Irrigation and Drainage Systems **11:** 103–118, 1997.

Farmer participation in irrigation

20 years of experience and lessons for the future

RUTH MEINZEN-DICK
International Food Policy Research Institute, 1200 17th Street, NW, Washington DC 20036-3006, USA

Accepted 6 March 1996

Abstract. This article examines trends in the understanding of and policies toward farmer participation in irrigation management over the past 20 years, with special attention to experiences with induced participation and management transfer programs in the Philippines, Sri Lanka, Pakistan, Senegal, Columbia Basin USA, and Mexico. Key lessons relate to the value of social organizers as catalysts; the role of the irrigation agency as partner; and the enabling conditions for participation. As levels of income and infrastructure rise, we can expect more formal organizations that enable farmers to deal with bank accounts, service contracts, water rights, water markets, and advanced technology in irrigation systems. The impact of participation on irrigation performance needs to be evaluated not just in terms of reductions in government costs, but by whether improvement in physical structures and farmers' control over water are great enough to offset the farmers' costs of participating.

Key words: Farmer participation, irrigation management, irrigation organization, water users' associations

Abbreviations: CNA – Comision Nacional del Agua (Mexico), FMIS – Farmer-managed Irrigation Systems, FO – Farmers' Organization (Sri Lanka), IA – Irrigators Association (Philippines), NIA – National Irrigation Administration (Philippines), USBR – United States Bureau of Reclamation, WUA – Water Users' Association

Introduction

Farmer participation has moved from a peripheral issue in irrigation management to center stage. Once thought to be limited to small-scale traditional systems, farmer participation and even control has become a major component of policies for irrigation development and reform. What have we learned about the factors that contribute to effective farmer participation in the process?

This article examines trends in the understanding of and policies toward farmer participation in irrigation management over the past 20 years. It then highlights some of the key lessons derived from academic studies and practical experience of systems with farmer participation, and likely future patterns of user participation in the light of policy changes which are taking place in both

low-income and high-income countries. The final section looks at the impact of participation on irrigation performance, and further research needs.

Trends and perceptions of farmers' roles

The conventional wisdom that dominated much official irrigation development in the 1950s and 1960s was that irrigation systems require centralized control. Water was a strategic resource over which the state assumed ownership, and water control was a public good, which the state provided. Indeed, the contribution of irrigation systems to stabilizing, then expanding food supplies throughout Asia (especially during the Green Revolution period) justified public expenditure (Svendsen & Rosegrant 1994). States and their agencies were seen as the prime actors, creating systems and delivering water to farmer "beneficiaries" of irrigation systems, who took the water supplied to their fields and used it for cultivation.

The discovery of elaborate farmer-managed irrigation systems (FMIS) in many parts of the world in the 1960s and 1970s challenged assumptions regarding the limitations of farmer involvement and the necessary role of the state (see Coward 1980). Studies of such systems as the Balinese *subaks*, Philippine *zanjeras*, Nepalese *kulos*, or Middle Eastern *qanats* demonstrated that farmers are capable of complex engineering and sophisticated management without external intervention or control. Yet most farmer-managed systems are also small-scale. Farmers' roles in large-scale systems were still perceived as limited, and legitimate questions were raised regarding the applicability of findings from such small-scale systems to large, state-run irrigation systems (see Coward 1980; Hunt 1990).

In fact, farmers often participate extensively in the management of large-scale systems, but this was not recognized for two reasons: First, formal management rules are too often accepted as representing reality, without looking at actual practices. If an irrigation agency was responsible for maintenance of a facility, few researchers (and even fewer agency staff) noted that the farmers were actually doing the work. Second, the "participation" of farmers has often been deemed "interference" in system management. Examples of this include enlarging outlets, taking water out of turn, or unauthorized adjusting of the levels of gates and even channel beds (Chambers 1988).

Induced participation and management transfer

In addition to the spontaneous involvement of farmers in FMIS and (informally) in agency-managed systems, a number of innovative programs during the

1980s tried to foster organized participation of farmers. Financial pressures to cut government subsidies for irrigation, and to improve the management and sustainability of irrigation systems have given impetus to this trend. The 1994 International Conference on Irrigation Management Transfer in Wuhan, China had case studies from 25 countries on 5 continents (Johnson et al. 1995).

Programs to promote farmer involvement range from Participatory Irrigation Management, with farmer input as a supplement to agency management, to Irrigation Management Transfer, in which farmers assume full responsibility for O&M of specific units of systems. While increasing farmers' financial contributions or direct involvement in O&M of tertiary systems is the most common element of such programs, a few also involve farmers in main system O&M, decision-making, and may even transfer full ownership rights and responsibilities to farmers' organizations. The reminder of this section highlights developments in a number of key cases, before turning to broad patterns and lessons regarding farmer participation in later sections.

The Philippines

The first and best-documented program to foster farmer participation within the context of government-managed irrigation was initiated in the Philippines in 1976, when a Ford Foundation-supported pilot project began to work with the National Irrigation Administration (NIA) to formally turn over responsibility, ownership and management of small-scale communal irrigation systems to Irrigators Associations (IAs). A key feature was the use of trained community organizers, who were employed by the agency to work with farmers. They were to act as catalysts for local action, without imposing their own ideas.

A second important element of the Philippines experience was the emphasis on local organizations for irrigation management. Although many communal systems already had indigenous organization prior to NIA involvement, community organizers worked with farmers to modify their associations and expand their capability to take on increased responsibility within an institutional environment which included the government. When these groups became legal entities and met other criteria in terms of equity contributions to system improvements, NIA would formally turn over ownership and management responsibility for the systems to the IAs. This enabled the farmers to mobilize resources, undertake contracts, and take on a wider variety of irrigation tasks.

The third key feature of the program was the modification of the government's approach to irrigation to allow it to work with farmers in a cooperative fashion. NIA was made a financially autonomous body, and its subsidies

were phased out. This meant that, instead of relying on the government for budget allocations, the agency had to meet all expenditures, including staff salaries, from irrigation service fees. This created powerful incentives to devolve recurrent O&M to farmers and increase collection of irrigation fees. Thus it was not only the organizers that promoted farmer participation; other agency staff were also rewarded for working constructively with farmers. The pilot program was expanded to cover all communal systems in 1980, and even extended to large-scale National Irrigation Systems.[1]

The Philippines' experience has had a profound demonstration effect. Impact evaluations showed that there were clear gains, to the farmers as well as to the agency, which more than offset the cost of the program (Bagadion & Korten 1991). Careful documentation of the organization process, its costs, and benefits provided guidance for expansion of the program, both within the Philippines, and in other countries. However, initial efforts in large-scale systems focused on farmers' collecting irrigation fees for NIA, and the transfer of management in National Irrigation systems has been limited (see Turral 1995).

Sri Lanka

Many of the essential elements of the Philippines experience were adopted and adapted in pilot participatory projects in Sri Lanka, beginning in 1980. Community organizers played a catalytic role in organizing farmers, and there was careful documentation of the process and impact of the program (Uphoff 1992). The Integrated Management of Major Irrigation Schemes program expanded a participatory management approach to major schemes in 1984 with the creation of farmers' organizations at the distributary level and formal meetings between farmers and agency staff to plan and manage O&M (Kloezen 1995). Although the irrigation agency was not made self-financing, the Irrigation Management Policy Support Activity worked to foster support for joint management within the agencies involved (Merrey 1991). Farmers' organizations (FOs) were legally recognized in 1992, and in 1994 they were exempted from paying water fees to the government if they operate and maintain the systems themselves. These FOs have demonstrated improvements in irrigation and other input supplies to their members, but long-range funding of O&M remains problematic (Kloezen 1995).

Pakistan

Efforts to include farmer participation under Pakistan's On Farm Water Management programs followed a different approach. The role for farmer participation was defined more narrowly, to include only watercourse lining and

water distribution below the outlet. Farmers were required to form Water Users' Associations (WUAs) as specified in provincial ordinances, and to make cash and in-kind contributions as a condition for receiving assistance in lining (Byrnes 1992). This top-down, conditionality approach to farmer participation has resulted in the formation of over 16,000 registered WUAs since its inception in 1981, but there has been little farmer participation after lining is completed. Currently reforms are underway to transform the Irrigation Departments into financially autonomous public utilities at the canal command level, and to devolve irrigation system management responsibility up to the distributary level to farmers. It is unclear how this will be implemented, or much this will build upon the watercourse-level WUAs.

Senegal

The transfer of irrigation management to farmers in Senegal was part of a broader state policy of disengagement in the wake of structural adjustment in the 1980s (Wester et al. 1995). Irrigation systems were plagued with problems of poor financing and O&M in the parastatal managing irrigation, resulting in poor agricultural production and frequent need for system rehabilitation.

Getting farmers to agree to take over these systems required considerable negotiation, especially because they perceived existing irrigation fees as too high, let alone the additional costs and responsibilities of covering full O&M. Increasing farmers' control of irrigation services was the key incentive for getting them to agree to take on system management. Farmers demanded the right to hire their own staff – choosing agency operators only if they had performed well (and even then reducing their salaries from the full civil service package).

Results of the program have been mixed. Making pump operators responsible to farmers improved the quality of service on many schemes, but the withdrawal of government maintenance services for pump engines led to serious problems and even crop failures on others (Wester et al. 1995). Training and institutional support programs were needed to prevent disruption of production when turnover accompanied rapid withdrawal of input subsidies and other state support.

Columbia Basin, USA

Yet another model for farmer participation is found in the U.S. Bureau of Reclamation's (USBR) strategy for development of irrigation systems in the western United States. The USBR was required to have signed agreements from farmers to take over the system before any construction could take place. This mandate for the agency meant that farmers were involved from the very

inception of the project, rather than being included as an afterthought when the project had been in operation and performance problems set in (as is too often the case). Although the Bureau managed the system initially, the system was transferred to farmers after complex negotiations over responsibilities and system improvements. A key feature of this approach was the use of contracts, which put farmer-managed Irrigation Districts, as legal entities, on a relatively equal footing with the Bureau, and made explicit the rights and responsibilities of each party (Svendsen & Vermillion 1994).

Mexico

Mexico has implemented the most rapid incorporation of user participation in the irrigation sector. Crisis situations in irrigation system financing and management provided the impetus for sweeping changes. By the end of the 1980s, an estimated 1.5 million ha (out of 6.1 million ha) of land went out of irrigated production because of lack of funding for completion of minor networks infrastructure and adequate O&M. To deal with this, the government required the Comision Nacional del Agua (CNA) to turn over management responsibility to farmers' organizations (Gorriz et al. 1995).

The scale of the Mexican cases demonstrates the capacity for farmer management of even large systems. In the first stage producers, organized in Water Users' Organizations covering 5,000–18,000 ha, assume responsibility for operation and maintenance of large lateral canals and drains. In the second stage, farmers' organizations take responsibility for the main irrigation and drainage canals and the machinery and equipment required for O&M. These organizations are meant to become financially self-sufficient through collection of water charges. Each organization hires a professional team to carry out O&M, including a manager and a group of water masters and a chief of maintenance (all graduate engineers) as well as their support staff (see Gorriz et al. 1995).

Instead of community organizers, Mexico relied heavily on mass media campaigns prepared by communications specialists to explain the changes to farmers and convince them to support the program. This approach lacked the face-to-face contact provided by community organizers, but allowed a much more rapid "scaling up" of the program to cover a large area. It built upon existing social capital by stressing norms of "citizen participation", and ensuring transparent management and fee assessment within the organizations. Detailed training of farmers' organization staff included computer applications and use of maintenance machinery. Districts in the best financial condition were transferred first (after necessary deferred maintenance was done) to ensure a successful start and build confidence. On the agency side, building a service orientation was stressed so that the remaining functions

would be carried out dependably. Finally, land and water laws were reformed to guarantee farmers' rights and give incentives for efficient resource use.

Lessons from experience with farmer participation

Even a casual survey of irrigation systems around the world indicates that farmer participation is much stronger in some contexts than in others. What accounts for these differences? Three critical factors that can be identified from the cases of farmer participation described above (as well as from others) are:[2]

- the institutional organizers and training programs;
- the partner bureaucracy; and
- the enabling conditions.

Institutional organizers and training programs

While farmers may participate in irrigation systems as individuals, the most effective participation requires cooperation among farmers. The emergence of such cooperation generally requires a catalyst. Local leadership may provide this catalytic role of bringing farmers together and forging agreements, but where this does not emerge spontaneously, external agents can be employed to fill this role. In the Philippines, Sri Lanka, Nepal, and other countries teams of trained specialists acting as community or institutional organizers have been successful in brokering agreements among the farmers, as well as between the farmers and irrigation agency. Ideally, the organizer should assist the irrigators in identifying appropriate local institutions to build on, help farmers collect contributions and complete whatever paperwork is necessary to gain project approval and legal recognition. Organizers also act as mediators between the farmers and external agencies until the farmers are sufficiently familiar with the system to do this on their own.

Employing organizers to work with each group of farmers takes more time than simply issuing requirements that farmers form a particular type of organization, but it has proved valuable in creating stronger local organizations (see NIACONSULT 1993; Uphoff 1992). Early projects (e.g. in the Philippines, Sri Lanka) often hired and trained special cadres of organizers, but more recent projects tend to assign existing irrigation agency staff responsibility for organizing farmers, especially where participation programs accompany reductions in agency staffing levels for O&M. This can be helpful because, to be effective in their roles as brokers, organizers need good working relationships with engineering staff, and strong support from upper levels of the irrigation agency. However, it is critical to ensure that organizers have the

training, orientation, and incentives to work constructively with and for farmers, which may require substantial reorientation and retraining for traditional irrigation department staff.

In addition to organizers, most programs to promote farmer participation have included a variety of training for farmers. This ranges from basic literacy/numeracy (e.g. Senegal) to computer operation (e.g. Mexico), in order to ensure that farmers have the skills required to run meetings, handle and monitor accounts, operate the irrigation system, and maintain the equipment. Such training, together with institutional organizers, account for the largest component of tangible costs attributable to participation programs.[3]

The partner bureaucracy

Constructive farmer participation often hinges on the ability to move beyond an adversarial or paternalistic relationship between bureaucracy and farmers to a partnership. This is not easy, for farmers often distrust the irrigation agency, while organized farmer participation can threaten the opportunities for rent-seeking, and even the jobs of agency staff under management transfer programs. Developing a service orientation among agency staff and a collaborative attitude between agencies and farmers has been essential for successful joint management and irrigation transfer programs in the Philippines, Sri Lanka, United States, Mexico, and other countries.

In many countries, the major stimulus to encourage farmer participation is the fiscal pressure from mounting O&M costs borne by the government. As powerful as these pressures on the government may be, they are unlikely to affect agency behavior unless these are also translated into the institutional culture and individual incentives of the agency staff. Providing financial autonomy for irrigation agencies so that they must rely on user fees for their funding, and linking salaries and performance appraisals to farmer input generally create the strongest and longest-lasting incentives to work with farmers (Small & Carruthers 1991). A strong commitment from government policy-makers and upper levels of agency management reinforces the need to establish positive collaboration between irrigation staff and irrigators.

Clear definitions of the roles and responsibilities of both farmers and agencies are important, especially in turnover situations where the traditional lines of demarcation are changing. Contracts between agencies and farmers' organizations are a valuable tool, because they make explicit the responsibilities of each party. Negotiations over the content of contracts (e.g. what rehabilitation had to be done before farmers would take over systems in Columbia Basin or Mexico) provides a useful forum for communication between agency staff and farmers.

Although the appropriate role of the state changes as farmers take on additional tasks, government support should continue. Instead of operating and maintaining systems down to the tertiary level, irrigation agencies would concentrate on allocation and regulation at the main system or watershed level. Where agencies retain operation and maintenance responsibilities at higher levels of the system, they need to carry out these roles effectively so that farmers feel it is worthwhile to carry out their functions at lower levels. Design, construction, and financial support for major rehabilitation may also be required on an occasional basis, but state roles would shift from "hardware" to "software", including:

- providing technical and organizational training and support to farmers;
- establishing and adjudicating water rights;
- monitoring and regulating externalities and third party effects of irrigation; and
- maintaining a supportive legal framework for farmers' organizations.

Enabling conditions

Expanding farmers' roles in irrigation requires more than a single program, but also a policy environment that is conducive to participation. Countries seeking to promote participation have therefore had to reform the **legal framework** that regulates the formation of farmer organizations, recognizes the organizations as representatives of the farmers, enables them to mobilize resources from members and other sources, operate bank accounts, and obtain credit. Experience (e.g. in Pakistan) has shown that complex procedures for organizing or the imposition of rigid by-laws provide barriers to participation. Instead, the legal framework needs to be flexible so farmers can adapt their organizations to local conditions. Above all, it must ensure a balance between the requirements or responsibilities and the *rights* of farmers' organizations.

Ownership of irrigation system assets provides a clear combination of rights and responsibilities. Ownership is based on investment in at least part of the capital costs, and implies a commitment to bearing full recurrent costs for the property. At the same time, it provides greater control over the property and rights to earn income from it, which improves incentives for management. The most important types of irrigation property include water, structures, equipment, and other assets (such as fish or trees).[4] While in most cases the state claims ownership of both the facilities and the water rights, farmer ownership is found in many traditional systems. Even where farmers do not have full ownership of water and facilities, they may have rights which are sanctioned by laws or local custom. More formal recognition of farmer ownership has been incorporated into many turnover programs, through which formal rights to the system are transferred from the state to

farmers' organizations after the users have met specified equity contributions and agreed to take on full responsibility for costs and management thereafter.

While governments may be able to operate at a deficit, irrigators' organizations cannot. Therefore, the **financial viability** of the irrigation enterprise is essential, at both the individual and local organizational level. If farmers do not make money from irrigating, they will not pay fees or contribute their time; if the farmers' organizations cannot collect enough fees to cover their costs, they will not be able to take on O&M tasks. Government policy has a major bearing on this, both through prices of agricultural inputs and output, energy prices, and choice of irrigation equipment. During the 1980s there were sharp declines in world prices for the major irrigated crops of rice and wheat, along with diminishing marginal returns to farmers' input use in intensely cultivated irrigated areas (Svendsen & Rosegrant 1994). Many countries (e.g. Senegal) have also been removing input subsidies as part of structural adjustment or liberalization programs. It has been in this economic climate that farmers are being asked to pay a higher absolute and relative share of irrigation costs. The ability of farmers' organizations to meet recurrent costs, especially on pumping schemes, needs to be examined carefully.

Improvement in the terms of trade for agriculture, together with crop diversification, increases farmers' incentives for irrigated production. However, adequate **infrastructure and markets** must be assured along with adequate quality of irrigation services before farmers will be willing and able to bear increased costs for irrigation management, especially if horticultural or high-value crops are required to produce sufficient returns to cover irrigation costs.

Emerging patterns of farmer participation

While the involvement of farmers in irrigation is likely to become widespread, the most effective way to structure such participation will vary according to local conditions. Nevertheless, it is possible to identify two broad patterns, which can be termed the "Asian model" and the "Americas model" (Meinzen-Dick et al. 1994). In practice, most cases – on any continent – will combine features of both models.

The **Asian model** (e.g. Philippines, Sri Lanka) tends to have smaller base organizational units, which allow direct participation of all members. Participation in irrigation activities may be embedded in other social institutions, which build upon members' daily interactions and knowledge of each other for decision-making, monitoring, and sanctioning. Because this model places more emphasis on social capital than on physical capital, it is likely to be most appropriate in socially cohesive societies with smaller land holdings,

low market penetration and less infrastructure (for irrigation as well as for transport and communications).[5]

The **Americas model** (e.g. Columbia Basin or Mexico) relies more heavily on specialized, formal irrigation organizations that employ professionals, rather than on face-to-face interactions between all members. Organizations are likely to be larger, and based on hydraulic, rather than social boundaries. Formal rules and supervisory bodies form the basis for decision-making, monitoring, and sanctioning. This model is adapted to situations of larger land holdings, greater market development, and more developed physical infrastructure.

Another critical feature of the Americas model is that it includes specific attention to farmers' water rights. The western United States has ensured these rights from the beginning of water development projects, while Mexico and Chile have reformed their water laws to make explicit provisions for water rights. Assigning water rights to individuals or user organizations also provides the basis for market allocation of water. Organized user participation has become a central element in the operation of water markets, which are being developed to increase the efficiency and responsiveness of resource allocation (e.g. in Chile, Mexico, and California; see Rosegrant & Gazmuri Schleyer 1994).

As levels of income and infrastructure rise in many countries, we can expect a shift from the Asian to the Americas model.[6] Formalization of organizational structures and specialization of roles will be necessary for farmers to deal with bank accounts, service contracts, advanced technology, and many other conditions in modern irrigation systems. Federation of base-level units will allow farmers to take over irrigation management at higher levels and on a larger scale. But as farmers' organizations evolve in this direction, it often becomes difficult to distinguish them from irrigation agencies (as, for example, in Taiwan).

Indeed, if farmers only pay fees to an organization that hires professionals to operate the system, one may question the extent of farmer participation. The critical difference lies in the ownership and accountability of the organization and its employees: to the farmers or to the government. If it is truly a farmers' organization, they will be able to decide on the rules governing water distribution, the level of fees to be levied and spent, and the hiring and firing of employees. It is this control over the system which is at the heart of farmer participation, especially under management transfer programs.

Performance outcomes

The involvement of farmers in irrigation schemes may have its own inherent value in building social capital or empowering local people.[7] However, farmers and governments are less likely to be interested in participation as an end in itself, than as a means to improve the performance of irrigation systems. The evidence on how much participation contributes to system performance is fragmentary, and often does not distinguish between the contribution of participation and accompanying changes such as physical rehabilitation of systems or withdrawal of other subsidies (for a table summarizing evidence from 14 countries, see Turral 1995: 94–95).

The most readily apparent effect of farmers' involvement in irrigation is the **reduction in government costs**. These savings primarily come from reduced administrative costs as the number of field staff decreases. Government costs can also go down as farmers become involved because of better project design, increases in fee collection, and decreases in the destruction of facilities. In the Philippines, participatory systems had higher mean equity contributions (357 P/ha compared to 54 P/ha on non-participatory systems; see Bagadion and Korten 1991: 90). A study by NIACONSULT (1993) found that, in 1991, National Irrigation Systems which adopted farmer participation had significantly higher collection efficiencies for irrigation service fees (74% versus 45% for non-participatory systems); lower recurrent maintenance costs (1.77 versus 4.62 P/ha); and lower personnel costs (260 versus 463 P/ha).

There is less information on *total* costs of irrigation management, including costs borne by farmers. Efficiency gains from local management have been observed through improved supervision of construction and staff, substitution of local materials, and lower salaries or fringe benefits for irrigation staff and labor. In the Philippines, because farmers had to assume a share of the cost, they had a larger influence over design and implementation of improvement works, resulting in cost savings and higher satisfaction with facilities. This, combined with the fact that farmers were now owners of the structures, reduced system breakages.

In practice, farmers' costs usually increase with participation. For example, irrigation fees in Mexico and Senegal increased by 4 to 6 times when farmers took over and had to cover full O&M costs. In most cases, cash payments do not reflect the full costs to farmers because they do not include labor and in-kind contributions, nor farmers' non-quantified "transactions costs" of attending meetings, settling disputes, or other aspects of participation. More careful examination of total costs is therefore required in order to assess the overall economic performance impact of farmer involvement. These costs should then be compared to service improvements and resulting income increases for the farmers in order to assess the long-run viability of the

O&M costs under farmer management. In the Columbia Basin, Svendsen and Vermillion (1994) found that irrigation fees decreased 22 percent when farmers took over, because the farmers cut expenses and found other sources of funding, but there were some indications of underfunding of maintenance.

The evidence on other aspects of system performance is fragmentary, but points to potential gains through participation. Tang (1992) found that FMIS tend to have more effective maintenance and allocation than bureaucratic schemes. **Improvements in water delivery services** – and, more importantly, with farmers' satisfaction with services – have been noted in participatory programs in the Philippines, India, Nepal, Bangladesh, and Sri Lanka (see Meinzen-Dick et al. 1994). In the Philippines and Sri Lanka, the involvement of tail-enders improved **equity** of distribution which, in turn, expanded the **area irrigated**. However, it must be recognized that many local organizations are dominated by elites, and transferring authority to them may exacerbate inequity in distribution of resources (see Turral 1995).

Perhaps the best test of the performance outcome of farmer participation is whether farmers continue to participate. More than any other single factor, the initial success and long-run sustainability of participatory irrigation management is dependent upon sufficient **incentives for farmers**. These must be great enough to offset the substantial costs of participation – both in terms of increased fees as well as time and transactions costs. Physical improvements to the system (e.g. watercourse lining in Pakistan, or rehabilitation in the Philippines or Mexico) provide short-term incentives for participation, but unless farmers see longer-term gains, they will not continue to be active. Having a "seat at the table" in determining water allocation between systems and between sectors has become an important issue to farmers as water scarcity increases in many parts of the world. Greater control over water supplies, which may come from ownership of infrastructure or water rights, or from involvement in decision-making and operations, provides a strong incentive for farmers to participate (Hunt 1990).

Increased yields and incomes arising from better water delivery services and better maintenance are, ultimately, the most compelling reasons for farmers to take on expanded responsibilities in system management. The NIA-CONSULT (1993) study found participatory systems had higher dry season rice yields (93 versus 83 cavans/ha). Taking farmers' costs and labor contributions into account, farmers' net income per month increased from 764 to 1,149 pesos after farmer participation was introduced on 3 systems in the Philippines, with clearest gains for tail-end farmers, due to improvements in the equity of water deliveries.

Empirical evidence on the extent of such gains from participation is scarce, and often does not control for other confounding factors such as changes in

weather, prices, or rehabilitation. Short-term assessments around the time of turnover may be misleading, either because extra resources are being given in the short run, or because farmers (and government) are still on a steep learning curve. Cross-sectional and time series data on a range of performance indicators are required to evaluate how farmer participation affects irrigation systems, and the factors that contribute to better performance. Given the fiscal and other pressures on governments to involve farmers, reform programs are unlikely to wait for the answers of such research, but findings from these studies are still needed to shape the ongoing process of irrigation reform.

Expectations that farmer participation will be a "magic bullet" that both reduces the state's burden for financing irrigation *and* improves the performance of irrigation systems will lead to disappointment. The involvement of the water users, who have the greatest stake in the systems, can certainly contribute to both of these objectives, but this will require flexible approaches and adequate support for farmers' organizations. Vermillion (1995) argues that management transfer programs which do not ensure that necessary conditions for effective management are met will create "false failures". The result would be that, after a few years, systems will deteriorate and state agencies will seek to take over management once more. To prevent this, research is required to identify the effect of participatory programs, and the conditions under which farmer participation is likely to be strongest.

User participation is an essential feature of irrigation system management, and it will continue, through formal or informal channels. But it is not the only essential feature. Much of the impact of participation – and, particularly, of management transfer programs – ultimately depends on the ability of the state to provide a receptive partner bureaucracy and enabling conditions for farmers to take on a greater role in irrigation system management.

Notes

1. While NIA's dependence on farmer service fees provided an incentive for staff to work with farmers, Korten notes that a heavy emphasis on cost recovery subverted the program's original plans to transfer management to IAs; instead of farmers taking over responsibility for O&M (which would have reduced NIA's fee collection, as well as NIA's costs), the IAs were contracted to collect fees, which were shared between the local organization and the agency. Full management transfer was thus delayed (see Meinzen-Dick et al. 1995).
2. For more specific design principles, see Ostrom (1992).
3. Although it is difficult to identify the exact costs attributable to increasing participation, such institutional development costs were budgeted at $24 million in the 1991 World Bank-assisted Irrigation and Drainage Sector project in Mexico (or 1.9 percent of total project costs), and $ 1.6 million (0.4 percent of total costs) in the 1994 Tamil Nadu Water Resources Consolidation Project in India (see Meinzen-Dick et al. 1995).
4. Other assets such as fish or trees can be important for cross-subsidizing irrigation activities, thereby improving the financial viability of irrigation organizations.

5. This would include many small-scale irrigation systems in Africa. However, many African systems employ professional staff.
6. For example, Turkey's program of farmer participation more closely resembles the Americas than the Asian model.
7. For example, tubewell associations in Nepal began to provide water to the local school, which led to other types of local collective action in the village (R. Reidinger, pers. comm.).

Acknowledgments

This article draws upon analysis presented in Meinzen-Dick, Manzardo, and Reidinger (1995) and Meinzen-Dick, Mendoza, Abiad-Shields, Sadoulet, and Subramanian (1994). I gratefully acknowledge the contributions of my co-authors from those pieces, as well as those of Mark Svendsen, Doug Vermillion, and two anonymous reviewers for the present article. I assume responsibility for any errors.

References

Bagadion B.U. & Korten F.F. 1991. Developing irrigators' organizations: a learning process approach. In: M.M. Cernea (Ed) *Putting People First: Sociological Variables in Rural Development*, 2nd edition (pp 73–112). World Bank, Washington, DC.

Byrnes K.J. 1992. Water User Associations in World Bank Assisted Irrigation Projects in Pakistan. World Bank Technical Paper Number 173. World Bank, Washington, DC.

Chambers R. 1988. *Managing Canal Irrigation.* Oxford and IBH Publishing Co., New Delhi.

Coward E.W., Jr. (Ed). 1980. *Irrigation and Agricultural Development in Asia: Perspectives from the Social Sciences.* Cornell University Press, Ithaca.

Gorriz C., Subramanian A. & Simas J. 1995. Irrigation Management Transfer in Mexico: Process and Progress. World Bank Technical Paper Number 292. World Bank, Washington DC.

Hunt R. 1990. Organizational control over water: The positive identification of a social constraint on farmer participation. In: R.K. Sampath & R.A. Young (Eds) *Social, Economic, and Institutional Issues in Third World Irrigation Management* (pp 141–154). Westview Press, Boulder.

Johnson S.H., Vermillion D.L. & Sagardoy J.A. (Eds). 1995. *Irrigation Management Transfer: Selected Papers from the International Conference on Irrigation Management Transfer.* IIMI and FAO, Rome.

Kloezen W.H. 1995. Financing participatory irrigation management in Sri Lanka. In: S.H. Johnson, D.L. Vermillion & J. A. Sagardoy (Eds) *Irrigation Management Transfer: Selected Papers from the International Conference on Irrigation Management Transfer* (pp 243–264). Rome: IIMI and FAO.

Meinzen-Dick R., Manzardo A. & Reidinger R. 1995. *Participation in Irrigation.* Environment Department Participation Series Paper No. 3. World Bank, Washington DC.

Meinzen-Dick R., Mendoza M., Sadoulet L., Abiad-Shields G. & Subramanian A. 1994. Sustainable Water Users' Associations: Lessons from a Literature Review. Paper presented at World Bank Water Resources Seminar, Lansdowne, Virginia, December 13–15, 1994.

Merrey D. 1991. Strategies for Joint Management of Irrigation Systems and Supporting Services for Turn-Over and Sustainability. Staff Working Paper No. 22. Colombo, Sri Lanka: Irrigation Management Policy Support Activity.

NIACONSULT. 1993. *An Evaluation of the Impact of Farmers' Participation on the National Irrigation System's (NISs) Performance.* NIACONSULT, Manila.

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

Rosegrant M.W. & Gazmuri Schleyer R. 1994. *Tradable Water Rights: Experiences in Reforming Water Allocation Policy.* Irrigation Support Project for Asia and the Near East (ISPAN), Washington, DC.

Small L.E. & Carruthers I. 1991. *Farmer-financed Irrigation: The Economics of Reform.* Cambridge University Press, Cambridge, UK.

Svendsen M. & Rosegrant M.W. 1994. Irrigation development in Southeast Asia beyond 2000: Will the future be like the past? *Water International* 19: 25–35.

Svendsen M. & Vermillion D. 1994. Irrigation Management Transfer in the Columbia River Basin. (USA) Project. IIMI Research Report. IIMI, Colombo.

Tang S.Y. 1992. *Institutions and Collective Action: Self-governance in Irrigation.* Institute for Contemporary Studies, San Francisco.

Turral H. 1995. Devolution of Management in Public Irrigation Systems: Cost Shedding, Empowerment and Performance. Working Paper 80. Overseas Development Institute, London.

Uphoff N. 1992. *Learning from Gal Oya: Possibilities for Participatory Development and Post-Newtonian Social Science.* Cornell University Press, Ithaca.

Vermillion D. 1995. Irrigation Management Transfer: Towards an Integrated Management Revolution. In: S.H. Johnson, D.L. Vermillion & J.A. Sagardoy (Eds) *Irrigation Management Transfer: Selected Papers from the International Conference on Irrigation Management Transfer.* IIMI and FAO, Rome.

Wester P., During A. & Oorthuizen J. 1995. Locally Managed Irrigation in the Senegal River Valley in the Aftermath of State Disengagement. Short Report Series on Locally Managed Irrigation No. 9. IIMI, Colombo.