

# Brackets and black boxes: research on water users' associations

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## Abstract

This paper reviews the current state of research on Water Users' Associations in canal irrigation. It argues that, while it makes several important contributions to our understanding of water institutions, collective action and local governance, it suffers from several weaknesses. Technology is treated as a black box. There is a very static and instrumental perspective. There is also a bracketing of the social relationships of which collective action is an expression. This paper concludes that further research is needed in order to understand the organizational dynamics of water users' associations and how different technological conditions of water distribution influence the possibilities for collective action. Research is also needed on the interplay of the broader contextual factors under which water users' associations operate and on the effects of WUA formation on social power relationships, water management and distribution practices.

*Keywords:* Decentralization; Governance; Institutions; Irrigation management transfer; Water management

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## 1. Introduction

Farmer-managed irrigation systems have been in existence for several centuries. However, the current debate on farmer participation in government-managed irrigation systems originated in the 1970s. This debate became more prominent and dominated discourses on irrigation management in the 1980s. "The irrigation projects with their complex engineering and bureaucratic organizations can not be successful without the active participation of beneficiary farmers in the management process. Consequently the literature on irrigation management in the recent years has given increasing attention to the value of organized participation by water users in the management process." (Pant & Verma, 1983 p20).

From an emphasis on participation, a shift took place to evolving institutions for self-governance in irrigation in the 1990s. The literature of the 1980s came mainly from sociologists and anthropologists who emphasized farmers' participation. Since the 1990s, major contributions have come from political

theorists and the new institutional economists who emphasized the evolution of institutions for self-governance at all levels.

This shift could be seen as parallel to the wider debates surrounding the relative roles of the state, the market and local organizations. In the 1970s and 1980s, local organizations were viewed as intermediaries between the state and the market (Esman & Uphoff, 1984). Starting in the 1990s, it has been felt that local organizations, particularly non-governmental organizations, have a greater role to play in the wake of the diminishing role of the state and expanding markets (Uphoff, 1993). There are complementarities among the roles of the state, the market and non-governmental organizations that need to be developed further (Nugent, 1993; de Janvry *et al.*, 1993). This is in contrast to the perceived relations of substitution that prevailed in the 1980s.

In the specific context of understanding water users' associations in canal irrigation, the 1990s saw some other paradigmatic shifts. Some of these shifts, as emphasized by Ambler (1994 p 22), involve a shift from *farmer participation* to *farmer/joint management*, from *motivating farmers* to *creating motivating conditions*, from building a sense of ownership to *a real ownership*, and from *forming WUAs* to *catalyzing WUAs* (Ambler, 1994 p 22). Most importantly, Ambler argues that farmers should be seen as *partners* rather than as *beneficiaries*.

## 2. A classification of the literature

There has emerged, in recent years, a vast and burgeoning literature on the subject of water users' associations in canal irrigation. Based on the dominant streams of thought in this literature, it could be classified into four categories:

1. the ecological basis of collective action,
2. the characteristics for success literature,
3. the new institutional economics literature,
4. the control and empowerment perspective.

### 2.1. *The ecological basis of collective action*

This approach brings to the fore the significance of agro-ecological and hydrological factors in understanding the evolution of irrigation institutions. The emphasis is on how factors such as the size of river basins, topography, seasonality, rainfall and water scarcity shape institutional evolution.

Wade (1995) argues that ecological factors determine the form a canal irrigation institution takes. These include the size of river basins, potential evapotranspiration, crop water requirements and population density. According to Wade, some social scientists err by advocating new institutional forms without considering their fit with agro-ecological environments. In a similar vein, Uphoff (1986) argues that the number of levels of management should correspond to the hydrological system.

In the more specific context of water users' associations, the relationship between physical scarcity and level of participation has been understood as being akin to an inverted U-shaped curve, peaking at some medium level of scarcity (Uphoff *et al.*, 1990). There appears to be an optimum level of scarcity, where the incentive to free-ride is curbed. At this level, a member of the group tends to lose by not contributing to decision-making and sharing information.

It has been argued that water must be scarce enough to induce collective action (Meinzen-Dick, 1996). At the same time, beyond a certain level of scarcity, collective action may not be rewarding at all. Where there is effective rainfall, there would be limited dependence on irrigation, and hence limited incentives for participation. Similarly, a large number of wells could encourage farmers to opt out. Those with plentiful water do not need to be active, and those who expect too little water have no incentive to be involved (Meinzen-Dick *et al.*, 2000). Thus it is argued that areas with moderate scarcity have higher returns to organization (Meinzen-Dick *et al.*, 2000). For the same reason, it is argued that organizations will be more active during a moderate drought.

## 2.2. The characteristics for success literature

The emphasis in this body of work is on the conditions of management and organization under which “farmers’ participation” will succeed. The major themes are organizational size, social and economic homogeneity of members, legal status of WUAs, conferment of secure property rights and the creation of a favorable bureaucratic and policy environment. Discussions in this body of work focus on how each of these factors influence the likelihood of success of water users’ associations. This view is inspired by the socio-technical nature of irrigation systems. The “software” of irrigation needs much the same emphasis as the “hardware”. Social engineering is as important as technical engineering (Cernea & Meinzen-Dick, 1994).

Conferring a legal status on WUAs is an important theme in this body of work (Uphoff, 1986; Saleth, 1996; Meinzen-Dick, 1996; Meinzen-Dick *et al.*, 2000). Without a legal identity, it is argued that WUAs cannot enter into contracts or enforce existing ones. Legal recognition and formal legal definitions of rights and responsibilities are also needed for WUAs that interact with government agencies in more market-oriented contexts (Meinzen-Dick *et al.*, 2000). At the same time, it is argued that excessive legal regulation of WUAs stifles local initiative and adaptation of organizations to fit local conditions.

Esman & Uphoff (1984) argue that paper organizations will be peripheral in their impact because people will only have half a commitment to something whose creation they do not own. On the other hand, informal WUAs, lacking legal status and backing, may be as, or even more, effective than formal WUAs that exist only on paper, as put forward by Ambler (1994) and Maloney & Raju (1994).

The second theme in this body of work is of social homogeneity and links from water users’ associations to prevailing institutions. When people interact anyway, it is argued that the marginal costs of interaction for water management are very low (Meinzen-Dick, 1996; Meinzen-Dick *et al.*, 2000). Thus, farmers’ participation programmes will be more viable if they build on already existing forms of collective action (Uphoff, 1986). Shah (2000), drawing upon the experience of water users’ associations in Sindh, Pakistan, argues that building upon existing community-based organizations saves the cost and effort in building new organizations. It also avoids duplication.

Higher organizational density, or the prevalence of other pre-existing forms of social organization, increases people’s participation in voluntary associations and the pool of recognized leadership. There are likely to be stronger WUAs where other local organizations are strong (Gulati *et al.*, 1999). Local organizations, such as cooperatives, official village *Panchayats* or traditional caste *Panchayats* or credit societies, add to the stock of social capital.

In a sample study in India, Meinzen-Dick *et al.* (2000) used temples and cooperatives as indicators of social capital. The existence of temples was found to be a facilitating factor, though the existence of economic cooperatives in the same village did not have the same positive effect. Homogeneity of asset

structure is another facilitating factor. Social heterogeneity, on the other hand, makes communication and cooperation more difficult (Meinzen-Dick *et al.*, 2000).

The third theme in this body of work is that of size. Uphoff (1986) notes that WUA size should be a matter of circumstance, while Maloney & Raju (1994) emphasize that a group of 40–50 members forms a cohesive unit. The experience of traditional water users' associations in Asia has suggested that it is more difficult to organize WUAs if the units are too large (Gulati *et al.*, 1999). Another observation is that membership should comprise field neighbors rather than adjacent neighbors (Uphoff, 1986).

Secure property rights in land and water are understood to influence the likelihood of success (Meinzen-Dick, 1996; Meinzen-Dick *et al.*, 2000). If well-defined tradable water rights are granted, water users' groups will have the incentive to economize on water (Rosegrant & Binswanger, 1994). They would also have the legal standing to bargain forcefully with the water conveyance bureaucracy for timely and efficient service.

The impact of markets on successful collective action seems to be ambiguous. On the one hand, there seems to be a negative relationship between market distance and participation. Sites closer to markets are more commercially oriented and the costs of interaction with the government are also lower (Meinzen-Dick *et al.*, 2000). On the other hand, market integration can also erode traditional bases of cooperation (Meinzen-Dick *et al.*, 2000).

The initial impetus for organization, whether internal or externally induced, has a major effect on the structure and viability of farmers' participation (Meinzen-Dick, 1996). Leadership, both in terms of traditional leadership as well as college graduates, are identified as other enabling features (Meinzen-Dick *et al.*, 2000). Leaders provide focal points for organization (Gulati *et al.*, 1999). This is more so in the initial stages when leaders can be critical, both for mobilizing support within and outside the group and in modifying the behavior of members. On the other hand, organizations and collective action that depend upon only particular individuals may not be robust and sustainable over the long run.

### 2.3. *The new institutional economics literature*

The New Institutional Economics seeks to integrate a theory of institutions with neo-classical economic theory. In the New Institutional Economics, institutions are seen as “rules of the game” that structure human interaction. They include formal and informal constraints and their enforcement characteristics (North, 1986, 1990).

The New Institutional Economics is considered to be a milestone in the evolution of institutional thought in economics. This is largely on account of its inter-disciplinary character and its perceived triumph over the old institutionalism that is criticized for its lack of coherent theory (North, 1986, 1990; Nabli & Nugent, 1989; Lewis, 1989; Eggertsson, 1990).

All institutions involve enforcement of some kind or other (North, 1986). Institutions, thus, are interpreted as constraints that individuals place on themselves. The role of institutions is to facilitate coordination between people by making it possible for individuals to reasonably predict how others will behave. Institutions thus provide assurances about the behavior of others and encourage them to act in ways that are collectively superior. They generate incentives for individual and collective action.

The application of this approach to collective action in natural resource management is as follows. Rational self-seeking individuals will try to maximize their gains from the use of a common pool resource (Ostrom & Gardner, 1993). Given the subtractability of the resource and the difficulty of exclusion, common pool resources will be overexploited in the absence of effective institutions – rules

that regulate the use of the common pool resource. Thus, the crucial determinant of a community's success in managing a resource, the new institutional economists argue, is its ability to build institutions that internalize the externalities and the consequences of individual actions.

“If exclusion is not accomplished by the design of appropriate institutional arrangements, free-riding related to the provision of the common-pool resource can be expected. After all, what rational actor would help to provide the maintenance of a resource system, if noncontributors can gain the benefits as well as contributors.” (Ostrom & Gardner, 1993 p 93).

The case of the provision of the collective good is likened to the classic “Prisoners’ Dilemma” in game theory: each user of the common pool resource is likely to benefit as much as the other from the provision of the good. However, not being sure of whether the other user will cooperate by contributing labor and/or funds, each user feels better off not contributing and the collective good ends up being not provided, or being overappropriated. This gives rise to what is called the “tragedy of the commons” (Hardin, 1968).

Thus, it is maintained by the new institutional economists that institutions or rules structuring human interaction are needed to curb opportunistic behavior. Such behavior may take the form of rent seeking, corruption or free-riding (Ostrom, 1992). In particular, there is a strong temptation to free ride (Tang, 1991; Ostrom, 2000). It is argued that collective outcomes depend on the physical attributes of the resource, attributes of the community and institutional arrangements (Tang, 1991, 1992). Together, these generate incentives for collective action and influence the management of common pool resources. By changing the set of rules, it is argued that we change the incentive structures facing the resource users. By doing so, we influence their ability to manage the common pool resource.

Ostrom (1992) identifies three levels of rule making. These include (1) operational rules that serve as a guide to day-to-day activities, (2) collective choice rules that regulate decision-making and conflict resolution processes and (3) constitutional rules that regulate membership and define users’ rights. The emphasis on rules is used to explain the crafting of effective institutions. Ostrom (1990, 1995, 2000) applies these design principles to the governance of common pool resources in general, while Ostrom (1992) focuses more specifically on crafting irrigation institutions.

Further, it is argued that it is important to involve farmers in crafting their own operational and collective choice rules. Without considerable confidence about the ability to effect outcomes, farmers will have little incentive to participate in collective efforts. When users of a common pool resource organize themselves to devise and enforce some of their own basic rules, they tend to manage local resources more sustainably than when rules are externally imposed on them (Ostrom, 2000). Thus, rule setting should be the domain of users and not just the government alone (Cernea & Meinzen-Dick, 1994).

The concepts of incentives and rules are used further to explain accountability and the appropriateness of community-managed irrigation systems over bureaucratically managed ones. Ostrom (1996) explains the poor performance of government-managed irrigation systems in Nepal in terms of the absence of correct incentives among bureaucrats and the staff at donor agencies. In the same set-up, farmer-managed irrigation systems were found to perform better because they built in better accountability mechanisms. The results in Taiwan and Korea have been found to be different largely because the system of operations and maintenance reward engineers for drawing on local knowledge and working directly with farmers.

Tang (1991) argues that the reliance on bureaucratic systems is less effective than community-managed irrigation systems that are more sensitive to local conditions. In a sample of 36 irrigation systems, it was found that rule conformance and maintenance were better in community systems than in bureaucratic systems. Similarly, they were higher, within bureaucratic systems, in those that had local farmers' organizations than those that did not. Tang's explanation of this phenomenon is that bureaucrats do not face direct accountability to the users and do not have direct access or proximity to the local information. Besides, bureaucratic systems tend to impose a uniform set of operational rules on different irrigated areas, regardless of specific circumstances. Community organizations, on the other hand, are characterized by a wider diversity of operational rules; furthermore, the collective choice rules in community organizations are more conducive to rule formulation, rule enforcement and official accountability than bureaucratic organizations.

Thus, a major achievement of this body of work is in its emphasis on a shift from participation (discussed in the preceding section) to self-governance of irrigation systems. This literature becomes more meaningful in the broader context of the debate surrounding Hardin's "tragedy of the commons" (Hardin 1968). While most prescriptions advocated privatization of natural resources or their nationalization (for a review, see Singh (1997)) as a way of averting the tragedy, the New Institutional Economists emphasized the distinct possibility of effective self-governance.

"Considerable empirical evidence from field and experimental settings holds that appropriators frequently do constitute and enforce their own rules, and that these rules work." (Ostrom & Gardner, 1993 p 96)

This literature also uses concepts of marginal analysis used in traditional micro-economic theory to explain whether individuals will contribute to a collective good. The other focus in this literature, thus, is on the costs and benefits of participation and the resulting incentives for participation. Balland & Platteau (1999) examine how inequality affects incentives for participation and conclude that, at best, this impact is "ambiguous". Also used widely in this body of work are game theoretic approaches that focus on the conditions under which cooperation is likely to take place (Seabright, 1993; Bac, 1998; Ostrom, 2000).

Related to this is the concept of transaction costs: the costs of information, contracting and enforcement (North, 1986, 1990). Individuals make decisions with subjective assessment of the benefits they are likely to receive and the costs they are likely to bear over a reasonable period of time (Brewer *et al.*, 1999). Benefits come through access to improved irrigation or reduced costs of organizing supplies. Organizational costs are comprised of consensus building, organizing and maintaining costs. Consensus building is necessary to make members agree that an improvement in the current situation is possible and desirable and the means to achieve it are appropriate.

For a public resource agency or management organization, transactions costs are related to its coordinating function: data collection, analysis, design and implementation of regulations, communications and conflict resolution (Hanna, 1995). For individual resource users, the transaction costs of resource management are related to participation: the cost of work time lost to meetings, time required to acquire information and communicate to other users and direct monetary expenditures for information, travel and communication.

Kolavalli (1996), cited in Brewer *et al.* (1999), argues that when these costs are borne by a few individuals, as, for instance, when they get concentrated in the leadership, it fosters the possibility of

collective action. In reviewing some experiences from farmer participation in Indonesia, Thailand and the Philippines, Bruns (1993) views the reliance on community organizers to organize farmers as “a state subsidy for the transaction costs of collective action” (Bruns, 1993).

Leadership, community organizers and external agents can subsidize transaction costs of collective action (Meinzen-Dick, 1996). The involvement of a charismatic or trusted individual reduces the transaction costs of organizing and provides assurances that make people more willing to participate in collective action (Gulati *et al.*, 1999).

Often larger WUAs may become financially viable; however, the transaction costs of monitoring group behavior tend to increase as size advances (Meinzen-Dick, 1996).

As the size of water users’ associations increases, the transaction costs within the group increase but transaction costs in dealing with the bureaucracy tend to diminish (Gulati *et al.*, 1999). Finding the appropriate balance between the two is identified as an important issue.

#### *2.4. The WUAs as failure argument: the control and empowerment perspective*

This literature focuses on why water users’ associations fail, rather than why they do or do not succeed. There is a critique of the basic concept of water users’ associations. The major concepts here are those of empowerment of users, conferment of real control over the availability of water, striking a balance between users’ rights and responsibilities and mainstreaming water users’ associations within the social and political environment.

Hunt (1989) argues that WUAs have been formed in an attempt to replicate the working of small-scale community-managed irrigation systems. However, this analogy is misplaced. Community-managed irrigation systems are a coherent whole in terms of the charter of authority, tasks, roles, size, vertical organization and combinations of characters. This synergy is missing in the case of WUAs formed for large-scale bureaucratically managed irrigation systems. Irrigation communities are vertically integrated to the head gate, so that the rights to water are protected and institutionalized, but in a WUA no group rights to water exist. There are no arenas to legitimately discuss problems with water delivery. WUA members have no reward for the “dirty functions” that they are supposed to perform. In particular, they do not have real control over water. The presumed benefits of WUAs are unlikely to be realized in its absence.

This view is endorsed by Goldensohn (1994) who argues that WUAs have been formed through desperate efforts at technical and social engineering, without considering what they actually mean for the people they are supposed to organize. WUAs are not associations of users of water, but of farmers who use water. Water is only an input into agriculture. WUAs would be more enduring if they were structured as multi-purpose organizations that were more central to the lives of the members.

Farmers do not get attracted towards irrigation organizations because they are concerned with only a small aspect of the agriculture enterprise (Shah & Shah, 1994). If irrigation organizations were promoted to MFOs (multifunction organizations), more farmers would show an interest in contributing to their effectiveness. Being multifunction helps irrigation organizations become effective and sustainable and deliver better services to farmer members. The quality of performance tends to improve as organizations become multifunctional and extend into a number of other related roles (Uphoff, 1986).

Drawing upon a case of a water users’ association in a South Indian canal irrigation system, Mollinga (1998a) attributes its failure to the absence of sound management at the main canal level and a failure to embed the effort in local political and social organizations. A case is made for shifting the emphasis

from “policy as prescription” to “policy as process” and for putting politics on the agenda of debates about the participation of farmers in water management.

There are more pessimistic variants of this view.

“With the present push to reduce government expenditure, there is some indication that what has been called ‘turnover’ can be ‘dumping off’. If after years of neglect, a system is handed over to farmers to manage, expecting them to make up multi-year deficits in maintenance, this is asking for problems. Or, if there has been no appropriate process of forming water users associations which are genuine people’s organizations and capable of performing the expected functions, to proclaim that popular participation has been advanced is a *sham* (emphasis added)”. (Uphoff, 2000 p 28)

### 3. An evaluation of the literature

The literature and research approach to studying water users’ associations suffers from several weaknesses. Technology is treated as a black box: there is a very static and instrumental perspective. There is a limited view of human agency and a failure to incorporate social and power relationships in an analysis of water users’ associations.

#### 3.1. *Technology as black box*

A major limitation of the literature on WUAs is the treatment of technology as a black box. In the context of Irrigation Management Transfer programmes, discussion has focussed on institutional and organizational issues while technology is largely left out of the discussion (Horst, 1998). At best, rehabilitation of existing projects is considered for turnover, taking the existing technology for granted. Discussions of technology have been confined to issues such as main system management and the physical state of the systems. That varying technological conditions of water distribution itself can affect the nature and forms of collective action or the potential for forming water users’ associations receives little attention.

The management structure of canal irrigation is shaped by the organizational requirements of system operation. This factor has a bearing on WUA establishment. The organizational implications of canal system operation also influence the range of functions that can be transferred to user groups. Thus, they shape the extent to which effective turnover can take place and the relationship between the users and the bureaucracy can undergo a change. For instance, the *warabandi* and *shejpali* systems of water distribution prevalent in India have a different potential for reform through WUA formation (Narain, 2003).

#### 3.2. *An instrumental and static perspective*

The literature on WUAs has a very strong instrumental perspective. This is particularly true of the “characteristics for success” literature. An extreme point of view is summed up thus. “Water users associations are not ends in themselves. From the farmers or government’s stand -point they are worth considering only if they improve the efficiency, equity or sustainability of irrigation systems” (Meinzen-Dick *et al.*, 2000 p 136). Rosegrant & Binswanger (1994) emphasize that, while “farmer participation has become its own discipline and spawned a large volume of conceptual papers and studies... it has



been difficult to establish that communal approaches to water management have actually increased farm production and income” (Rosegrant & Binswanger, 1994 p 1615).

That there should be an instrumental perspective is, however, not surprising since much of this literature has been produced in the wake of the evaluation of Irrigation Management Transfer programmes. These programmes have had clear objectives of improving financial recovery and irrigation system performance. Further, they have been part of structural adjustment programmes aimed at reducing the fiscal burden on governments and securing a greater role for the non-government sector. They have also been aided by a number of multilateral and international agencies with certain objectives and conditions. Under these conditions, not only has the formation of water users’ associations become an important reform strategy, but understanding the conditions for success has also assumed significance. Therefore, efforts have focussed on examining the conditions under which WUAs will succeed and how this can be achieved effectively, or “at a low cost”.

There is relatively very little effort to look at what this process of organization actually means for the farmers that are its “targets”. An important question that is evaded is whether the formation of WUAs actually improves the control that farmers have over water or makes the bureaucracy more accountable to them. Every time an external intervention takes place, it results in a redefinition of water rights (Benda Beckmann *et al.*, 1997). Further, there is often a mismatch between the farmers’ own normative structures and the structures imposed by water users associations (Boelens, 1998). These subjects, notwithstanding their significance, receive relatively little attention.

There is also a very static perspective. Performance is measured at a point of time. On the other hand, performance would be subject to variations. In the *characteristics for success literature*, there seems to be an inherent assumption that all organizations are either a success or failure; on the other hand, all social interaction has a spatial and temporal dimension (Giddens, 1979). There is also a tendency to group organizations as “good” or “bad” without clear definitions of what good or bad organizations are, or even what success or failure means.

Rasmussen & Meinzen-Dick (1995) highlight other weaknesses of the literature. There is a lack of comparative research. There is no definition of what a “good” organization is. Some concepts are not measurable. There is a bias in favor of studying successful organizations. We know little about what kind of external support is useful in strengthening local organizations. We know as little about how external relations of local organizations and inter-group relations affect the degree of organizational effectiveness. We also get to know little about the impact that WUA formation has on creating civic culture and their interface with forms of social organization, a point that is elaborated in the following section.

### 3.3. Bracketing social relations, human agency and power

The obsession with outcomes or products of Irrigation Management Transfer has led to very little attention being given to the social relations that sustain it. We know far more about the impacts and outcomes of Irrigation Management Transfer than we do about the processes that are behind it, or the contextual factors within which water users’ associations operate.

Conspicuous by its absence is a concept of power. Power, used in an absolute sense, could be interpreted in terms of a transformative capacity, that is the ability of actors to produce desired outcomes, i.e. the ability to *act*. In a relative sense, power refers to regularized relations of autonomy and independence (Giddens, 1979). The literature tells us little on whether the formation of water users’ associations does alter the balance of power between the water users and the bureaucracy, or among the

water users themselves. There seems to be an implicit assumption of homogeneity: one does not get a feel for who gains and who loses in the formation of WUAs; whether their formation alters the balance of power among the major actors or maintains the *status quo*.

Changing power relationships should be an integral part of reform processes and research on WUAs should explicitly address this dimension. There are two levels of studying power relationships in water users' associations: the first is between the users and the bureaucracy and the second is among the WUA members (Narain, 2003). The first level of accountability relationships shapes the nature of control relationships between the users and the bureaucracy and, to that extent, determines whether WUA formation is a genuine exercise in devolution, rather than a mere exercise in assigning roles and responsibilities to users. Understanding power relationships among WUA members is essential for understanding accountability in WUAs, since accountability relationships in local governance structures are shaped by social power relationships (see Narain, 2003).

The literature tells us little about the internal organizational dynamics of WUAs. A point that has been missed in most discussions is that a water users' association is an organizational entity, comprising a number of actors, acting and interacting with each other in order to accomplish certain goals and purposes. Further, there is a context in which these interactions take place and in which water users' associations behave as organizational entities.

#### 4. Conclusion

This paper has reviewed the current state of research on water users' associations in large-scale irrigation systems. In most discussions, technology is a black box, there is a limited view of human agency and a bracketing of social relations, of which collective action is an expression. Further, the literature has strong instrumental underpinnings.

Further research is needed on the internal dynamics of water users' associations to understand how they behave as organizational entities. Research is also needed to understand whether their formation alters the balance of power among the major actors or maintains the *status quo*. Finally, research needs to be directed at how different technological conditions for water distribution affect the possibilities of collective action by defining the range of functions that can be transferred to user groups. This would also determine whether water users' associations are autonomous, self-governing organizations or mere arms of the bureaucracy.

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