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# Institutional Reform Options in the Irrigation Sector

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# 1. Introduction

Over the past 30 years, the green revolution has averted millions of deaths from hunger and has improved living standards for hundreds of millions more. Irrigation and drainage are a vital leg of the tripod supporting the green revolution, together with new seed varieties and fertilizers. Moreover, irrigation will be called on to produce 80 percent of the additional food required to feed the 2 billion more people who are expected to join the global population during the next quarter-century. At present, most of the water withdrawn from waterways in developing countries is used for irrigation. To meet rapidly expanding water requirements for urban, industrial, and environmental purposes, some of this water will have to be diverted to other sectors. Countries have to focus on producing more food with less water through improved management. In the process, countries are realizing that old organizational models are no longer appropriate, and irrigation institutions and management systems must be reformed to support increased agricultural productivity from more efficient use of water at the field, system, and basin levels.

## Scope of Paper

The objective of this paper is to examine the range of institutional options available to manage in the changing irrigation sector of the 21st century and to learn from country experience with these various institutional forms. It is intended to be used by professionals and policymakers who must decide on courses of institutional change in their countries or regions and by those who advise and inform them. The choice of reform must be made based on adequate information about the prevailing policies, legislative environment, and institutional setup. The paper describes the various institutional approaches that are being used and explores the dimensions of the national contexts within which they are being implemented. Management roles, dimensions of governance, and operational functions are combined to help select appropriate institutional options. Drawing from experience in different countries, the paper examines performance as related to the national context and organizational framework. In addition, it presents selected examples of national experience in a set of boxes scattered throughout the paper. It is expected that countries will be able to use the matrix provided in the appendix to explore and evaluate their range of possible options as they design programs of institutional reform for the irrigation and drainage sector.

## Irrigated Agriculture

### *Global Importance*

Since World War I, the land area served by irrigation and controlled drainage has exploded. Global irrigated area, with accompanying drainage, grew by around 2 percent a year during the 1960s and the 1970s, 1 percent a year in the 1980s, and less than that in the 1990s. In spite of this declining rate of growth, irrigated farmland in developing countries expanded from an estimated 40 million hectares in 1900 to more than 250 million hectares by 1996 (FAOSTAT 1998).

The pace of irrigation and drainage investment reached US\$10-15 billion per year in the late 1970s. This rate dropped during the 1980s, but agricultural water control investments accounted for 28 percent of all World Bank lending during the 1980s, with spending commitments for irrigation and drainage by all aid agencies exceeding US\$2 billion per year. In China, Indonesia, and Pakistan, irrigation and drainage absorbed more than half of all agricultural investment, while in India about 30 percent of public investment has gone into irrigation (FAO 1994). From the early 1980s, public investments in irrigation have fallen dramatically. Annual expenditures in China and Sri Lanka were reduced by 50 percent between the late 1970s and late 1980s. Similarly, declines in the late 1980s from peak expenditure levels in Bangladesh, India, Indonesia, and Thailand range from 15 to 40 percent (Rosegrant and Svendsen

1993). Overall the growth rate in irrigated area has declined from 2.08 percent per year during the period 1970-82 to 1.28 percent during 1982-94, and this rate is expected to continue to decline, reflecting lagged impact of the slowdown in investments (Rosegrant 1997).

On the other hand, investments in large-scale drainage programs, such as the Left Bank Outfall Drain in Pakistan, have helped support overall drainage and irrigation investment levels. The mix of irrigation and drainage investments has also changed, with more resources deriving from governments, commercial sources, and farmers; however, overall investment levels still fall short of those prevailing during the late 1970s and early 1980s.

The shift in attention from irrigation to drainage reflects the importance of artificial drainage in mitigating the problems of waterlogging and secondary salinization which result from extensive irrigation in flat arid environments. It also relates to the past neglect that drainage to alleviate periodic inundation of farmlands in humid areas has suffered. This has been a serious impediment to higher yields and improved standards of living in a wide swath of areas, including the Gangetic Plain in India and Bangladesh, the Red and Mekong River Deltas in Vietnam, and smaller areas in Guyana, the Philippines, Thailand, and elsewhere. Drainage has more of a collective good character than does irrigation and poses a slightly different set of challenges in terms of institutional options and management.

By the early 1990s, more than 40 percent of the value of all grain produced in developing countries was grown on irrigated land, some with controlled drainage, including 67 percent of the rice and wheat produced. For the period of 1960-1990, 8 percent of the increase in world cereal production was because of horizontal expansion and 92 percent was because of vertical increases brought about by irrigation and other intensification measures, such as improved drainage (World Bank 1994).

### *Basin Context*

Between 70 and 80 percent of all water abstracted worldwide is used for irrigation. Only about 25 to 40 percent of that water is used by the intended crops while the remaining 60-75 percent is used by other plants, seeps below the root zone, or runs off the land. Similarly, urban water supply systems often lose 50 percent or more water from leaky distribution systems. In both cases, much of this water returns to the river. Generally, the quality of the flows returning to the river has been altered, to some degree, limiting possibilities for reuse. And for return flows joining the river near its mouth, there may be no reuse opportunities.

With few new water resources available for development in most countries, additional water to meet new urban, industrial, and environmental demands must be derived from already developed resources. Integrated management of water resources at the basin level provides one mechanism for making needed adjustments and improvements (Svendsen 2001). Under an integrated approach, hydrologic, agronomic, and economic relationships can be integrated into a comprehensive framework, and, as a result, policy instruments designed to make more rational economic use of water resources are more effective (McKinney and others 1999). Because irrigation is the major user of water in most basins, reform in that sector, including improved drainage, is a critical component of improved water management at the basin level.

## **Shifting Organizational Paradigms**

Until the late 1800s, the bulk of irrigation in the world was developed by users and operated through a participatory process at the village or community level.<sup>1</sup> These irrigation systems were developed,

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<sup>1</sup> Exceptions to this pattern were the ancient hydraulic civilizations of Mesopotamia, the Indus Valley, and Egypt.

operated, and maintained using local resources largely provided by the water users. Working together, users made decisions about water allocation, established priorities for repairs and system expansion, and jointly established contributions in cash and kind to be provided by all who received irrigation and drainage services from the system (Martin and others 1986).

In contrast, the vast amount of irrigation and drainage development that has occurred since the early 1900s is quite different. Most of these large-scale irrigation and drainage schemes were developed by public agencies. Although some early development, such as that in British India and the Western United States, as well as that carried out by large agribusiness firms producing plantation crops, employed private funds, funding sources gradually shifted to public sources. External funds from various development organizations and international banks became an increasingly important part of this mix. Irrigation changed from being an activity under the control of the local community to a responsibility of a public works or agricultural ministry. Rather than being the responsible parties, users became passive recipients of the service provided. Through the 1950s and 1960s, with massive help from the donor agencies, public irrigation development followed a model that excluded users from active involvement in management.

By the early 1970s, it was becoming obvious that this model had created irrigation systems that were difficult to operate and maintain and were open to extensive rent-seeking and, as a result, were becoming less and less sustainable (Repetto 1986). Centrally financed irrigation agencies were almost invariably unable to collect sufficient irrigation service fees from water users to cover even the operation and maintenance (O&M) costs of their expanding irrigation systems. As a result, they were routinely funded from general government revenues. Revenue shortfalls, together with perverse bureaucratic disincentives, resulted in poor management of water deliveries, waterlogging, shrinking service areas, and deteriorating canals, drains, and structures. The overall result has been poor economic returns to irrigation and drainage investments, lower than expected farm incomes, and fewer beneficiaries than expected.

At this stage, a number of irrigation specialists articulated the need for a new paradigm for irrigation development, recognizing that sustainable irrigation systems require active participation of the users to be properly operated and maintained (Coward and Levine 1987). Unfortunately, by the time governments recognized users' need to actively participate in operation and maintenance of irrigation systems, there were large, vested public irrigation organizations in place that viewed user participation as a challenge to their authority and power—and their jobs. At the same time, the strict control which governments, including Colonial powers, had exercised over their citizens was breaking down in many countries, and more democratic forms and expectations took root. While old establishments were unwilling to give up authority, they were losing the ability to administer systems effectively under old authoritarian rules. This uneasy relationship between users and agency staff increasingly became an obstacle to sustainable operation of public irrigation and drainage systems.

By the late 1980s, the large O&M subsidies required to operate large government-run irrigation agencies were becoming a burden that governments could no longer bear. The problem was reinforced by the subsidies required for other state-run enterprises, including municipal water supply systems and electricity distribution systems. To reduce these burdens, governments all over the world began instituting programs to privatize public enterprises, including airlines, banks, steel mills, and telecommunication systems. After this initial round of privatizations, large natural monopolies, such as irrigation and domestic water service provision, were the next logical reform targets.

This second round of reforms is proving somewhat more difficult than the first. Because of the natural monopoly status of the services provided, their partial public goods character, and their life-and-death importance to large segments of the rural population, many more public policy issues are involved, and successful approaches have to be developed *in situ* rather than being imported.

## **Reforming Irrigation**

### *Involving Farmers*

Early reform activities in the irrigation sector were modest with a primary focus on the formation of small water user associations (WUAs) at the local or village level. Many times, these organizations were created on paper, usually to satisfy a donor requirement, but were in reality not functional.<sup>2</sup> Public irrigation agencies were happy if local WUAs cleaned canals and drains and collected service fees but were not really interested in farmer associations taking over broader O&M responsibilities. These rather half-hearted attempts were not very successful in the absence of political will at all levels to institute serious reforms in the system (World Bank 1994).

By the early 1990s, despite numerous failures, participatory management programs in Mexico, Colombia, Taiwan, Nepal, and China, among others, had demonstrated that water users could successfully play a major role in operating and maintaining irrigation systems, even those covering large irrigated areas. This new generation of programs generally employed a different model than did the early ones, involving much larger units, less grassroots organizing work, and professional operations staff. In these countries it was also demonstrated that if users were given responsibility and authority for O&M, they were often willing to pay the real costs for O&M, even when this might mean an increase in irrigation fees of ten times what it was under public management (Svendsen and others 1997) As a result, more and more countries have initiated programs in which management responsibility for operation and maintenance—and in some cases ownership of the infrastructure—has been transferred to users.

While most countries did not go as far as New Zealand, where all public irrigation assets were sold to farmer associations, active participation by users in irrigation management at the tertiary and secondary level has become widely accepted (Farley 1994; Vermillion and Sagardoy 1999). Donors have provided important support for these efforts, such as the participatory irrigation management program of the World Bank Institute, which sponsored workshops and training programs and encouraged countries to include transfer of responsibility to local users as a part of new loan programs (see box 1).

#### **Box 1. New Zealand: privatization of irrigation schemes**

From 1910 through the 1980s, the Government of New Zealand developed 40 irrigation schemes in the South Island and nine in the North Island covering about 120,000 ha. From 1912 through 1987, the Ministry of Works and Development (MWD) was responsible for construction and operation, as well as establishing annual water charges. Public irrigation schemes were developed under the Public Works Act of 1910 which provided that 100 percent of off-farm construction costs were paid by the government with O&M costs, as well as 25 percent of the interest to be paid by the farmers. From 1975 to 1978, the government provided a 33 percent grant for on-farm works, which increased to 50 percent after 1978. In addition, the government paid all investigation and design costs.

Beginning in 1984, economic reforms focused on the agricultural sector with almost all agricultural subsidies removed. In 1987, the government decided to end all subsidies for irrigation and to sell all schemes. Primary among the problems in the sector was a lack of financial and operational responsibility on the part of MWD, with water charges set too low to recover O&M and capital costs.

Selling schemes to the users was seen as the best way to increase the efficiency of their operation and was a means of removing future liabilities of the government—for example, it was estimated that the minimum cost to rehabilitate the Central Otago schemes was \$NZ 50 million.

A number of different sale options were considered: sale to irrigators, sale to a state-owned enterprise, sale to

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<sup>2</sup> There were exceptions to this generally bleak pattern. The Philippines, at that time, was one of these and showed considerable early success in involving users in rehabilitation planning and implementation, cost sharing, and water management.

**Box 1. New Zealand: privatization of irrigation schemes**

local government, sale to other parties, and whether to continue government ownership or close the schemes. Government decided to sell the schemes on the basis that: (1) schemes were sold on a commercial basis; (2) preference was given to selling the schemes to irrigators because of political and monopoly issues; and (3) if irrigators were not interested the government would sell the schemes to others on terms the same as offered irrigators.

Prior to 1990, the legislative basis for the government to develop and manage irrigation schemes was the Public Works Act of 1981. This contained no authority for the government to dispose of its ownership in schemes; therefore, new legislation was required to carry out the sales. This was passed as the Irrigation Schemes Act of 1990, though the first sales agreement was approved by the government in 1989. Matters provided in the act include authority to sell, provision for the transfer of existing registered easements and rights to the purchasers, the provision for transfer of existing government-held water rights, and privileges to purchasers.

Of the schemes, 47 were sold to groups (45 ordinary companies, one cooperative, and one incorporated society), one was sold to the sole user, and one was sold to users jointly. Very few schemes yielded a high sale price to the government. The key reason was the low net revenue generated by the schemes under government ownership. Other limitations resulted from liabilities accepted by purchasers. The sale process was also constrained by the absence of competitive bidders because schemes were sold effectively only to irrigators. The 49 schemes had a historical investment cost of \$NZ 117 million yet they only generated \$NZ4 million in actual sales revenue. In many schemes, the government paid purchasers a cash payment in lieu of a commitment to complete or rehabilitate the schemes.

Since completion of the sales and transfer of ownership to the irrigators, indications are that efficiency gains of 30-50 percent are being achieved in the schemes. This has primarily occurred because of maximum incentives to control costs, recover charges, and invest prudently.

Source: Authors.

*Irrigation Agency Reform*

Initially, there was but limited emphasis on irrigation agency reform. While recognizing that transfer of O&M responsibility meant an increased role for users, the implications of those changes for the role of the irrigation agency remained little explored. In many important irrigating countries, irrigation agencies are stable, mature bureaucracies that have evolved elaborate management procedures. These entrenched organizations have typically not been at the forefront of change, particularly when change might result in a reduction in their size, power, and importance. When there is broad political support for institutional change, these organizations have become more supportive of restructuring.

Reform often means a fundamental change in the activities undertaken by an agency. While previously much of the time and effort of staff was spent on irrigation O&M, institutional reform means that resources are now available to undertake tasks which often have been neglected in the past. These may include:

- River basin planning
- Watershed management
- Environmental monitoring and enforcement
- Water resource management and allocation/reallocation
- System modernization

Irrigation agencies can be retained as public entities with changes in mandate and a revision in areas of responsibility. This was the case with CNA in Mexico (see box 2). A second option is to assign these

responsibilities to a new quasi-public basin authority. This is what is happened in Victoria, Australia with the formation of the Goulburn Murray Water Authority under the Murray-Darling Basin Commission and is now beginning to happen in the Indus Basin system in Pakistan (see box 3).

**Box 2. Mexico: retaining irrigation agencies as public entities**

From the 1930s, large-scale irrigation districts were created in Mexico as part of a policy to foster food self-sufficiency. These districts, covering 25,000-300,000 hectares, were operated until 1990 by the government irrigation agency with little direct user involvement. By the end of the 1980s, Mexico had approximately 6 million hectares under irrigation, with 3.3 million hectares in 81 public irrigation districts.

During the 1950s, more than 85 percent of the O&M costs in these districts were recovered from users, but, by the 1980s, this figure had dropped to just 20 percent. In 1989, the National Water Commission (CNA) was created with a mandate to develop a national water resource management system. Within the sector, the task was to develop a system of co-responsibility with water user associations (WUAs) to improve system performance and ensure financially self-sufficiency. Phase I of the transfer program shifted management of government-run irrigation districts to WUAs, with each WUA having a water right and being responsible for O&M within a defined irrigation area. Phase II of the program created Limited Responsibility Societies (SLRs), which are federations of the individual WUAs within a district, with responsibility for operating the main infrastructure.

The decision to implement the transfer program was made in the Office of the President and was strongly supported by farmers in the more commercial agricultural areas in the country. By concentrating on areas with strong local support, within 10 years, the country had transferred 3.2 million hectares to 470,000 users organized into more than 420 WUAs and had established 10 SLRs. As the WUAs became financially self-sufficient, the subsidy from the federal government was reduced. The transfer program and associated increases in water tariffs have allowed the irrigation districts to go from 30 percent self-sufficiency in 1991 to more than 80 percent self-sufficiency by 1999. From 1989 to mid-2000, CNA O&M personnel levels were reduced from around 8,000 to fewer than 2,000 employees.

The irrigation reform was initiated under the existing 1972 water law. After about three-quarters of the transfers were completed, a new water law was drafted and passed in 1992, and regulations to implement the law were issued in 1994. The new law contains the basic principles for water concessions to WUAs that ensure equal seasonal water allocation for all WUAs in a district. Concessions are for up to 50 years and are renewable. Concessions are granted not to individual users but to the WUA, giving each a proportional right to the supply of water available to the district. When a SLR is formed, it is only granted authority to manage water concessions, which remain with the WUAs.

CNA's role in irrigation is quickly being reduced to management and enforcement of regulations management of dams and head works and insurance against damage by floods or other natural disasters. In the future, the CNA headquarters office will oversee water management and develop policy. Regional offices will promote and strengthen river basin councils and coordinate water planning and reservoir operation. Recognizing this new role, CNA has been shifted from the Agriculture Ministry to the newly created Environment, Natural Resources Ministry. As effective user-based water basin councils develop, they will assume a technically, administratively, financially, and operationally independent management function, allowing CNA to become a true national water authority, setting standards and policy and ensuring enforcement of laws and environmental protection of water resources.

Source: Authors.

The first option is relatively straightforward, though involves a significant reduction in staff (Johnson 1997). The second option is more drastic and involves changes in overall organizational structure, financing, and, usually, the legal framework, as well as requiring changes in staff skills, management, and decisionmaking (Langford and others 1999). These changes don't just accommodate user participation

and transferred responsibility for local O&M, but also have the potential to improve the performance of the entire water resource system.

Another role that a restructured agency is often asked to assume is that of providing support to user associations, such as technical advice and training services. Training in technical tasks, such as water measurement, water allocation, drainage management, maintenance, emergency repairs, and sediment removal, are typically important. Training in other management skills, such as accounting, irrigation service fee establishment and collection, conflict resolution, computer training, information systems, and auditing, may also be required (World Bank 2000).

When restructured irrigation agencies become quasi-public organizations, they generally see their public funding taper off and often are mandated to develop their own sources of revenue with a long-term goal of becoming self-financing organizations. This usually involves establishing or reforming a system to collect fees from clients. In many countries, this is a new activity for the irrigation agency and has proven to be a managerial and political challenge. In a few countries, restructured agencies have become involved in other income-generating activities, such as power sales, water sales to municipal and industrial (M&I) users, provision of drainage services, bulk sales of excess water, equipment rental, and provision of engineering services.

### **Box 3. Australia: assigning responsibilities to the Goulburn Murray Water Authority**

In Victoria State, Australia, the centralized state irrigation and water supply department has evolved into five regional water authorities, the largest of which, the Goulburn Murray Water Authority (GMWA), had emerged as the biggest regional authority in the state. Reforms began in 1984, and the authority continues to evolve.

The GMWA is responsible for providing bulk water supplies to urban water authorities and other rural water authorities, as well as for the retailing of irrigation, domestic and stock supplies and drainage services to 24,900 farm properties within the 68,000 square kilometer area of responsibility. The authority also undertakes a number of natural resources management activities for the government on a cost recovery basis.

The authority derives its powers from the Water Act and submits its corporate plan each year to the minister administering the Act to ensure compatibility of its business directions with prevailing government policy. The authority is accountable to the government through a Board of Management and is managerially and financially autonomous. The government provides regulatory oversight through the minister and the Department of Natural Resources and the Environment in the central bureaucracy. The Victorian government remains the equity owner of the authority.

Farmers and other customer groups are represented through Water Services Committees (WSCs). The ten committees, all consisting of democratically elected farmers and chaired by a farmer, advise the GMWA Board and represent customers in the six irrigation services areas. The Board interacts directly with WSCs each year in developing financial plans and setting prices for water services, such as bulk deliveries and irrigation, drainage, and flood control, and the negotiation of business plans.

WSCs negotiate with the GMWA Board regarding their annual business plans and customer service agreements, which include specification of levels of service. They also prioritize asset investment programs. Negotiated business plans comprise a contractual arrangement, allowing the GMW area managers and staff and the WSC to conduct day-to-day operations with minimum Board involvement. Business plans identify short- and long-term key initiatives and business objectives, strategic programs, and actions to achieve these objectives, including setting prices for irrigation and drainage services, and I&D services.

Irrigation retailing services are provided to each of the six irrigation areas as separate financial entities. An area manager and staff in each service area work closely with the corresponding WSC. Area WSCs meet on a monthly basis and a copy of minutes is forwarded to the Manager Rural Water Services

The authority has a bulk water entitlement from both the Goulburn and Murray Rivers and is required to operate

**Box 3. Australia: assigning responsibilities to the Goulburn Murray Water Authority**

within those entitlements. Bulk water is effectively purchased by each service area and there is a clear separation of the costs of wholesale and retail services. The authority works to ensure water resource availability for bulk entitlements, achieve agreed environmental flows, and contribute to a sustainable and productive natural environment.

An interstate river basin commission, the Murray-Darling Basin Commission (MDBC) has overall management control of the land and water resources in entire basin, which covers four states in southeastern Australia. The Victorian state government is represented on the MDBC and has nominated the CEO of GWMA as the Victorian commissioner.

Source: Authors.

## **2. Organizational Options**

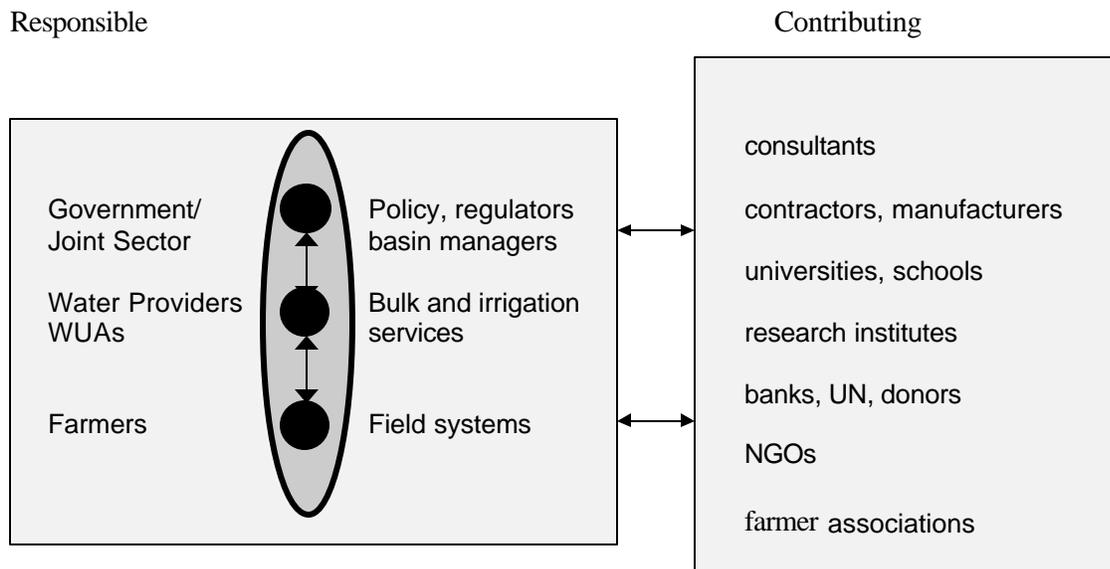
The day of a single monolithic irrigation agency having total responsibility for and absolute control over irrigation water deliveries is past. Today, irrigation is the province of many different actors who must interact and cooperate if the system is to work effectively. This makes the structuring of an irrigation sector not simply the task of designing one organization which is right for the job but that of defining a set of effective organizations along with the governance mechanisms (rules of the game) under which they operate and interact (Huppert, Svendsen, and Vermillion 2001).

The options for structuring an irrigation and drainage sector can be framed in terms of the roles played, the structures of individual organizations, and the various functions that the organizations carry out. In addition to this static snapshot, we also need to understand how transactions take place among the involved actors and try to establish rules that will govern those transactions. It is also necessary to establish incentives that will guide them to effective and efficient performance.

### **Roles in Irrigation Management**

A number of typical roles can be identified for the players in the irrigation drama. The main ones are presented in figure 1 (adapted from Bart Schultz) and described briefly in the following sections.

**Figure 1. Typical roles in irrigation and drainage management**



Source: Schultz, Bart, 2000.

### *Farmer*

The farmer is the client for services provided by water providers upstream while being a manager at the field system level. It is at this level where she is the entrepreneur who takes water, along with seeds, land, her own and others' labor, other inputs, and judgment and produces a crop. This is the most difficult task in the whole irrigation complex and is the task in which the stakes of success and failure for the role player are the highest. As the client, the farmer is the one person the service provider must satisfy directly. The arrangement between farmer and service provider is the key to effective irrigation performance (Huppert, Svendsen, and Vermillion 2001).

There is tremendous diversity among the billions of farmers across the world—among nations certainly, but also within countries and even within individual schemes. As implied above, a substantial share of farmers in the world are women—and the prominence of this fact is overshadowed only by the frequency with which it is ignored. The sheer number of farmers in all but the smallest schemes requires that they be linked together in some way to interact effectively with service providers. The diversity among them makes that a distinct challenge. That challenge includes the need to represent fairly the different perspectives, as well as the different interests of the involved farmers—men and women, head-end and tail-end irrigators, and commercial and subsistence producers. It also includes the need to develop widely accepted rules which will allow farmers jointly to be effective and efficient in their dealings with service providers and other actors. Over the past decade much has been learned, but our understanding is still very imperfect, especially concerning the adaptation of organizational forms and rules to particular cultural situations, which must always be done carefully and *in situ*.

### *Water Service Providers*

Institutional change is quickly evolving into a system in which there are various types of water providers. These can be divided in irrigation service providers that actually supply water to farmers or farmer user associations and bulk providers that supply water to service providers.

### **Irrigation service provider**

The irrigation service provider (ISP) plays the other important part in the “contract” between farmer-client and supplier. The ISP takes water delivered by a bulk water provider and distributes it to individual farmer-clients. Their job, as Dave Freeman from Colorado State University reminds us, is to “make big water into small water.” This is, in part, a technical task of calculating allocations, operating control structures, making repairs, and doing maintenance. But there are other equally important aspects of this role that too often get less attention. These include creating awareness among clients of the capabilities and limitations of the water resource and the delivery infrastructure, soliciting assessments of the level of service clients receive, and developing explicit agreements with farmers regarding types and levels of service to be provided.

As pointed out earlier, reform of service providing entities has received far less creative attention than has organizing farmer-clients. This role offers considerable opportunities for applying private sector-like incentives to improve performance—a particularly fertile area for experimentation. The system of delegated management in France offers one such alternative (see box 4).

### **Bulk water provider**

Bulk water providers capture and convey water to the point in which it is delivered to one or more water service providers for distribution to clients. The source can be a diversion weir in a river, a storage dam, a well field, or even a flow of treated wastewater. The clients of a bulk water provider are the ISPs themselves. Important aspects of this role are that (a) it often acts as a wholesaler to more than one service provider, including both ISPs and municipal water suppliers; (b) it must act impartially in supplying water to its different clients; and (c) it deals with larger and more technically challenging infrastructure than direct service providers.

At times, the role of bulk water providers and ISPs reside in the same organization, but, as the size and variety of demands on water resources expand, it becomes increasingly likely that a bulk water supplier will be wholesaling water to a number of different users, including ISPs, municipal suppliers, and the environment. This trend makes the separation of ISP and bulk water provider roles both appropriate and increasingly likely. Along with this separation comes the challenge of linking the two together through some form of agreement that can regulate their interactions and exchanges.

#### **Box 4. France: delegated management of irrigation systems**

The operation of irrigation systems by private companies is not common. In this context, the experience of the French Companies is unusual and interesting. The irrigated area served by collective schemes in France is presently about 650,000 hectares, out of which roughly 2 percent are operated by private firms. The framework is not classified as privatization but as delegated or contracted management because the ownership of the irrigation assets remains with the original owner, a water user association, or a local government. Two types of contractual relationships between the owner and the operator can be found:

The first is *affermage* contracts, which have a typical duration of 10 to 20 years. In this case, the private operator bears the commercial risk because the source of his income is the billing to the final users. The second type comprises short duration (a few years) contracts for operation and maintenance. In such contracts, payments to the managing firm are made by the owner of the system.

Since the 1980s, Lyonnaise des Eaux has been operating irrigation schemes providing pressurized water to about 2,200 users gathered in 20 WUAs, covering 8,800 hectares of irrigated farmland in four different regions of France. The largest contract (near Lyon) deals with peri-urban agriculture specialized in high-value crops; but, in other cases, basic crops are dominant. *Affermage* is the most frequently used contractual arrangement. In most cases, the institutional setup involves WUAs, local chambers of agriculture, and consortia of municipalities and could be called a public-private partnership.

**Box 4. France: delegated management of irrigation systems**

Important socioeconomic factors explaining the outsourcing of management by farming communities are (a) the high level of reliability required for sophisticated crops and (b) the shortage of available manpower on the farms, making it difficult for farmers to give time to water users associations.

From the French experience, the several conditions lead to a choice of private sector management.

A critical mass of irrigated area is necessary so that fixed costs can be shared among a significant number of farmers. In peri-urban areas, small WUAs can be served by operators providing municipal water services in the same neighborhood.

The regulatory framework must provide a fair competitive environment for private companies to compete with public entities.

The principle of full operation and maintenance cost recovery on the final users must be socially accepted.

Though the size of this business remains small, the acceptance of it by French farmers is not in question because most of the contracts with private operators have been regularly renewed during the past two decades under transparent procurement procedures.

Source: Tardieu, Henri, 2000.

*Government*

**Basin Managers**

At the upstream end of the spectrum, the role of the bulk water supplier merges into that of the basin manager (Svendsen 2001). A basin manager is typically responsible in some overall way for the water (and sometimes other) resources in a drainage basin. He inventories demands and supplies and matches the two, based on public policy, laws, environmental and other regulations, as well as negotiated agreements. In some cases, a basin manager also acts as a bulk water supplier to all service providers in the basin. In other cases, the basin manager restricts itself to coordinative and other roles, leaving bulk water supply to a specialized technical agency.

**Regulators**

Regulation is, by definition, a service to the public at large and is a role that falls to public agencies, or joint public/civil society commissions, to play. Regulators enforce society's rules and protect the public against unfair dealings by service providers, individuals, and unacceptable environmental degradation—all critically important functions. This is a difficult role, particularly when regulators are poorly paid and professional standards are low. Recognizing the Bulk Water Providers and Irrigation Service providers have monopoly power, regulation is being taken over by a National Utilities Regulatory Body in a number of countries, which has reduced political interference and rent-seeking. This is an element of the institutional setup for irrigation management that deserves greater attention.

**Policymakers**

Policymakers set the highest-level visions, goals, and targets to be achieved in irrigation development and management. They also help define the rules of the game, shape organizational structures, and provide funding and other resources (thereby shaping programs). Policymaking is a public function but is subject to the widest range of influences and pressures from affected stakeholders. It is a process motivated by policymakers' notions of the public good but also by personal contacts, public opinion, and, in a democracy, the ability to mobilize votes.

It is in this process that poor and unorganized constituencies often lose out. It is far easier for a public employees union representing irrigation and drainage agency staff to bring influence to bear than it is for the unorganized farmer-clients of a public irrigation agency to do so. The ability to influence public policymaking is an extremely important potential outcome of programs to organize irrigators and places a premium on the ability of WUAs to organize for representational purposes.

### *Change Agents*

Change agents are roles coming from outside the government-service provider-farmer chain of responsibility. These include manufacturers, contractors, local and international consultants, international banks, bilateral funding organization, UN agencies, local and international research organizations, and NGOs, including WUAs. Acting in this role, change agents bring in new ideas, evidence of successes and failures elsewhere, holistic research methodologies, and perspectives and values that may challenge local orthodoxy. To be most useful, international change agents should work with local change agents to provide technical support, strengthening them and providing new ideas, legitimacy, methodologies, technical assistance, and funds.

They can energize and catalyze local debates over goals, options, and techniques and lead to rapid positive change, as did the World Bank's support for IMT in Turkey in the early 1990s (Svendsen and Nott 2000). Another classic case is the early support provided by the Ford Foundation in the 1970s and 1980s for the participatory irrigation management program mounted by the Philippine National Irrigation Administration (Korten and Siy 1988) (see box 5).

NGOs have multiplied in recent years in numbers and scope of coverage and have become significant players in irrigation management in many locations. Both national and international NGOs are involved and play a variety of roles, from introducing new technology to organizing WUAs.

### **Types of Service Providing Organizations**

As indicated, the two core roles, for our purposes, are those of the water user and the irrigation service provider. The other roles are also important, but they serve to enable and support the effective provision of irrigation services to farmers by the ISP. We now narrow our focus.

To this point, we have been describing roles and not organizations. While roles are sets of expectations and tasks associated with particular functions, they do not necessarily coincide with specific organizations (Coward 1980). More than one role can be played by a single organization, as when the roles of bulk water provider and ISP are played by the same agency. A complete role can also require simultaneous action by a number of different organizations—a set of WUAs in an irrigation system, for example. Similarly, a single role may be split among a number of different organizations, as when an ISP performs some functions itself and contracts out others to third parties.

**Box 5. Philippines: restructuring the National Irrigation Administration**

Irrigation in the Philippines is the responsibility of the National Irrigation Administration (NIA). Over the past 25 years, the country has worked to restructure the NIA in order to fully privatize large and medium irrigation schemes and limit NIA's O&M responsibility to major storage and conveyance facilities. NIA's experience with agency restructuring has been ongoing since 1974 when it was given the power to retain irrigation service fees (ISFs) and other sources of income. In exchange, subsidies were to be phased out over the next five years. NIA's management developed a fourfold strategy to respond to these charter amendments, including: devolving responsibility for O&M, increasing revenues by raising ISFs, reducing operating costs through cuts in staff, and providing financial incentives for superior performance.

Recognizing the need to reduce the management costs of irrigation, NIA established a complex procedure for forming Irrigator Associations (IAs) using community organizers and farmer leaders. Through IAs, NIA involves water users in construction and rehabilitation. Under Stage I contracts, IAs take responsibility for irrigation O&M. Stage II contracts involve IAs in ISF collection with incentives provided for exceeding collection targets. Through Stage III contracts, smaller systems will be transferred completely and larger ones will take responsibility for all but main system management and storage. To date, less than 10 percent of the systems have reached Stage III, but more than 60 percent of the systems have Stage I or Stage II contracts. With almost 2,000 IAs formed and active, the aggregate ISF collection rate is still less than 50 percent.

Once government subsidies were to be removed, NIA's philosophy changed radically. The need to generate internal funding led to cost cutting measures, including staff reductions; major efforts to increase ISF collection rates; and development of costs centers to monitor and reward staff performance. ISFs are denominated in paddy and set at the same level by the government for all national irrigation systems. This has protected NIA from inflation, but low paddy prices over the past few years have seriously undermined NIA's overall budget. NIA's total staff declined by 50 percent from 1975 to 1995. An engineer's income was 40 percent lower in 1997 compared to 1965.

Although in theory NIA is a separate public corporation, the government has not granted administrative freedom in many areas. Constraints on the establishment of service fees and the terms of employment have severely restricted NIA's corporate flexibility. Farmer resistance to ISF payment has remained high. Collection rates have not increased, and ISF revenues only cover about 50 percent of O&M costs, even though NIA field staff spend as much as 40 percent of their time on collection efforts. Devolution of O&M activities to IAs and the resulting opportunity to reduce O&M staff have continued to be NIA's major strategies to maintain operating costs.

NIA has demonstrated that it is possible to convert a conventional public irrigation agency into a more people-centered organization with IAs taking a larger role in O&M; however, such a transformation requires strong political will. Even with widespread restructuring, NIA has been unable to accomplish its goal of financial self-sufficiency and continues to receive 30 percent of its budget from the government. In response to financial problems and rice shortages, in 1998 a new populist government temporarily reduced ISFs and reinstated public subsidies, though this policy was later reversed under external pressure. Lack of political will and weak national leadership have allowed NIA to avoid making the difficult policy decisions needed to achieve financially self-sufficient. At the same time, lack of sufficient funding has resulted in a declining system performance and physical deterioration.

Source: Authors.

While it is possible to list a number of familiar models, such as a line irrigation department, a regulated public utility, or an irrigation district, these names will often mean different things in different locations and different things to different people; moreover, there can be a great many variations on each particular model. In one location where a so-called *utility model* prevails, the utility itself may hold a water license and own the physical water control facilities, while, in another, the utility may lease the facilities from the government and rely on a water right held by the government. In some locations where the *irrigation department* model is utilized—some Indian states, for example—maintenance may be done primarily by

force account. In others using a similar model—Guyana for example—most maintenance may be contracted out. These familiar labels are often ambiguous and fail to communicate clear meanings. We need a better way of classifying types of organizational arrangements for service provision based on a set of core attributes that are clear and unambiguous.

We can do this by making a fundamental distinction between organizational governance and functional performance. **Functional performance** is what organizations do to carry out the roles they have been assigned. For an ISP, these generally include:

- Water allocation and distribution
- System repair and maintenance
- Income generation
- Conflict resolution
- Representation in basin and water resource level discussions
- Other internal supporting services

There are many possible ways to organize to carry out these functions using different primary organizations and various combinations of hired staff and outsourcing.

**Organizational governance** constitutes the higher-level control of the organization. Governance operates within the confines of public policy to make top-level decisions, such as:

- Strategic planning
- Approving budgets
- Setting prices
- Program approval
- Selecting CEO
- Setting staff terms and conditions of employment
- Setting internal policy
- Defining service needs and selecting ISP.

These functions provide top-level guidance and control as opposed to providing services. The outputs of the governance process are decisions that shape the functional performance of the organization. Governance decisionmaking is not an every day activity but takes place at longer intervals. Governance decisions are not taken by the employed staff of the organization but by people outside the organization who have a mandate to manage and control it. Looking at who holds governance authority provides powerful insight into the nature of an organization, regardless of the name it goes by.

Another important dimension defining the nature of an organization is its sources of funding, both operational funds, as well as long-term capital financing. Organizations which fund themselves entirely through the sale of goods and services are clearly in a different class from ones which receive their annual budget from the public treasury. A classification of eight common organizational types of irrigation systems is shown in table 1 and discussed below. Note that these are “pure” or archetypal forms. In practice, organizations may represent variations and combinations. An irrigation district, for example, may be a recipient of various public subsidies, as in the United States, but still be considered self-financing because the variable component of its income is earned.

**Table 1. Basic forms of irrigation service providing organizations**

<i>Organizational Form</i>	<i>Orientation</i>	<i>Source of Operating Funds</i>	<i>Organizational Governance</i>
▪ Communal	▪ Non-profit	▪ Communal members	▪ Community
▪ Contractor	▪ For-Profit	▪ Earned	▪ Owners
▪ Department	▪ Government	▪ Appropriated	▪ Government
▪ Government/User Board	▪ Non-Profit	▪ Appropriated/Earned	▪ Mixed Board
▪ District	▪ Non-Profit	▪ Earned	▪ Clients
▪ Canal Company	▪ Non-Profit Corporation	▪ Earned	▪ Corporation
▪ User Association	▪ Non-Profit Association	▪ Earned	▪ Members/Representatives
▪ Public Utility	▪ For-Profit	▪ Earned	▪ Owners/Regulators

Source: Authors.

### *Communal Irrigation System*

Communal irrigation systems are usually developed by the villages in the community, often over many decades. The infrastructure belongs to the community and is maintained by community labor, normally in an organized effort during the months before the season starts. In some cases, community members pay an irrigation service fee while, in other cases, they contribute labor and materials to prepare the system for use. Membership is often voluntary, though many communities have strict social pressure that ensures all members that plan to use the system contribute their fair share.

### *Contractor*

Contractors are family owned or private sector companies that provide irrigations services for a fee. In South Asia, contractors often operate small-scale lift devices from wells or pumps lifting from streams and ponds. In Shaanxi Providence, contractors operate local irrigations systems based on a multi-year contract signed between the contractor and the users.

### *Department*

An irrigation department is a traditional way of organizing the delivery of irrigation services, particularly in large canal commands. It can be an arm of a national government (as in Malaysia) of state governments (as in India), or local government units (as in China). Key features are that is not operated for profit, its operating funds are provided by its parent government unit, and it is accountable directly to the parent government unit which makes its fundamental decisions.

### *Government/User Board*

Authorities differ from departments in that, while nonprofit, they typically earn some of their income from the sale of services, while other income is derived from government allocations. Governance is through a mixed board made up of government officials from different departments or ministries, often supplemented with other outside directors from the private sector, client groups, or civil society. The Murray-Darling Basin Commission in Australia would fall into this category as does the *Office du Niger* (see box 6).

### *District*

Irrigation districts are governed by their clients, defined as everyone meeting certain criteria, including receipt of service, within a set of geographic boundaries. This distinguishes them sharply from departments and authorities where top-level control rests outside the client group. They operate on earned income and do not earn or distribute a profit (though they may retain reserves from year to year for future needs).

### *Canal Company*

Canal companies are typically nonprofit corporations organized under corporation law. The company's canal systems were usually built by the corporation by borrowing money, without government assistance. They have a set of bylaws that specify how the corporation will be run. A Board of Directors hire a manager to handle the day-to-day operation through a hired staff.

### *User Associations*

User Associations are member-based organizations that are governed by their members and cover their own costs. In many countries, user associations are organized similar to irrigation districts, while, in other countries, they are voluntary rather than automatic. User associations are generally smaller than districts, though it is not unusual to find user associations serving in excess of 10,000 ha.

### *Public Utility*

Public utilities provide irrigation service to earn a profit, though the amount is usually restricted by the state to a fixed percentage. They generate their own income from sale of services, and they are governed jointly by the corporate owners and by some sort of a public regulatory body. This hybrid form of governance is necessary because irrigation service, as a natural monopoly, is not subject to market forces which would otherwise control its charge rate and level of service. Regulated public utilities are at present far more common in municipal water supply and electricity supply than in irrigation service provision. Mixed national and local government corporation, such as the Societe du Canal de Provence in France, offers one such model.

## **Variations and Combinations**

Although some on-the-ground service providing organizations will fit neatly into the typology developed above, others will not. There are many variations on these themes, both in the area of finance and governance, and the variations may be more common than the pure types. Still the archetypes provide a useful framework in which to classify organizations.

Defining the nature of a governing body also presents complications. Classification may be difficult for mixed governing boards. The designation is more straightforward when one party, such as a particular ministry, clearly dominates decisionmaking, despite representation from other involved parties. The designation decision is more complicated when governing body members wear several different hats. In Turkey, for example, while governing boards of IAs are usually dominated by heads of local government units, these local government leaders are often also farmers themselves and are elected to their municipal positions predominantly by farmers. To classify governance as coming either from *clients* or from (*local government*) is not simple (see box 7).

Seldom today is a single organization in charge of ISP from river to farm. Several organizations will typically be involved in making water deliveries to farmers. Organizations may be combined in several different ways. They can be chained together from source to farm, with one organization serving as bulk water supplier and another as a farm service provider. These can be different types of organizations (e.g.,

a department or authority at the wholesale level with a district or cooperative at the retail level). Another possibility is that a federation of local service providers can act as bulk water supplier to its member districts. This model has been employed in Mexico, China, and Turkey and is of growing importance in California and other states in the American west where it is being applied on a very large scale.

**Box 6. Mali: the reform of a multifunctional monopolist in Office du Niger**

During the early 1960s more than half of Mali's rice consumption was produced by the Office du Niger on about 45,000 ha. Gradually this share dropped, and imports increased as yields fell to 2T/ha and cropping intensity plunged to 60 percent. The downturn resulted from the monopoly on rice marketing held by the Office because farmers were forced to sell their paddy to the Office at low prices, with the difference used to pay its 4,000 staff members. Eventually, farmers refused to grow rice, and Office income became insufficient for O&M.

The Office staff members operated not only in the irrigation network but also supplied inputs, provided extension, stored the paddy, operated the rice mills, ran a seed farm, produced farm equipment, managed guest houses and restaurants, staffed health clinics, and ran literacy courses. Because of this vertical integration, the agency was all-powerful, and there was room for rent-seeking. Vertical integration was useful when the scheme was built because the delta of the Niger was almost uninhabited. Gradually this control was no longer justified and became a source of inefficiency and lack of accountability. As a result, the scheme survived on annual infusions of funding by the Government of Mali that, in turn, solicited support from donors for financial and technical assistance.

In 1979, the Government, the Office, and bilateral donors agreed on the need for reform. Initially, rehabilitation was emphasized, along with improvement of rice varieties and cultivation practices, including the introduction of transplanting. Over time, empowerment of the users became more central. In 1984, one donor distributed transportable de-hulling machines to village associations. These were meant to allow farmers to de-hull paddy used for home consumption and to provide village associations with income; however, this also broke the Office's monopoly of marketing and milling of rice. Another donor supported a program to introduce comanagement committees composed of water users and the Office.

In 1993, in collaboration with the bilateral donors, Mali appointed a presidential delegate who was mandated to draw up a reform plan and implement it before 1996. Rice mills were sold and the seed farm, guest houses, the equipment workshop, and the training center were all leased out. Health clinics were transferred to the Ministry of Public Health, while extension and literacy training became services that the Office delivered for a fee. A generous severance pay plan, financed by the bilaterals and made twice as generous by the devaluation of the CFA, motivated many to leave voluntarily. In 1996, the Office had less than 400 staff members and had been turned into a public enterprise with full financial and administrative autonomy.

In 1995, a first three-year performance contract was signed between the Minister of Finance, the Board of the Office, and two elected representatives of the farmers. Joint committees, with 5-10 farmers and 5-10 Office staff members, were established in each zone. These committees decide on type of service, costs, and ISF, as well as deciding on the use of 50 percent of the ISF. Fees are collected by the Office in a two-stage process. During the first phase, committees prepare proposals to management to sanction farmers with arrears. During the second phase, the director of the zone approves the list and forwards it to the Managing Director. Sanction for non-payment of the fee are severe. Since farmers are tenants, they may be evicted from their land and, because evictions occur every year, eviction is a credible threat.

Some major outcomes of the reforms and improvements are that, in many zones, paddy yields climbed to 6.5T/ha, water use dropped, and cultivation intensity rose to 115 percent. Income from one season of paddy on an average 3 ha farm equals 877,500 FCFA (=USD 1,350 at Euro 0.88 to USD 1). Collection rates are practically 100 percent, and water fees equal 8.5 percent of Gross Value of Output (at FCFA 110/kg). The sustainability of the network is now assured and is even expanding again, thanks to renewed confidence of bilateral donors and private investors.

Source: Authors.

Another type of combination results from outsourcing by an ISP of particular functions to other entities, which may be private firms, NGOs, or government agencies. Functions sometimes outsourced include accounting, fee collection, specialize maintenance, emergency repairs, design, construction, rehabilitation, and training.

Not subject to contracting out are organizational governance functions. These functions embody control of the ISP and will always be performed by those with the mandate to control. This is why governance functions are the key to organizational classification and should be the primary focus of restructuring efforts. Performance functions are important but can be handled in a great variety of different ways—always under the control of the governing body. The first step is to “get the governance right” and then to design the service delivery mechanism based on principles of comparative advantage and economy.

**Box 7. Turkey: irrigation management reform**

In the early 1990s, Turkey began a program of converting its department-run irrigation systems into district-operated ones. Today, more than 80 percent of the large-scale irrigation in the country is managed by locally controlled districts. A sizeable area comprising smaller schemes is also managed directly by local governments. Cooperatives manage about 3 percent of the total—mostly small groundwater schemes.

Turkish irrigation districts represent a variation on the standard model in that they are actually associations of relevant local governments rather than unions of farmers. Because irrigated agriculture is a central feature of village life in affected areas and because local leadership is directly elected by voters, many of whom are farmers, there are generally effective accountability links between irrigation district governance and the farmer clients of the systems. A new draft irrigation law would change this system to one of direct governance by farmers. Systems are governed by a five-member executive committee elected by a general assembly of around 50 people, comprising local government officials and some farmer representatives. Day-to-day management is in the hands of a hired general secretary, typically a university graduate in agricultural engineering, and a staff member.

Districts currently coordinate informally to represent their interests with government authorities. There is interest among districts in developing more formal linkages among themselves to provide a stronger voice in public decisionmaking that affects them.

In the early years following transfer, the government provides indirect subsidies for system maintenance, though these generally phase out in 2 or 3 years. Following that, districts bear the full out-of-pocket costs of irrigation operation and maintenance. Responsibility for drainage system operation and maintenance is not clearly defined and is currently shared between the government and the districts. An ongoing program subsidizes maintenance equipment purchases by districts through a World Bank credit.

Bulk water supplies are generally provided by the national water resources agency, DSI. No payments for bulk supplies is required. DSI also operates newly built systems until districts are formed and responsibilities transferred to them, as well as systems deemed difficult or impossible to transfer to local control.

Regulatory oversight of districts is provided by DSI and by the Ministry of the Interior, whose regional representatives are responsible for overseeing financial operations of the districts.

Basin management is largely absent. This gap stems, in part, from the absence of an explicit system of water rights. The lack of both a system of water rights and a regular process of integrated planning for water use and quality maintenance is a serious problem and a growing concern.

Source: Authors.

## **Assess Institutional Options**

Table 1 presents a “pure” or archetypal form of ISPs. This table provides a way to make a basic typology of ISP organizations. For a government to decide what form of, or combination of, ISPs they want to

institute it is not any one characteristic but the traits considered together. While table 1 is useful in a conceptual sense, the appendix provides a more complete framework for assessing institutional options.

Utilizing this table, a country that is exploring a range of options to reform their irrigation and drainage sector can assess what form of ISP fits under their own conditions, or what changes—including legal—would be needed to adopt one or a combination of the ISP options.

In the table, special attention is paid to the dimension of ownership, both of the irrigation assets, as well as the holder of water rights. This is an area in which legal changes are occurring rapidly around the world, yet it is also the area in which countries continue to struggle. Governments are often concerned about the long-term sustainability of irrigation infrastructure if ownership is transferred to private organizations. Some governments like Mexico have opted for a concession system in which control of O&M is transferred but actual ownership is not, while other countries like Romania are transferring complete ownership of secondary irrigation infrastructure.

Similarly, governments have been hesitant to grant legal rights to private individuals and associations for irrigation water supplies; yet, they have come to realize that, without security of supply users and associations, governments are reluctant to invest in infrastructure improvements. Given the principle of state ownership of natural resources that exists in many countries, it often requires rewriting laws regulating water for users to be given security of access to water.

The matrix in the appendix provides a means of understanding how different options relate to functional performance and what options mesh with existing cultural and legal systems in the country. The table also provides the same type of information with respect to organizational governance. For example, the row that details how management is selected indicates how management control for an ISP is selected. This information is very important because a country should not opt for a contractor form of ISP unless the country is willing for management to be in the hand of the contractor and out of the hands of the government. Similarly, the matrix indicates a country would only want to elect to use a public utility type ISP if they have a strong utility regulatory board that can audit the books to ensure profits are kept within the prescribed range.

## **Unbundling Services**

There may be advantages to unbundling irrigation and drainage services that are still bound up in a single bureaucratic structure. Unbundling infrastructure services can improve accountability and foster a more transparent and, in some cases, competitive environment in irrigation and drainage. Experiences in other infrastructure sectors with a monopolistic character illustrate these benefits. Natural monopolies exist when one provider can serve the market at a lower cost than two or more providers could. Such is the case when the costs of producing and delivering a service decline with economies of scale or scope.

By isolating the natural monopoly segments of an industry, unbundling promotes transparency and accountability in segments that are potentially competitive. Failure to unbundle can constrain an entire sector to monopoly provision even when some activities can be undertaken more cost effectively on their own. Some advantages of unbundling include the improvement of management accountability, makes cross subsidies between different lines of business more transparent and identifies more precisely the subsidies needed to deliver services to the poor. Unbundling services are currently going on at a rapid pace in a number of sectors.

Vertical unbundling separates a chain of services into its individual links. Generation of electric power, transmission, and distribution, for example, have been separated in several countries. Similarly, in the natural gas industry, the wellhead, the pipeline, and local distribution systems are often owned and operated by different entities. In irrigation, there are now examples of how unbundling can be introduced. In the sector reforms of Victoria, Australia, and Mexico, basin management, bulk supply, and retail

irrigation provision are responsibilities of different entities. The steps taken by Pakistan in the process of unbundling the irrigation system in the Indus Basin indicate the magnitude of the undertaking (see box 8).

**Box 8. Pakistan: unbundling the irrigation system in the Indus Basin**

The Indus Basin irrigation system is the largest contiguous irrigation system in the world, serving in excess of 14 million hectares. Agricultural growth in this system has stalled, and the irrigation system is suffering from severe O&M problems. Over the past decade, the government has tried to stop deterioration of the irrigation system and improve its performance but without success because these approaches were only addressing the symptoms and not the root cause of the problems—unresponsive and inefficient O&M provided by the government agencies themselves.

Recognizing the need for a new strategy to solve their irrigation problems in 1997, the government adopted a new program to establish a self-sustaining irrigation system. This involves: (a) reorienting the Water and Power Development Authority (WAPDA) to focus on interprovincial roles and functions; (b) transforming Provincial Irrigation Departments into Provincial Irrigation and Drainage Authorities (PIDAs); (c) creating Area Water Boards (AWBs); (d) organizing WUAs and federations of WUAs into Farmer Organization (FOs); and (e) forming active WUAs to take O&M responsibility on each watercourse. Key objectives of the reform program are: (a) substantial improvement in client services and (b) financial sustainability through the reduction of costs and increases in irrigation service fees (ISFs).

FOs are to distribute water among WUAs, collect ISFs, maintain accounts, carry out maintenance programs and develop system improvement programs. To date, the involvement of WUAs in irrigation O&M, if any, was in cleaning the main watercourse canal and irrigating their own fields. Under the new structure, WUAs are the critical building block for improved irrigation management. With the need to establish more than 110,000 WUAs, Pakistan has undertaken a massive job.

Replacing the PIDs with PIDAs, creating AWBs, and forming sustainable FOs and WUAs depends upon efficient water charging systems and sustainable cost recovery. Farmers will need to pay water charges sufficient to cover the O&M costs of their WUA, to cover O&M costs of a federated WUA, including those incurred by the FO in delivering water and operating the drainage system, as well as the costs of operating PIDA and the percentage of WAPDA's costs that are associated with irrigation and drainage. The target rate for collection efficiency, assuming active and effective WUAs, is more than 90 percent—an ambitious goal.

The government has finally realized that agency reform, though difficult, is critical if the country is going to maintain its large irrigation system and continue to feed its growing population. Divestiture of power, retrenchment of staff, establishment of firm volumetric water rights, organization of more than 110,000 effective WUAs, and development of more than 50 AWBs are all tasks that have to be completed in order to reform irrigation institutions in the country. The process is expected to take at least 20 years, but when institutional reform is completed, irrigation in Pakistan will be a decentralized, local activity with strong management and financial support from irrigation water users.

Source: Authors.

Horizontal unbundling separates activities geographically, allowing for better performance comparisons and more efficient regulatory monitoring. In Mexico, for example, there are 82 irrigation districts with separate organization, accounting services, and representation of users, while in Victoria, Australia, there are six irrigation areas with their own administration and water service committees. In Japan, the national railway was reorganized and split into six regional passenger operators, while in Britain, trackage and rail service were separated.

But unbundling is a mixed good. Constraints on unbundling are both technical and economic. Even when the technology permits unbundling, the legacy of history and institutions often limits the possibilities for change. Attempting to force activities that are closely interdependent into distinct boxes can also impose

high transaction costs because the coordination once achieved smoothly within a single entity becomes more difficult and costly when handled between entities. The disastrous British Rail experiment demonstrates this. Many small, separated vertically linked monopolies, each of which charge a markup over costs, may create higher charges than with a single, vertically integrated organization. As with many businesses, economies of scale can operate within the divided entities as well. In Japan, for example, WUAs with irrigation area of less than 1,500 hectares have reported lower efficiencies and higher costs than larger associations. Similarly, in Mexico, small WUAs with less than 2,000 ha have found it is better to combine together to achieve economies of scale with respect to fixed costs.

In the move from a government monopoly to an unbundled, more transparent system, enforceable contracts are required to balance the interests of various parties and to provide the stability needed for long-term investment. Comprehensive, transparent, and nondiscriminatory rules of the game are also required. Although basic institutions must exist and be enforceable, experience has shown that the move to unbundling need not wait for the rules to be embedded in a fully developed statutory regulatory system.

### **3. National Context**

In developing programs to reform their irrigation institutions, countries adapt institutional options to their own traditions and culture, while incorporating models and elements that have succeeded in other countries. When appropriate, governments are also borrowing institutional options from other sectors in which agencies have evolved new ways to reform public services with a monopolistic character. Although many reform programs contain common elements, countries have tended to follow a unique path determined by their own national context. Before attempting to make major institutional reforms in the irrigation sector it is important for reformers to understand the national context, the opportunities the national context offers, and the constraints it places on successful institutional reform. Important dimensions of the national context are discussed below.

#### **Size and Engineering Complexity**

From the smallest communal irrigation system in Africa to the largest technical irrigation system in China, irrigation O&M has a common set of core activities. As irrigation systems increase in complexity and size, technical skills and equipment required for O&M activities increase. Organizational structures differ in their ability to handle increased levels of engineering and administrative complexity; therefore, this is an important consideration in considering options.

China has done a good job recognizing that institutional options change as irrigation system size and complexity increases and has been very innovative in the use of different kinds of institutions at different points in the system, ranging from small contractors or WUAs at the lowest tertiary level to Water Supply Corporations at the headworks and main canal level (Johnson III and others 2001) (see box 9).

#### **Box 9. China: irrigation reform**

When in 1978 China started its fundamental economic reforms, its irrigation institutions became the object of reforms as well. The infrastructure had been expanded rapidly, from 16 million hectares in 1949 to 50 million hectares in 1992. By the late 1970s, problems associated with this pace started to appear as substandard construction, and this, coupled with inadequate maintenance and management, led to rapid structural deterioration and declining productivity.

Two major alternative types of management organization existed then:

- (1) Dam, headworks, and main canals are managed by a single management organization, while branch and

**Box 9. China: irrigation reform**

tertiary canals are managed by organizations set up by lower levels in the government water conservancy departments

(2) The entire canal system, down to the tertiary units, is managed by a single organization set up by the water conservancy department. This model is practiced in only few provinces, one of them being the Guanzhong Region of Shaanxi Province.

Since the 1980s, central government funds and manages only large inter-provincial projects. Construction and management of schemes within provincial boundaries have been transferred to the provincial governments. Emphasis has shifted from construction to consolidation and performance improvement. The policy of requiring farmer contributions in cash and labor for construction and repair remains in force. It is estimated that in this way farmers directly contributed one-third of total investment in China's infrastructure built after 1949.

As part of the consolidation effort, the Ministry of Water Resources developed a new institutional approach, it terms SIDD, which stands for Self-financing Irrigation and Drainage Districts, and pilots are under way. In this new approach, reservoir, headworks, and main canals are operated and maintained by a single organization, a Water Supply Corporation. It is often owned and financed by and responsible to water users, other beneficiaries, and investors. Its board of directors assigns 40 percent of the seats to farmer representatives. It sells bulk water to WUAs that operate and maintain the secondary and tertiary levels and that, in turn, sell the water to their members.

A different reform path was followed in Guanzhong where the Provincial Government addressed overstaffing and deferred maintenance issues through a program for management reform at two levels: (1) main system (the headworks main and secondary canals) to be managed by the nine irrigation districts and (2) transfer of responsibility for irrigation O&M to individual operators, joint stock-holders, or groups of farmers (WUAs) at/below minor or lateral canal systems. The districts have designed procedures through which they give out contracts. Some contracts are concerned only with the operation and maintenance of the tertiary system; others include an obligation to invest in rehabilitation and construction, to increase the served portion of the command, and to increase the annual volume of water purchased from the irrigation district. In at least one SIDD system in which the tertiary canals are lined, the water supply company distributes flow meters to the WUAs that collect the water charges. WUAs can use these to verify complaints by farmers that they did not receive the water they were billed.

Within a year, the reforms in Guanzhong increased the area served by 10 percent. This points to the effectiveness of introducing private sector incentives in management and capital services. On the downside, it is noted that farmers are generally not party to the contracts and have no legal recourse against poor service delivery. No regulatory authority has been established yet to safeguard against abuse. It is noted that farmers as a group lose control over a major investment in those cases in which ownership of the tertiary is transferred, be it temporarily, to the investor.

Source: Authors.

As the scale and complexity of a scheme increases, formal technical engineering knowledge becomes increasingly important. System operations for large schemes bring about similar challenges. This should not rule out farmer control of such schemes through a district form of governance. A general does not have to know how to repair a jet engine to command an air force. Hired staff with specialized technical skills are used in all sorts of organizations to perform functions which may be unfamiliar to the members of their governing bodies. Members of the governing boards do need skills in planning, budgeting, evaluation, and communication to be effective, and these sets of skills are at least as important as specialized technical skills. Skill demands for both operational performance and organizational governance increase as physical systems expand in size and complexity. These demands are important considerations in designing, or redesigning, an institutional setup for irrigation service provision.

## **Legal Framework**

Water sector reforms can rely on existing legislation as an enabling basis, as in Turkey, or can be built around new purpose-designed legislation and authority, as in the case of Mexico and India (Andhra Pradesh). Which path is chosen depends on the nature of the existing laws, the flexibility that planners are allowed in interpreting the laws, the difficulty in putting in place new legislation, and the scope of the proposed reforms.

Transferring irrigation O&M for the 112,000 hectare Alto Rio Lerma Irrigation District in Mexico to farmer control involved the creation of 11 WUAs with professional irrigation staff, the revision of Article 27 of the constitution, and the negotiation of a legal, concession agreement between each of the modules and CNA, as well as provision of extensive training programs on O&M and financial management (Kloezen and others 1997). Similarly, in Pakistan, as long as institutional reform was limited to formation of WUAs at the watercourse command area served by a single turnout, the Canal Act of 1857 was legally sufficient. Once institutional reform began to move up the tertiary canal to form Farmer Organizations, Area Water Boards, Provincial Irrigation and Drainage Authorities, and to reorient the national Water and Power Development Authority, numerous institutional changes, including new legal acts, were required. Successful institutional reform as instituted in Mexico, Australia, New Zealand, Chile, India, and Argentina have employed new laws to legalize the changes being made (Andhra Pradesh). Countries in the former Soviet Union, such as Kazakhstan, Kyrgyzstan, Romania, and Bulgaria are all now in the process of drafting new WUA laws, and in some cases, new water laws, because they have come to realize this must be done first if they are going to implement successful institutional reform.

An interesting hybrid approach is being followed in Turkey. There a rapid and sweeping IMT program was implemented using existing legal authority beginning in 1994. Several years later, with 70 percent of the State-run irrigation in the country transferred to local control, a process of developing a new irrigation association law was initiated which included the active involvement of the new irrigation associations. The new legislation was designed specifically to remedy deficiencies in existing law that became apparent during implementation. The law is now making its way through the system and will be a better law in that it will be based on 5 years of early experience.

## **Capacity of Supporting Institutions**

Successful institutional reform requires not only changing the system on paper but the ability to implement and enforce provisions of new legislation and regulation. This is done through institutions capable of supporting the intended changes (Vermillion and Sagardoy 1999).

One of the most basic supporting institutions required is respect for property, entitlements, contracts, and agreements. This respect includes such things as water rights, contracts for water service, contractual agreements with suppliers, and leases of equipment. Respect for these arrangements requires a reasonably impartial legal system to adjudicate disputes, mechanisms to enforce settlements, and widespread access to affordable legal representation.

For example, countries are often encouraged to establish a system of water rights to give the users more security. But agricultural water rights are very difficult to adjudicate and even more difficult to enforce. Countries, such as Chile, Mexico, and the Philippines, have found it much more difficult than expected to establish a national register of water rights. And having established a register, it may be difficult to find a suitable organization for enforcing settlements. Spain has established a special system of water courts for adjudicating water conflicts. Specialized water courts tend to work better than the regular courts because the former are often clogged with pending cases and unfamiliar with water issues; moreover, rural water users may have little faith in the formal legal system because it has so often been manipulated against them.

A second set of essential institutions are those which provide transparency for public, corporate, and NGO decisionmaking. Corruption, mismanagement, and favoritism all flourish in dark corners away from public scrutiny. Institutions that mandate and enforce public disclosure of contracting, financial records, hiring and firing, adjudications, and similar practices are essential in facilitating democratic processes, local control, and efficiency. The basis for such institutions are laws which open public records to public examination, expectations on the part of farmers and others of access to such records, a free press at both national and local levels to publish such information, a tradition of investigative journalism to bring excesses to light, and NGOs and other advocates to push for openness and transparency (see box 10). A third important set of institutions comprise external organizations which support ISPs in a variety of other ways. These include a competitive private sector that can be tapped for engineering services, accounting services, audits, equipment rental, etc.

Another important future role for private sector firms is in taking over operational responsibility for irrigation systems. This could be done either under contract with the governing body of a district or cooperative or through a direct contract with government, operating as a public utility. In the urban water sector, where strong private sector firms exist, many local governments are starting to contract with private firms to manage municipal water supply systems. These kinds of management contracts have not yet been used to any extent in irrigation O&M, though the Chinese are using them more and more at the tertiary and secondary levels, and France also has some experience. Private sector involvement in irrigation is presently limited by the fact that irrigation service fees typically cover only a portion of the real costs of irrigation service. Private firms are only willing to take over irrigation O&M when they can cover costs and earn a reasonable profit for their efforts.

### **Type and Security of Rights (Water, Facilities)**

Rights to water is emerging as a key issue in the ongoing discussion of restructuring irrigation institutions (Svendsen, Trava, and Johnson 1997). Historically, in most developing countries, water resources have belonged to the state. State agencies, such as ministries of water resources and departments of irrigation, have been assigned responsibility for diverting water from natural sources and delivering it to users, such as municipalities, industry, and irrigation systems. Under this arrangement, control of water resources is directly in the hands of the government, and regardless of whether there is a formal system of water rights, the state retains the *de facto* right to abstract and allocate water. Irrigators have no control over or ownership of the

#### **Box 10. India: NGOs and transparency in Rajasthan**

In the early 1990s, an organization called *Mazdoor* (labor) *Kisan* (farmers) *Shakti* (strength) *Sangathan* (organization) or MKSS began working in rural Rajasthan to open local public financial records for examination. Members walked from village to village asking residents if they knew how much money was coming to their village for development and where it was being spent.

Village and block level officials refused access to vouchers, bills, and muster rolls documenting public expenditures. In response, MKSS organized dharnas (sit-in protests), strikes, and public hearings. After months of effort and a 53-day strike in Jaipur, the Deputy Chief Minister of the state finally released an order granting public access to these records. After several months of additional effort, MKSS members, armed with the government order, succeeded in obtaining some of the information and organized public hearings in several villages. Prior to the first hearing, the sarpanch (head) of the village where the hearings were scheduled returned Rs 150,000 of public funds with a promise of Rs 50,000 more. A second hearing resulted in the return of Rs 147,000 and Rs 114,000 by two additional village heads. Corruption thrives in secrecy, but strong grassroots commitment and determined effort can pierce the curtain of secrecy and admit the light of accountability.

Source: Excerpted from an article by Sanjit Roy in the July 1999 issue of the German development journal D+C.

resource until it is delivered to their farm outlet. A similar situation of state ownership usually exists with respect to infrastructure used to divert water from the source and convey it to users.

Formal water rights do not exist in many developing countries, but this is not so important because state agencies are responsible for diverting, managing, and delivering water through state-owned infrastructure to end users. This situation changes significantly once the State begins to assign portions of this responsibility to other organizations. Now there is no longer a single chain of control from source to user, and water may change hands several times in the process. Linking involved parties and requires agreements that specify the water supply obligations of the provider. In addition, new financial responsibilities are being thrust on both the middlemen and on end users to pay for water and often to pay for construction and rehabilitation of water delivery facilities. Moreover, there is much talk of private firms that are involved in both constructing and operating irrigation facilities. All of these changes will be difficult to implement without a more formalized system of water rights and institutions to protect those rights.

Without a firm guarantee of water supply and access to distribution facilities, users will generally be unwilling to invest their own resources of time and money in creating a strong user association. Likewise, without a clear and transparent recognition of ownership, users will be unwilling to invest in rehabilitating existing infrastructure, much less in upgrading irrigation systems by lining canals or installing new gates (Johnson III and others 2001).

Rights to water are actually a bundle of rights. These include:

- Rights to use the resource
- Rights to derive income from a resource
- Rights to change a resource
- Rights to transfer the resource to others

Not all of these rights must be involved in a rights allocation and registration scheme. For example, rights to *use* and to *derive income* from a resource could be specified initially, while rights to *change* the resource and to *transfer* it could be frozen until a later stage, as we presently see in the land market in many of the former Soviet countries. It is not necessary to assign water rights to individuals directly. In many countries with well-functioning rights systems, rights are held by an organization, such as a WUA, on behalf of involved individuals. These arrangements have proven successful in countries like Mexico when agreements provide long-term security (10-20 years) because users have been willing to invest in system improvements. Short-term arrangements, such as 1-year contracts in Turkmenistan, have not provided enough security, and users have been unwilling to invest in system improvements—or even system maintenance.

## **Stress on Water Resources**

Historically, irrigation uses between 70 and 80 percent of the water supplies diverted, with some countries using in excess of 90 percent. But this percentage is rapidly changing as more and more countries face water shortages. In *Pillar of Sand*, Postel (1999) states that in excess of 1 billion people live in countries and regions where there is insufficient water to meet food and material needs per person. As these populations in those countries rapidly expand, a larger and larger percentage of the global population face food shortages due to insufficient water supplies. By 2025, more than 3 billion people will live in water-stressed countries. In addition, by 2025 more than 5 billion of the expected 8 billion people living on earth will live in urban areas, and, with approximately 60 percent of the population in urban areas, the share of water going to urban areas will increase from 13 percent to 27 percent. Much of this water will

have to come from agriculture and will place a serious strain on the existing institutional structure in the agricultural sector.

Declining water quality adds to the stress on supplies. As full water treatment is lacking in many developing countries, the quality of water in the natural streams is being increasingly degraded as a result of expanding use and reuse. In turn, the quality of water diverted for irrigation is declining. This is a major problem in the Jordan Valley because much of the irrigation water is affected by poorly treated wastewater from Amman (Fardous and Fandi 1999). Water in lower reaches of many rivers, though available, is unusable for most purposes because of its poor quality. The health ramifications of declining water quality, as well as the costs it generates, are other stress factors forcing institutional reform.

As the stress on water resources quality and quantity increases, friction will grow between established irrigation agencies that are fighting to retain their power and municipalities that are scrambling to obtain sufficient water to meet municipal and industrial needs. In general, history has demonstrated that, the more stress there is on available water supplies, the stronger the forces for institutional change. As water stress increases and competition between the sectors becomes stronger, pressures for additional institutional reform will build.

### **Agricultural Productivity and Degree of Commercialization**

Almost all successful institutional reform programs have been able to pass the bulk of the costs for irrigation O&M from the government to water users (Johnson III 1995). This increased burden can be borne by farmers in countries that have productive agricultures, such as China (Chen and Renbao, 1995), Mexico (Johnson III, 1997), and Turkey (Svendsen and Nott, 1998) because irrigated agriculture has high economic returns and real irrigation O&M costs are a reasonably small share of the gross cost of production. In all of these countries, good links between input supplies and output markets exist and the commercial system supports high production agriculture. In contrast, agricultural yields in countries such as Armenia (Irrigation Institutional Audit Team, 2000), Ecuador (SNV, 1996), Albania (Mountstephens and Dede, no date), Morocco (World Bank, 1999c) and Sudan (Narayanamurthy, et al, 1997) are fairly low and linkages with both input suppliers, especially credit, and markets are weak. As a result, farmers are limited in their ability to increase the amount they pay for irrigation O&M and systems and operational practices must be designed for lower cost.

In general, the more commercial the agriculture, the easier it is for farmers to pay actual costs of delivering irrigation supplies and to pay for higher quality service. Countries that are seriously interested in institutional reform must also support well-designed agricultural development programs. These programs ensure that agricultural productivity is high and that net returns to agriculture generate sufficient income to cover the costs of the reforms. For example, farmers in Hubei and Shaanxi Provinces have two crops a year with good yields and are able to pay for the increased costs of irrigation O&M (World Bank, 1999a). Where yields are low and farming practices are traditional, farmers often are struggling to survive financially. As a result, institutional reform is difficult to implement and usually must be more modest, since farmers usually do not have sufficient income to share the costs of improved irrigation O&M. As argued by some, governments can support the entire program in these type areas with subsidies but that places farmers in a dependent situation and leaves them vulnerable to sudden changes in government funding and policy.

### **Land Ownership/Security**

Successful institutional reform requires that the involved parties accept responsibility for management of all or part of the irrigation system. One reason that communal irrigation systems are generally sustainable is that users have accepted almost complete responsibility for system construction, operation, and

maintenance. Moreover, users own the land they farm, and as they have built the system themselves, also own the irrigation infrastructure. By contrast, where the State builds and owns the irrigation infrastructure, there is no local ownership and little sense of security. Under such circumstances users are, in effect, just tenants that receive irrigation water without having any say over timing or quantity of water delivered. In some cases they are even told what crops they can grow.

When land ownership rests with the State or is held communally, farmers cannot be certain they will be farming the land the following season, and will be unwilling to accept additional responsibility for irrigation O&M. At present, this is the situation in many countries of the former Soviet Union and a number of African countries, including South Africa (World Bank, 1999b; Abernathy, et al, 2000; Lahiff, 1999).

In Turkmenistan, for example, all land still belongs to the State. Farmers are assigned a piece of land to farm but as a condition must plant a specified portion of the land in crops designated by the State (normally wheat and cotton) and sell their output to the State at State-controlled prices. If they are unable to do this, as often happens, they will be assigned lesser quality land or a smaller piece of land the following year. Under this system farmers have little incentive to develop a water user association and take on responsibility for irrigation O&M. Institutional reform requires a system of land rights, either through ownership or secure tenancy, before it is possible to expect water users to invest in sustainable irrigation reform.

## **Political Constituencies for Change**

The speed and extent, and often the quality, of irrigation institutional reform are directly correlated with the political will that supports the reform. Even with pressure from a powerful external actor such as the World Bank or the Asian Development Bank, without high-level government commitment it has proven almost impossible to institute a serious program of institutional reform. For example, the strong, entrenched irrigation bureaucracy in Indian states has been a constraint on institutional reform throughout the country (Brewer, et al, 1999). Only in cases such as Andhra Pradesh, when a strong Chief Minister has thrown his support behind institutional reform, did radical change occur in the State (Peter, 2001).

In the majority of the countries where institutional reform has been successful, a strong political constituency for change has been a driving factor. Successful institutional reform reflects a political decision by the concerned government to shift responsibility for delivering equitable and efficient irrigation services from the government to a new set of actors. This commitment for change must be clearly stated, understood by all, and not change every time the senior administration changes. For example, after the election of President Salinas in 1988, as part of an overall program to reduce subsidies on food and improve efficiency in the agricultural sector, the Mexican Government created the National Water Commission (CNA). The CNA was created with an explicit mandate to reform the management of water in the country. This led to the formulation of the National Program for Decentralization of Irrigation Districts. This program had the direct political support of President Salinas and consequently irrigation sector reforms were implemented very rapidly (Johnson, 1997). A similar situation exists in Australia (Langford, 1998) as well as China (Chen, 1995) and Turkey (Svendsen and Nott, 1998). In all these countries the policy for institutional reform came directly from the top, or had top-level support, and has been consistent through political changes.

In contrast, in countries like Nigeria (Musa, 1995) and Niger (Abernathy, et al., 2000) institutional reform has failed because policies were not consistent and the involved parties were uncertain what institutional reforms were to be implemented. This situation is also often found in the former Soviet Union as political systems are weak and mixed messages concerning reforms are common. For example in Tajikistan and Turkmenistan, while the governments are advocating institutional reform in the irrigation sector, powerful groups in the country continue to push for a delay in land privatization, enforcement of cotton quotas and

forced sales of cotton to the Government at controlled prices. Such policies seriously handicap farmers and limit the possibility of instituting a sustainable reform program.

## **4. Guidelines for Designing Reforms**

The preceding sections of the paper have discussed key issues related to irrigation sector reform and organizational forms that can be employed. Missing, though, is a sense of the process to be employed in designing the reforms. Ideally, a planning process would follow a neat linear path, perhaps based on a strategic planning model. This might involve visioning, fact-finding, analysis of options, market research, and testing, followed by program planning, budgeting, restaffing, training, and implementation. Unfortunately, such a neat linear sequence cannot always be followed. Steps may be taken out of sequence; the timeframe may be compressed, with steps taking place concurrently; or the process may get stuck at certain points and have to be jarred loose. Reform is often opportunistic, riding on the back of a crisis—a budget shortfall, critically low production levels, or acute farmer dissatisfaction—and requires immediate action. It helps to have an overall model in mind, so that problems thwarting progress, such as a lack of shared vision or purpose, can be identified and addressed. General guidelines that will help a country identify the form of that model include the following.

*Guideline 1.* Institutional reform must be the result of a specific policy decision made by the senior administrators and policymakers in the country. It cannot be simply be a program agreed to under pressure from a donor but requires high-level involvement and commitment, even to the level of the president or prime minister. If it takes time for leaders to build a coalition and agree on a model for reform, it is better to take that time initially than to start the process and later make fundamental changes in the model because of social and political backlash. Tools like the table in the appendix in this document will help senior leaders anticipate the hard decisions they will have to make. These may include eliminating departments (or even ministries), releasing redundant staff, increasing water fees and energy charges, and transferring infrastructure and water rights to WUAs, etc. These are all difficult decisions with major political ramifications. It is best if these decisionmakers are involved from the beginning to ensure they are fully and knowledgably committed to the overall institutional reform process. It may take some serious marketing to bring all parties on board, but, when it is apparent that the most senior leadership is committed, other groups are more likely to fall into line.

*Guideline 2.* Although the process of institutional reform may require some adjustment and adaptation during implementation, it is important that the government, service providers, and farmers share a vision at the outset of what the system should look like when the reforms are completed. This final configuration can take a wide variety of forms:

- All irrigation systems are privatized, or all systems under a specific size are privatized.
- Main system O&M remains the responsibility of the Government, and secondary O&M responsibility is assigned to a public utility or let on contract to a private firm.
- WUAs assume O&M responsibility at the tertiary level, and federated WUAs are responsible for O&M at the main system level.
- All users become shareholders, and a joint stock company hires staff to operate the entire system.
- The irrigation agency itself is changed to a quasi-government entity controlled by a board made up of users of the system.

No matter what model of reform is selected, a country must know where it is heading and have the political will to implement the program, even through changes in political leadership. A reform program will almost certainly fail if the program changes every time political leadership changes.

*Guideline 3.* Along with the overall vision, the expected roles of the primary parties, including farmers, irrigation service and bulk water providers, and government (including basin managers, regulators, and policymakers) must be clearly understood. The reform model must include a communications strategy that involves stakeholders in assigning and clarifying these expected roles. The more sweeping the changes envisioned, the more resistance is likely. Defusing this and gaining buy-in to the program involves extensive and repeated efforts to communicate the nature of the program and discuss its benefits and drawbacks and to utilize the feedback received to adapt the program.

*Guideline 4.* Too often, major donors have taken a one-model-fits-all approach to institutional reform. This has often caused serious problems for countries trying to design institutional reform programs. Countries with large-scale technical irrigation systems face a different set of circumstances than do countries with many small-scale, communal-type irrigation systems. Even within a country, small-scale systems in mountainous terrain require a different type of management structure than large-scale systems serving irrigated export crops in the lowland plain. Informal WUAs can deal with small-scale systems, but, beyond a certain size and degree of engineering complexity, the O&M organization, whether it is a WUA, a private contractor, or a public utility, has to be more structured and employ a hired professional staff. Countries must take into account their own agricultural circumstances and the type of irrigation systems that exist in their country. When a country's irrigation infrastructure includes both small-scale and large-scale systems, it may be necessary to develop different kinds of institutional reforms for the two different settings.

*Guideline 5.* In most cases the principal driving force for institutional reform is poor O&M and the inability of the government to mobilize funds, either directly or indirectly, for even deficient service provision. Typically, users pay only a tiny fraction of the costs of such operation, and other taxpayers fund the rest. Governments must be honest with all the parties, particularly the farmers, preparing them for the fact that no matter what reform model is selected, irrigation water costs are generally going to increase. Part of the education program associated with institutional reform must include educating users about the real value and costs of irrigation service. Ignoring the fact that a shortage of government funding to sustain public irrigation systems is the driving force behind most institutional reform, some individuals have advocated continuing to subsidize irrigation but channel these funds through the users to empower them. This approach appears to allow a country to institute institutional reform even when farmers have limited resources and, as a result, has great conceptual appeal (see guideline 7). The concept is being debated in a few countries but, unfortunately, has yet to prove that it will work as envisioned, much less increase the sustainability of irrigation systems. It is unlikely that placing farmers in a dependent position will actually empower them.

*Guideline 6.* When a country develops a long-term vision of what it wants its irrigation system to be like when the reform process is implemented, it also has to think about the legal ramifications of these changes. If the vision involves selling or transferring public irrigation infrastructure to a WUA, or a federated WUA, laws will usually have to be changed to allow the transfer of public assets. When WUAs are expected to take O&M responsibility, laws may have to be changed to allow for the formation of WUAs and assigning them rights and powers such as setting and collecting irrigation service fees. Similarly, if the government wants users to invest in system improvements, laws may have to be changed to give them secured access to water over the expected lifetime of the improvements.

*Guideline 7.* Experience from a number of countries demonstrates a direct relationship between the degree of agricultural commercialization and the ability of water users to share the costs of a reform program. Farmers who are barely surviving will find it difficult to contribute to a reform program that

requires increasing their water fees by as much as 10 times, even when the present fee is very low. On the other hand, farmers who are growing commercial crops, such as cotton and vegetables or even high yield wheat and maize, can afford to pay the majority of the real costs of irrigation O&M service. This argues that institutional reform programs could initially be started in agricultural areas where farmers are earning a better financial return and can afford to pay a larger share of the real irrigation costs. In areas where farmers are barely breaking even, it is often necessary to work on extension and agricultural production improvement programs before, or in conjunction, with irrigation reform programs.

*Guideline 8.* Poor system condition is often asserted to justify deferring institutional changes. In many countries it has been argued that irrigation systems must first be rehabilitated and modernized before management can be transferred. Experience has proven that this is seldom a valid argument. Rehabilitating prior to reform denies new managers the opportunity to help shape the redesign and ensure it is appropriate for the new management set-up. In many countries, new managers, WUAs, and federated WUAs have been willing to contribute to the rehabilitation process, improving system design and reducing the loan burden of the government.

*Guideline 9.* There has been considerable debate within the irrigation profession over the merits of slow methodical approaches versus the quick “big bang.” It is worth noting that some of the most dramatic successes have come from programs that expanded coverage to the entire state or country rapidly. Instituting a reform program with a few pilot interventions is usually either an excuse to avoid serious institutional reform or one to delay it with an expectation that the government will change and the policy will change, as well. It is no longer necessary to prove that WUAs and federated WUAs can manage large, complex irrigation and drainage systems. This has already been demonstrated. Countries that begin with a few pilot schemes get caught up in looking at each little tree and rarely are able to expand the program to cover the entire forest.

## **5. Summary and Key Issues**

Expansion of irrigated agriculture has made an enormous contribution to feeding the worlds expanding population over the past 50 years. The challenges ahead are more formidable still and involve a restructuring of the institutions that manage irrigation, drainage, and water resources and positioning them to score major future gains in resource-use efficiency.

Core reforms required involve specialization and diversification. Comprehensive state agencies will give way to multiple specialized agencies in different sectors, each filling a niche determined by natural incentives and other elements of institutional comparative advantage. Public agencies and bodies will fill needs for macroplanning, regulation, and higher-level management. Locally controlled and private sector organizations will provide irrigation and drainage services. A variety of other organizations will supply supporting services. Relatively more attention has been paid to developing and strengthening locally controlled organizations than to restructuring public agencies and to needed supporting services. This balance will need to change as the pressure for institutional reform increases.

Eight contextual factors offer opportunities for and place constraints on institutional reform in irrigation:

1. Size and engineering complexity
2. Legal frameworks
3. Capacity of supporting institutions
4. Property rights to water and facilities
5. Stress on the water resource

6. Agricultural commercialization and productivity
7. Land tenure security
8. Political support.

Of these, political support and institutional capacity are foundation blocks of a successful reform program.

Implementing irrigation reform must respect and adapt to the context of the reform. Planners must consider a wide variety of perspectives—male and female, large and small landowners, upstream and downstream irrigators—and consult extensively with a full range of stakeholders. Implementation must respond to problems encountered, learn, and adapt on the move. Design of new organizational structures should focus first on organizational governance and then turn to ways to perform service delivery functions. Expanding programs rapidly to full national coverage is strongly recommended unless there are serious fundamental weaknesses in one or more of the eight contextual factors.

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## Appendix: Matrix of Functions and Institutional Options for Irrigation Service Provision

	<i>Institutional Options</i>							
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
	<i>Public enterprise</i>							
	<i>Government department</i>	<i>Government board</i>	<i>User-dominated board</i>	<i>User association or district</i>	<i>Public utility</i>	<i>Contractor</i>	<i>Canal company</i>	<i>Communal irrigation system</i>
<b>Operational functions</b>								
Business planning and programming	Government	Board		User association or district	Utility	Contractor	Corporation	Community
Budgeting	Government	Board		User association or district	Board or government	Contractor	Corporation	Community
Capital financing	Government	Cost sharing		Cost sharing	Users	Cost sharing	Corporation	Community
Financing O&M	Government and users	Users		Users	Users	Users	Users	Community
Performing O&M	Government	Public agency and outsourcing		User association, district, and outsourcing	Private operator	Contractor	Corporation	Community
Setting fees	Government	Government		User association or district (with government oversight)	Utility (with government oversight)	Contractor (with government oversight)	Corporation (with government oversight)	Community
Collecting fees	Revenue dept.	Public agency		User association or district	Utility	Contractor	Corporation	Community

*Institutional Reform Options in the Irrigation Sector*

	<i>Institutional Options</i>							
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
	<i>Public enterprise</i>							
	<i>Government department</i>	<i>Government board</i>	<i>User-dominated board</i>	<i>User association or district</i>	<i>Public utility</i>	<i>Contractor</i>	<i>Canal company</i>	<i>Communal irrigation system</i>
<b>Governance functions</b>								
Performing sector policy and regulatory functions	Government	Related ministry		Ministry of agriculture, water				
Owning assets	Government	Government	User association, government, or district	Government or utility	Government	Corporation	Common (owned collectively)	
Holding water rights	Government	Government, board, or users		Government or association members	Utility or members	Government	Corporation or users	Community or users
Auditing	Government	Government	User association or district (with government oversight)	Board	Private auditor	Private auditor	Government, NGO, or private auditor	
Performing mgmt. Selection	Government	Related ministry or board		Users	Board	Contractor	Corporation	Community
Overseeing mgmt. transfer agreements?	No	Yes		Yes	Yes	Yes	Yes	No

Source: Authors.