Institutional Design Principles for Accountability on Large Irrigation Systems

Douglas J. Merrey

INTRODUCTION

THIS PAPER ADDRESSES an issue that is fundamental to the future productivity and sustainability of irrigated agriculture in many developing countries. This issue can be framed as a question: What institutional conditions and principles are most conducive to achieving and sustaining high performance on those gravity irrigation systems currently owned and managed by government agencies?

There is a substantial literature on indigenous "farmer-managed irrigation systems" (FMIS). Researchers have generally emphasized the strengths of FMIS, identified underlying principles believed to be the foundation of their success, and proposed ways governments can support their continuation and improvement. But a very large proportion of the total irrigated area in developing countries receives its water through systems constructed, owned, and administered by government agencies. Most of these systems are relatively large compared to the farmer-managed sector in a given country. Researchers have documented the experiences with "water users associations" (WUA) at the tertiary and secondary levels of government-managed systems, focusing on methods for organizing WUAs and the potential roles, benefits and advantages (rarely disadvantages and costs) of WUAs. Some of this work notes that government agencies change themselves much to enable them to support WUAs.

However, this literature makes a crucial assumption: that the government agency will continue to retain primary responsibility for overall system management on the larger systems, and will share some of these responsibilities with farmer organizations. Although there are variations in what tasks and responsibilities are shared, turned over to farmers, or retained by the government, the most frequent pattern in Asia is one in which the government retains control over the water resource, reservoirs, and main canals, and overall ownership and financial responsibility for the system. Maintenance and (perhaps) operation of lower level canals are turned over to WUAs. Representatives of farmers may or may not be consulted on policy issues affecting the larger system.

The fundamental problem is that while public organizations, under various forms of pressure, have agreed to "share" with farmer organizations many of the responsibilities -- especially the expenses and hard work -- of system management, there is no significant change in the power relations between the farmers and officials. Mutual accountability is absent. Officials have no incentives to foster independent WUAs. Farmer organizations remain dependent on the public organization legally, financially, and psychologically. "Joint management" as currently practiced is often business as usual with cosmetic changes.

This paper selectively synthesizes recent research and introduces a framework for classifying systems based on hypotheses on the institutional determinants of performance. It then discusses the implications of these hypotheses for shared or joint management of government irrigation systems. This is a simplified and selective version of a larger and more academic paper which contains more details and a full set of references (Merrey 1994).

INSTITUTIONAL PRINCIPLES FOR IRRIGATION MANAGEMENT

Self-Governing and Government-Managed Irrigation Systems

We can distinguish between systems owned, controlled, and managed by users organized into local organizations; and systems owned and to varying degrees managed by government agencies. The former includes both indigenous systems which often have long histories, and systems that have been turned over by the government to user groups for management. Both types are widespread throughout the world, in both developing and industrialized countries. Terms for this class include "irrigation communities," "communal irrigation," and "farmer-managed irrigation systems" (FMIS). There is considerable though not unlimited variety in the size, technology and organization of FMIS.

The other class of systems -- those constructed, owned and controlled by government agencies -- also includes both ancient and modern systems. There is a variety of types of government agencies, including civil engineering departments, area or river basin development authorities, and agricultural agencies; the dependence of these agencies on political authorities' control, their financial dependence or autonomy, and the extent to which government control extends to the farmgate or is "shared" with local user groups at lower levels also vary.

There is no clear relationship between size or scale, and governance arrangements (Hunt, 1988). There are very large "farmer-managed" systems (in Nepal, USA, and Argentina for example), and quite small government-managed systems (in Indonesia and Sri Lanka for example). The general tendency, however, is for farmer-managed systems to be relatively small, and government-owned systems to be relatively large. There is evidence that the performance of government systems is not as good as that of FMIS (Tang, 1992). There is also evidence that introducing water users associations (WUAs) on the tertiary levels of government systems leads to better performance; but the sustainability of these improvements in performance is questionable. This is because the basic institutional framework, including the nature of the government management agency, is often little changed.

Design Principles for Local Irrigation Organizations

Much of the work on FMIS has been aimed at identifying the institutional principles characterizing successful FMIS (Uphoff, 1986; Freeman, 1989; Hunt, 1988; 1989; 1990; Ostrom, 1990; 1992; and Tang, 1992). Here I synthesize the major principles emerging from that work:

1. A supportive policy, regulatory and legal environment, preferably recognizing water rights and ownership of infrastructure by the irrigation community;

2. Capacity to mobilize resources adequate to meet the costs of operations and maintenance, including emergency repairs;

3. Benefits exceed costs of participation, with proportional equivalence between benefits and costs; and

4. Effective collective choice arrangements or "organizational control of water" by users (Hunt, 1990), which will normally have the following characteristics:

    a. Organizational autonomy, with clearly defined boundaries (area and membership), in which the users control both capture and allocation of water, and officials derive their legitimacy and authority from users and are accountable to users ("internal charter of authority" in Hunt's terms);

    b. Financial autonomy, i.e., an institutional arrangement in which the irrigation management organization relies on direct methods to raise most or all of the resources needed for O&M (Small and Carruthers, 1991:48-49);

    c. Single organizational entity manages single infrastructural system;

    d. Maintenance and conflict resolution are tightly connected to the capture and allocation of water;

    e. Transparent performance monitoring arrangements; and

    f. Nested (or federated) organizational structure.

Other proposed principles whose universality is less certain are the use of graduated sanctions; maintenance of written accounts and records; water sufficient to meet crop water demands; general assembly of members which chooses a committee of officials; use of specialized paid staff for regular maintenance; and local recruitment of staff.

"Shared" Management of Large Irrigation Systems

Several pilot projects and national programs have demonstrated the benefits of using social organizers as "catalysts" or management consultants to assist farmers to organize effective WUAs (Bagadion and Korten, 1991; Uphoff, 1992). These programs involve establishing WUAs at the tertiary level to improve cooperation among farmers for local operation and management. They differ primarily in how far "upstream" the role of WUAs is extended, and the extent to which WUA representatives are involved in overall system management policy decisions. WUAs are often limited to tertiary level rehabilitation and O&M only (Pakistan, India); sometimes, tertiary WUAs are federated at the secondary canal level and given the responsibility for O&M at this level (Sri Lanka, Philippines). In some cases, representatives of these secondary level WUAs are "involved" in overall system-level decision making, for example through a joint project management committee (Sri Lanka).

However, two related issues that remain problematic are the relationship between the WUAs and the government agency; and the nature of the agency itself. The relationship between the agency and WUAs may be formally contractual, such as an agreement to deliver a given quantity of water in return for an agreed fee, or an agreement that the WUA will carry out maintenance and operational responsibilities in return for a payment; the latter may be accompanied by a rebate on the irrigation service fee the association collects on behalf of the government, as in the Philippines.

The key to success is *accountability*. Financially autonomous public irrigation agencies dependent on farmers paying fees for a substantial source of their funding tend to provide better service (Small and Carruthers, 1991). But it is rare to find a country where the farmers can obtain compensation for losses resulting from bad irrigation service. That is, even where contracts exist, their enforcement is difficult.

Accountability is especially problematic in large public service agencies with many different stakeholders. Such agencies are usually structured hierarchically, with primary accountability of officials upward to their supervisors and to the political level. Stakeholders of a large government irrigation department include politicians, the civil service hierarchy, the users of the services (who are themselves not a homogenous group), other government departments and ministries, private firms, and donors. Even where corruption and other such problems are minimal, it is difficult for politicians or senior officials at the central level to effectively understand and represent the specific interests of local users. Decentralization within agencies may be a partial solution, but does not solve the problem of accountability upwards (see Ostrom et al., 1993).

Many researchers and practitioners recognize that sharing control with WUAs has important implications for the roles, functions, attitudes, and organizational structures of public irrigation agencies. The most frequently recommended "solution" is that the agency undergo a process of "bureaucratic reorientation" (BRO). The National Irrigation Agency (NIA) of the Philippines is a good example of a public irrigation agency which has been undergoing BRO successfully (Korten and Siy, 1989).

To recapitulate the key point, most scholars and practitioners advocating WUAs for government-managed systems assume that such organizations are compatible with the continuation of traditional public agencies managing the higher levels of the system. The special difficulties of designing effective institutional relationships on such systems are acknowledged, but not explicitly or adequately addressed. Hunt (1989) is one of the few scholars to question the assumption that WUAs on large systems are analogous to irrigation communities managing FMIS.

Institutional Arrangements for Large-Scale Irrigation Schemes

We have noted so far that a few specific institutional design principles underlay successful self-managed systems, primarily because they support a high level of *accountability* between leaders and irrigators; that ensuring a high level of accountability by officials in charge of government-managed systems is particularly problematic; and that interventions based on an assumed analogy between irrigation communities and water user associations on large government systems have been only partially successful. A more holistic approach is required to design robust performance-oriented institutions for managing larger irrigation systems currently owned and managed by government agencies.

Three of the FMIS organizational principles discussed above are broadly applicable to all irrigation systems: supportive policy, regulatory and legal environment; capacity to mobilize adequate resources; and benefits being greater than costs and proportionally equivalent. This section focuses on the interactions between two of the characteristics listed above under the fourth principle, "effective collective choice arrangements." These are: 1) financial and organizational autonomy, and 2) management of a single infrastructure by a single organization. As will be shown, these two principles may be particularly powerful predictors of performance.

Relationship of Managing Agency to the Government

To simplify the presentation, I have combined two dimensions of the continuum between "autonomy" and "dependence:" organizational, and financial. Both dimensions refer to the relationship between the management institution and the government.

An irrigation management agency can be either financially *independent*, that is, self-financing; or financially *dependent* on outside sources (generally the state treasury) for most or all of its funds; in this case, it is the outside source -- the government -- which controls and allocates the level of resources available to the managing agency. An irrigation management agency that receives some funding from outside sources (such as capital funds for construction) which are not re-payable, but which is dependent on generating operational funds internally, may be considered partially independent.

Agencies Managing Multiple Systems

Autonomous Agencies Managing Multiple Systems

Cell 4 -- autonomous agencies operating many systems -- is nearly empty. One well-known case, the National Irrigation Administration (NIA) in the Philippines, does not fully meet the criteria. First, NIA is only partially autonomous financially; it continues to receive various subsidies, and it cannot set the amount of fees, or effectively enforce fee payment. Second, its charter of authority is from the government, with no user controlled over NIA itself; NIA is dominated by its parent ministry.

Nevertheless, NIA is an interesting case because its relative autonomy has made it more innovative and performance-oriented than most cases in cells 1 (single systems, dependent) and 3 (multiple systems, dependent). NIA has been a pioneer in developing methodologies and policies to develop strong irrigation associations on both "communal systems" (FMIS) and "national systems," those owned and controlled by the government through NIA.

NIA has created cost centers on most national systems, and evaluates staff and system performance using a "viability index," the ratio of costs to expenditures. This has motivated NIA staff to reduce costs and improve services to encourage farmers to pay irrigations service fees. Central to this program is the promotion of "Irrigation Associations" to take responsibilities for O&M as well as fee collection on specific subsystems (for example, a lateral). NIA has three "models" of joint management in the form of contracts: Type I involves maintenance contracts on certain canal lengths; in Type II, the association also undertakes operations and fee collection, keeping a certain percentage of the amount collected over a specified minimum; and in Type III contracts the association assumes full O&M responsibility and also amortizes a portion of the construction costs over a period of time.

Type III systems are not equivalent to farmer-managed or communal systems. In the provisions on the obligations of NIA and the irrigation associations under these contracts, NIA retains a stronger role than it does in communal systems; more important, NIA retains the water rights, whereas communals have their own legally recognized water rights. Wijayaratna and Vermillion (1994) note that only 15% of a sample of 94 national systems are under Type III contracts; and they discuss the disincentives for NIA to turn more systems over completely to the irrigation associations. Most Type III ("turned over") systems to date are the least viable in terms of covering costs from irrigation service fees; those systems which are most "viable" financially tend not to be turned over.

Given the hypothesized relationship between autonomous organizations managing single systems, and performance, the obvious direction for future reform would be to create fully autonomous user-based management entities on each scheme (i.e., carry the current policy of turnover to its logical conclusion). These organizations should acquire clear water rights, thus converting such systems into true "communals." It would be necessary to devise incentives for NIA to pursue this path, and would require further reorientation of NIA to provide technical and management support to irrigation associations. Otherwise, the present limited and dispersed accountability may inhibit improving and sustaining performance over the long term.

Dependent Agencies Managing Multiple Systems

Cell 3 cases are more difficult. A very large number of the systems in this category are performing poorly, and the responsible agencies have been only partially successful in implementing reforms. Mexico has embarked on a program to shift its government-managed systems to management by autonomous agencies accountable to users. This entails moving these systems into cell 2, which we predict will in the long run lead to improved performance. At present there are little data available on this program.

In contrast, Sri Lanka and Nepal, like the Philippines, have been experimenting with informal "joint management" arrangements for about a decade. Sri Lanka and Nepal have similar organizational models for joint management of government-owned irrigation systems. Both include informal groups at the tertiary levels which choose representatives to more formal organizations at the distributary level (distributary canal organizations in Sri Lanka). A joint Project Management Committee including representatives of farmers and government departments is intended to make overall water allocation and seasonal scheduling decisions in Sri Lanka; this joint decision-making process seems less formal in Nepal. Some systems in Nepal have formal water users associations at system level;

one finds these on a few Sri Lankan systems though until recently they were not officially encouraged, and their role is not clear.

A recent review of Nepal's experiences with joint management (Pant et al., 1992) suggests that while the short-term results are clearly impressive, the sustainability of the WUAs and the joint WUA-Department of Irrigation relationship is doubtful. Nepal has not yet developed a management system that would ensure sufficient accountability of officials to farmers, farmer leaders to members of WUAs, or WUAs to the government. The large number of relatively small systems spread throughout a large country with poor communications and transport, compounded by shortage of funds and institutional weaknesses, make it difficult to envision how the Department can ever manage these systems effectively and improve their performance.

IIMI has been closely associated with the participatory management program in Sri Lanka since 1986. There are presently three sets of government agencies implementing the participatory management policy. The Irrigation Department is trying to implement it on the small and medium systems for which it is responsible, usually through its own staff and with no external support until recently (MANIS). On 38 major schemes under the Irrigation Department, a parallel division of the Ministry is promoting the development of the participatory management model described above; on some of these systems there is external assistance supporting the use of institutional organizers, consultants, and training programs (INMAS). Since October 1992, the Mahaweli Authority has also initiated a program similar to INMAS on the large schemes under its control.

The first report from an ongoing comparative study monitoring the performance of these programs provides a mixed picture (IIMI, 1993). All "INMAS" schemes in the sample were reported to have project management committees, about 88 percent of the distributaries had organizations, and considerable progress had been made in the "turnover" of distributaries to farmers. However, in most cases the farmer organizations remain dependent on the Department which gives them funds for maintenance. The concept of "turnover" is not precisely defined. It is not "ownership" and does not include enforceable water rights; distributary canal organizations take contracts for O&M from the Department, like the Type I contracts in the Philippines; but unlike in the Philippines, the government pays the farmers without collecting irrigation fees.

In Mahaweli systems, little turnover has occurred as yet, but distributary organizations are being formed. The systems under the Irrigation Department's MANIS program show the least progress, because of the very weak support. Overall, the interviews carried out by IIMI picked up a marked reluctance among both farmers and officials of all departments to turn over full O&M responsibilities to farmer organizations. Case studies on a variety of irrigation systems provide a mixed picture, with examples of both strong and weak farmer organizations (Merrey, 1994).

A recent review of the experience of the Mahaweli Authority prior to 1992 suggested that the impediments to strengthening farmer organizations and their system management role lay primarily in the organizational structure, incentives and philosophy of the Mahaweli Authority itself (Merrey, forthcoming [1994]). But the problem is deeper than this. It is the result of the reluctance of Sri Lanka to date to carry the logic of the participatory management policy to its logical conclusion. Neither the Irrigation Department nor the Mahaweli Authority (nor some future amalgamation of the two) will ever have the combination of resources, incentives and accountability to system users to be able to achieve a high level of performance on the hundreds of systems scattered around the Island.

Radical reform to shift Sri Lankan and Nepal systems to cell 2 (single systems managed by autonomous agencies), as is underway in Mexico, may be the most promising long-term institutional means to achieve sustainable high performance.

CONCLUSION

The findings reported in this paper are suggestive, though certainly not prescriptive. The basic conclusion is that single irrigation systems managed by system-specific organizations that are both financially and organizationally autonomous generally perform better and are more sustainable over the long term. If this paper is on the right track, the findings should be of great interest to countries currently struggling with improving the performance and sustainability of government-managed gravity irrigation systems.

The term "autonomy" is not to be confused with "private." A strong government role is necessary in most countries, not only to avoid "capture" by an influential minority, but also because the authority inherent in the

government is necessary for enforcing rules to manage and conserve a common resource. Local authorities with specific government mandates for the integrated management of particular irrigation systems, whose charter of authority derives from the users, seem to be an effective arrangement for managing irrigation systems.

In "crafting" institutions, special attention needs to be paid to *incentives*, both positive and negative, through *accountability* of users as well as managers. An integrated approach based on the whole system, and not fragmented between "users groups" and government departments, is essential. Therefore, countries presently promoting partial turnover programs face a serious problem: water users associations on parts of systems, partial turnover of O&M even for entire systems while the government retains the primary rights and authorities, or "shared" management through joint farmer-government committees are not likely to become stable effective institutional mechanisms for managing irrigation systems.

The recommendations therefore are clear, though difficult to implement. Those countries whose irrigation management agencies are dependent on the government financially, organizationally or both should consider how to make such agencies more autonomous. Those countries in which a single provincial or national irrigation management agency manages a large number of systems should explore ways to encourage the emergence of autonomous user-based organizations on each system, or perhaps on specific watersheds. Such reforms will be successful only if governments are willing to provide a supportive and enabling institutional and policy framework, positive incentives for local users to take full responsibility and authority for their systems, and sufficient training and technical support.

Figure 1. Matrix of irrigation system governance arrangements.

Agency Manages:	**Relationship of Agency to Staff Government:**	
	Dependent	**Autonomous**
Single irrigation system	Egypt Punjab, Sindh-Pakistan ORMVAs, Morocco[a] Haryana, India FLIAs in Korea 1	Mendoza, Argentina Irrig. Districts, USA Taiwan systems *Unidades* in Mexico Communals-Philippines FMIS by definition 2
Multiple irrigation systems	3 Sri Lanka; Nepal Most states in India NWFP, Baluchistan - Pakistan *Distritos* in Mexico[b]	4 National systems under NIA-Philippines[c]

a. ORMVAS are a partial case: they are partially autonomous financially, but their charter of authority is derived from government.

b. These are in transition through a turnover program and are therefore moving into cell 2 (autonomous, single-system).

c. NIA is a partial or mixed case; it is partially, but not fully, autonomous in financial terms; and its charter of authority is based on dependence on the government; therefore, the distinction between the cases in cells 3 and this case in cell 4 is not as great as is often claimed.

References

Bagadion, Benjamin U, and Frances F Korten. 1991. Developing irrigators' organizations: A learning process approach. In Michael M Cernea, ed., Putting people first: Sociological variables in rural development. 2nd edition. New York: Oxford University Press for the World Bank.

Chambouleyron, Jorge. 1989. The reorganization of water users' associations in Mendoza, Argentina. Irrigation and Drainage Systems 3: 81-94.

Chambouleyron, Jorge. 1994 [forthcoming]. Determining the optimum size of water users' associations. Irrigation and Drainage Systems, forthcoming [1994].

Freeman, David. 1989. Local organizations for social development: Concepts and cases of irrigation organization. Boulder, CO: Westview Press.

Hunt, Robert C. 1988. Size and the structure of authority in canal irrigation systems. Journal of Anthropological Research 44: 335-355.

Hunt, Robert C. 1989. Appropriate social organization? Water users associations in bureaucratic canal irrigation systems. Human Organization 48: 79-90.

Hunt, Robert C. 1990. Organizational control over water: The positive identification of a social constraint on farmer participation. In R. K. Sampath and Robert A. Young, eds., Social, economic, and institutional issues in third world irrigation management. Boulder, CO: Westview Press.

International Irrigation Management Institute (IIMI). 1993. Progress of participatory management: Reconnaissance results. Monitoring and Evaluation of Participatory Irrigation System Management (TA 1705 SRI), Report to Ministry of Lands, Irrigation and Mahaweli Development, Sri Lanka, and Asian Development Bank. Colombo: IIMI and Agrarian Research and Training Institute.

Korten, Frances F, and Robert Y Siy, Jr. (eds.). 1989. Transforming a bureaucracy: The experience of the Philippine National Irrigation Administration. Manila: Ateneo de Manila University Press.

Levine, Gilbert. 1991. The Taiwan irrigation associations: Observations from the outside. In K. K. Singh, ed., Farmers in the management of irrigation systems. New Delhi: Sterling Publishers Private Limited.

Merrey, Douglas J. 1994. Institutional design principles for management of large irrigation systems. Draft Manuscript.

Merrey, Douglas J. forthcoming [1994]. Potential for devolution of management to farmers' organizations in an hierarchical irrigation management agency: The case of the Mahaweli Authority of Sri Lanka. Paper presented at the Symposium on Irrigation and Society in the Context of Mahaweli, Sri Lanka, 24-29 August 1992. Forthcoming as edited book, Colombo, 1994.

Ostrom, Elinor. 1990. Governing the commons: The evolution of institutions for collective action. Cambridge: Cambridge University Press.

Ostrom, Elinor. 1992. Crafting institutions for self-governing irrigation systems. San Francisco, CA: Institute for Contemporary Studies Press.

Ostrom, Elinor, Larry Schroeder, and Susan Wynne. 1993. Institutional incentives and sustainable development: Infrastructural policies in perspective. Boulder, CO: Westview Press.

Pant, Shiva Raj, Alfredo Valera, and Ujjwal Pradhan. 1992. Proceedings of the national workshop on participatory management in agency-managed irrigation systems in Nepal. Kathmandu, Nepal: Department of Irrigation and IIMI.

Small, Leslie A, and Ian Carruthers. 1991. Farmer-financed irrigation: The economics of reform. Cambridge: Cambridge University Press in association with IIMI.

Tang, Shui Yan. 1992. Institutions and collective action: Self-governance in irrigation. San Francisco, CA: Institute for Contemporary Studies Press.

Uphoff, Norman. 1986. Improving international irrigation management with farmer participation: Getting the process right. Boulder, CO: Westview Press.

Uphoff, Norman. 1992. Learning from Gal Oya: Possibilities for participatory development and post-Newtonian social science. Ithaca, NY: Cornell University Press.

Wijayaratna, C M, and Douglas L Vermillion. 1994. Irrigation management turnover in the Philippines: Strategy of the National Irrigation Administration. Short Report Series on Locally Managed Irrigation Report No. 4. Colombo: IIMI.