for Self-governing Irrigation Systems*. Institute for Contemporary Studies, San Francisco, California.

Palanisami, K. (1999). Irrigation in Tamil Nadu. Working Paper (Draft). Water Technical Centre, Tamil Nadu Agricultural University, India.

Pant, N. (1999). Impact of IMT in Maharastra – an assessment. *Economic and Political Weekly 34*(13), A-17–A-26.

Parthasarthy, R. (1999). *Inclusion of Land – Poor Women and Men in Irrigation Management Transfer: A Comparison of Gujarat and Andhra Pradesh, India*. International Irrigation Management Institute and Gujarat Institute of Development Research, A Proposal, May 1999–April 2000, Ahmedabad.

Parthasarthy, R. (2000). Participatory irrigation management programme in Gujarat – institutional and financial issues. *Economic and Political Weekly 35*(35–36), 3147–3154.

Patel, K. (1999). *Bharatma Sinchai Vyavasthani Tabdilini Sthiti: Anklav Peta Gaun Naher Pani Sahkari Mandali: Mahi-Kadana Yojana: Khedutona Anubhavo*. IIM, Ahmedabad and IIMI, Colombo, February 1999. Translated to English as *State of Irrigation Management Transfer in India: Anklav Sub-Minor Canal Water Cooperative Association: Mahi-Kadana Project: Experiences of Farmers*.

Samad, M. (2002). Impact of irrigation management transfer on the performance of irrigation systems: a review of selected Asian experiences. In *Water Policy Reform: Lessons from Asia and Australia*. Brennan, D. (ed.), ACIAR, Proceedings No. 106, Canberra.

Singh, K. (1994). Co-management of canal irrigation – a case study in Gujarat. *Journal of Indian Water Resources Society 14*(1–4), 26–33.

Small, L. & Carruthers, I. (1991). *Farmer Financed Irrigation: The Economics of Reform*. Cambridge University Press, Cambridge, UK.

Small, L. E., Adriano, M. S., Martin, E. D., Bhatia, R., Shim, Y. K. & Pradhan, P. (1989). *Financing Irrigation Service: A Literature Review and Selected Case Studies from Asia*. Irrigation Management Institute, Colombo.

Swain, M. (2002). Turning over irrigation management to farmers – prospects and constraints. *Kurukshetra 50*(8) (June), 4–10.

Vaidyanathan, A. (2001). Irrigation subsidies. Paper discussed at a Conference on Fiscal Policies to Accelerate Economic Growth, Organised by the National Institute of Public Finance and Policy, May 2001.

Wade, R. (1988). *Village Republics*. Cambridge University Press, Cambridge. (Quoted in *Institutional Reforms in Indian Agriculture*, Gulati A., Meinzen-Dick, R. & Raju, K.V. (eds), Sage Publications, New Delhi, 2005, pp. 227.)

Received 12 April 2012; accepted in revised form 12 August 2012. Available online 25 October 2012