

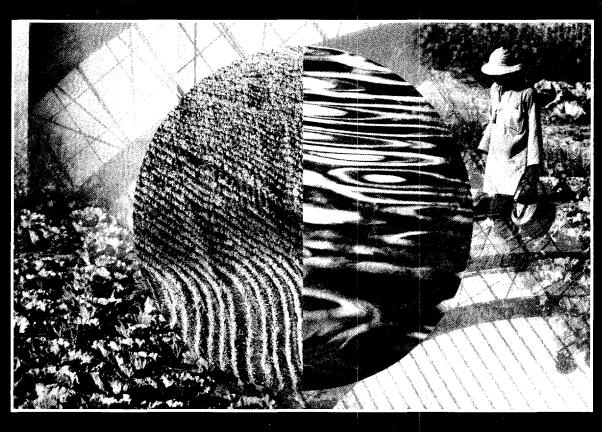
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Case Studies in Participatory Irrigation Management

Edited by

David Groenfeldt

Mark Svendsen



WBI LEARNING RESOURCES SERIES

Case Studies in Participatory Irrigation Management

Edited by **David Groenfeldt and Mark Svendsen**

World Bank Institute Washington, D.C.

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The World Bank Institute (incorporating the former Economic Development Institute (EDI)/Learning and Leadership Center) was established by the World Bank in 1955 to train officials concerned with development planning, policymaking, investment analysis, and project implementation in member developing countries. At present the substance of the WBI's work emphasizes macroeconomic and sectoral economic policy analysis. Through a variety of courses, seminars, and workshops, most of which are given overseas in cooperation with local institutions, the WBI seeks to sharpen analytical skills used in policy analysis and to broaden understanding of the experience of individual countries with economic development. Although the WBI's publications are designed to support its training activities, many are of interest to a much broader audience.

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Foreword

Following the publication in 1993 of the World Bank's policy paper on *Water Resources Management*, the World Bank Institute (WBI), formerly the Economic Development Institute/Learning and Leadership Center, initiated a training program on water policy reform, based on the principles outlined in the policy paper. A series of national, regional, and international seminars was organized to disseminate best practices in water resources management and to stimulate high-level policy dialogue on policy options in the water sector.

Within the irrigation subsector, the WBI training program focused on policies that encourage participation of the irrigation users in managing the irrigation systems on which their livelihoods depend. This theme of participatory irrigation management (PIM) has attracted a great deal of interest among government agencies, as well as the farmers themselves. While the basic principles of PIM (outlined in chapter 1) seem intuitively sound and even obvious, there are surprisingly few cases in which PIM policies are adopted and fully implemented at a national level.

In order to understand better the conditions that give rise to PIM implementation and to provide documentation to be used in training courses, the WBI collaborated with the International Water Management Institute (IWMI) in commissioning studies of situations where PIM seems to have worked. These studies, published in this volume, address the political antecedents of PIM policies, the process of implementing the policies, and the second-generation challenges of sustaining PIM. We hope that the hard-won experience documented in these case studies will prove useful to policymakers and irrigation professionals who are facing similar challenges in their own countries.

Electronic versions of the four case studies (chapters 2–5) and the synthesis of benefits and second-generation problems (chapter 6) are available on the website of the International Network on Participatory Irrigation Management (INPIM) at http://www.inpim.org.

Vinod Thomas, Director World Bank Institute

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Acknowledgments

The case studies in this volume had their genesis in the Second International Seminar on Participatory Irrigation Management, held in Antalya, Turkey, in April 1996. In preparation for that seminar, which was jointly organized by the World Bank Institute (WBI) and the Turkish General Directorate of State Hydraulic Works (DSI), a background paper was commissioned on the participatory irrigation management (PIM) program in Turkey. That paper, authored by Mark Svendsen and Gladys Nott, became the model for a series of other cases that the WBI and the International Water Management Institute (IWMI) commissioned on Argentina, Colombia, Mexico, and the Philippines. All five papers were presented and discussed in a workshop in Cali, Colombia, in February 1997. Four of them were later revised for this publication. Chapter 6 synthesizes the lessons gleaned from the workshop's analysis of these case studies.

Many individuals and institutions were involved in the long process of bringing these case studies to light in the present volume. In addition to the acknowledgments made by the authors of each case study, several separate appreciations are due. In Turkey, the DSI foreign relations officer, Mehmet Cagil, and later Hasan Ozlu, offered invaluable encouragement in planning the Antalya seminar and later in facilitating participation of a key DSI official, Savas Uskay, in the Colombia workshop. Within the World Bank, Joma Mohamadi provided encouragement and guidance. In the Philippines, the National Irrigation Administration (NIA) provided help to the case study author in many ways; special thanks go to then administrator, Rodolfo Undan, and his manager in charge of institutional development, Billy Mejia. In Mexico, many officials within the National Water Commission (CNA) and within the Mexican office of the IWMI, notably Wim Kloezen, aided the case study author.

During the Colombia workshop, the 25 participants offered many valuable suggestions and insights, many of which have been incorporated into this text without acknowledgment. Such is the freedom of information sharing! Carlos Garces (IWMI) and staff from the International Center for Tropical Agriculture, the Colombian irrigation agency (INAT), and the Federation of the Water Users' Associations of Irrigation Districts (FERRIEGO) organized the Colombia workshop. Thanks are due to then director general of INAT, Mario Montoya Negrete, and the president of FERRIEGO, Armando Gomez.

Finally, here in the WBI, grateful appreciation is due to then chief of the Environment Division, Hatsuya Azumi, and to the current manager, Dennis Mahar. Special acknowledgment is made to Peter Sun, former WBI task manager on PIM, who helped frame the concepts upon which this volume is based, and to Anju Sharma, who guided the early production phases of this book.

Abbreviations and Acronyms

AA Administrative agency (of an LDD)

ANUC National Association of Rural Users (Colombia)
ANUR National Association of Water Users (Mexico)

ATP Accelerated Transfer Program

CDA Cooperative Development Authority (Philippines)
CIAT Centro Interacional de Agricultura Tropical (Colombia)

CIS Communal irrigation system (Philippines)

CNA Commission Nacional del Agua (National Water Commission) (Mexico)

CNI National Irrigation Commission (Mexico)

CO Community organizer

CONPES National Council of Economic and Social Policies (Colombia)

CONSUAT Superior Council of Land Development (Colombia)

CORPOICA Colombian Corporation for Agricultural Research (Colombia)

COTAS Committees of aquifer-level users (Mexico)

CP Colegio de Posgraduados (Mexico)

D&C Design and construction

DGI Departmento General de Irrigacion

DNP Department of National Planning (Colombia)

DSI Devlet Su Isleri (Turkish General Directorate of State Hydraulic Works)

EA Executing agency (of an LDD)

FAO United Nations Food and Agriculture Organization

FEDERRIEGO Federation of the Water Users' Associations of Irrigation Districts (Colombia)

FINAGRO Fund for Agricultural Financing (Colombia)

FIO Farmer irrigation organizer FO Farmer organizations

FONAT National Land Development Fund (Colombia)
GATT General Agreement on Trade and Tariffs
GDRS General Directorate of Rural Services (Turkey)

GNP Gross national product
GRU General Registry of Users

Ha Hectares

HIMAT Institute of Hydrology, Meteorology, and Land Development (Colombia)

IA Irrigation or irrigators' association

ICA Colombian Agricultural Institute (Colombia)

ICO Institutional community organizer

ID Irrigation district

IDB Inter-American Development Bank

IDD Institutional Development Division of NIA (Philippines)

IDEAM Institute of Hydrology, Meteorology, and Environmental Studies (Colombia)

IDO Irrigator development officer

IFPRI International Food Policy Research Institute

IG Irrigation group

IGAC Agustín Codazzi Geographical Institute (Colombia)
IIMI International Irrigation Management Institute
IMO Irrigation management organization (Turkey)

IMT Irrigation management transfer

IMTA Instituto Mexicano de Technologia del Agua (Mexican Institute of Water Technology)
INAT Instituto Nacional de Adecuación de Tierras (National Land Development Institute)

(Colombia)

INCORA Colombian Institute of Agrarian Reform (Colombia)

INDERENA National Institute of Renewable Natural Resources and Environment (Colombia)
INIFAP National Institute of Forestry, Agricultural, and Livestock Research (Mexico)

INPIM International Network on Participatory Irrigation Management

ISF Irrigation service fee (Philippines)

IURUDES Irrigation Units for Rural Development (Mexico)

IVA Value added tax (Colombia)

IWMI International Water Management Institute

LDD Land development district

M\$ Mexican pesos (M\$1 = US\$0.125)

m³ Cubic meters

NGO Nongovernmental organization

NIA National Irrigation Administration (Philippines)

NIS National irrigation system (Philippines)

O&M Operation and maintenance

OECD Organisation for Economic Co-operation and Development

P Philippine peso (US\$1 = P27)

PIM Participatory irrigation management PSBR Public sector borrowing requirement

RADAT Administration Regulations for Land Development Districts (Colombia)

REPDA Public Register for Water Rights (Mexico)

RUT Roldanillo-La Unión-Toro Irrigation District (Colombia)

SAC Farmers' Association of Colombia (Colombia)

SAGAR Secretariat of Agriculture, Livestock, and Rural Development (ex-SARH) (Mexico)

SARH Secretariat of Agricultural and Hydraulic Resources (Mexico)

SAT Subdirectorate of Land Development SEC Security and Exchange Commission

SEMARNAP Secretariat of Environment, Natural Resources, and Fishing (Mexico)

SENA National Learning Services

SRH Secretariat of Water Resources (Mexico)
SRL Society of limited responsibility (Mexico)

TL Turkish lira

TSA Tertiary service areas, command areas of about 40 hectares within an irrigation sys-

tem (Philippines)

UPRIIS Upper Pampanga River Integrated Irrigation System (Philippines)

WB World Bank

WBI World Bank Institute
WUA Water users' association

Glossary

agency

articles of association

A public-sector organization that develops and/or manages irrigation systems. The legal document establishing the formation of an irrigation association as a legal entity in Turkey. It sets out all of the provisions for the membership, administration, and dissolution of the association. Also referred to as statutes.

assembly association A group of elected representatives. An association of irrigation users.

A *barrio* or village and the lowest unit of government (Philippines).

barangay barrio

A village (Philippines).

bayanihan

A system of exchange labor and mutual help (Philippines).

branch office

A DSI office, below the Regional Office level, responsible for the administration of a number of irrigation schemes (Turkey).

council decare

A group of elected representatives consisting of less than 10 people (Turkey).

A tenth of a hectare.

district

Irrigation district, a management unit comprising an entire irrigation system

(Mexico).

ejidatario

A small farmer who works land held collectively as an ejido (Mexico).

ejido

A landholding, and the corresponding group of farmers, that is owned by the state and worked by ejidatarios who have use rights to the collective land-

holding (Mexico).

federation

An apex-level body established by a group of irrigation associations to support them and to represent their interests.

general assembly

The governing plebiscite of an irrigation management association. It is composed of members who represent the interests of their constituent irrigators (Turkey).

gross irrigation area

imece

The total area supplied with irrigation facilities. A traditional form of communal labor (Turkey).

irrigated area

The portion of the irrigation area actually irrigated in any given irrigation season.

irrigation area

The portion of the potential scheme command area that the irrigation network has the capacity to irrigate.

irrigation association

An institution formed for the purposes of irrigation operation and maintenance on units covering more than one administrative unit (village or municipality)—the Turkish term is Sulama Birligi, which is sometimes translated as a water users' association (WUA).

irrigation group

An institution formed by the DSI to operate and maintain irrigation facilities at the village level. The *muhtar* or mayor is the designated head of an irrigation group.

kanalet

An irrigation channel constructed out of u-shaped concrete segments joined together and sealed with bitumenized cord. The segments are of varying sizes depending on the water capacity required. They are often supported above the ground by concrete frames, but they may also be positioned at or below ground surface level.

lamina

The planned water duty to be supplied to a particular irrigated area (Mexico).

management committee

A group composed of members selected from the general assembly plus an appointed secretariat. Its function is to advise and support the chair in the matters related to the day-to-day administration of the IMA. Also referred to

as a council (Turkey).

mayor

The elected administrative head of a municipality or city.

module

A subunit of an irrigation district (Mexico).

muhtar

The headman of a village (Turkey).

net irrigation area

The portion of the gross irrigation area remaining after deducting land under roads, water bodies, houses, and so on. The DSI calculates net irrigation by

multiplying gross irrigation area by a factor of 0.864.

pakikisama

Smooth interpersonal relations (Philippines).

region

A geographic area defined according to specified administrative, agroclimatic, or other features. DSI-defined regions are different from agroclimatic regions.

scheme

An irrigation development sharing a common controlled water source (for

example, dam, regulator, or pumping station) (Turkey).

statutes

A term sometimes used as equivalent to articles of association.

unit

A hydrologic segment of an irrigation scheme (for example, left bank, right

bank).

units

Small irrigation systems operated by users (Mexico).

usufructuary

Resource rights that convey permission to use the resource, but not owner-

ship (Mexico).

Introduction: A Global Consensus on Participatory Irrigation Management

David Groenfeldt

Around the world, countries that once promoted more government involvement in irrigation management are adopting new policies that do just the opposite, creating incentives for farmers to take over the management of operations and maintenance, while government agencies focus on improving the management of water at the main system level. Is this just another management fad? Will the pendulum that is now swinging toward greater management control by farmers soon swing back the other way, toward greater state control? There is strong evidence that the current fad of participatory irrigation management (PIM) is here to stay. Governments cannot do everything, and there are some things that they are simply not very good at doing. Farmers who depend on irrigation water for their livelihoods have the strongest incentive to manage that water carefully. No public sector agency could ever match the discipline that farmers impose on themselves when they manage their own irrigation systems.

One of the most impressive examples of PIM is in Mexico, where the government adopted a new water policy in 1989 that included a resolve to transfer large irrigation districts to user management. The success of Mexico's program on irrigation management transfer has proved inspiring to several other countries and has in large part served as the core model for the World Bank Institute's (WBI's) training program on PIM.

Most of the industrial countries adopted PIM policies some time ago as a matter of fiscal necessity. Australia, Japan, Spain, and the United States are just some of the countries where irrigation management has largely been transferred from government agencies to the control of the users themselves. In the United States, for example, the government has promoted the management turnover of irrigation systems that were built and operated by the Bureau of Reclamation. Individual farms have become members of large irrigation districts, and the engineers who now operate the canals and distribute water to each farmer are the employees of the farmers whom they serve.

Farmers in industrial countries enjoy high levels of education and strong support services through both the private market and the public sector (such as the agricultural extension service). Does a management approach that works well in an industrial country setting have any relevance to developing countries where literacy rates may be low and support services unreliable? Participatory irrigation management may be even more important in a developing country context for the following reasons:

- Cost—Countries incur a high financial and a social cost when government agencies assume irrigation management functions that farmers could otherwise handle themselves.
- Incentives—Irrigation users have stronger incentives to manage water productively than does a
 government bureaucracy.
- Efficiency—When management is decentralized to users, they can respond more quickly to problems or changes in the system.

Aside from the theoretical arguments in favor of PIM in both industrial and developing countries, there is the empirical fact that participatory management approaches are becoming accepted policy in more and more countries.

What exactly do we mean by the term PIM? Participatory irrigation management, or PIM, refers to the involvement of irrigation users in all aspects and at all levels of irrigation management. "All aspects" includes the initial planning and design of new irrigation projects or improvements, as well as the construction, supervision, financing, decision rules, operation, maintenance, monitoring, and evaluation of the system. "All levels" refers to the full physical limits of the irrigation system, up to the policy level in the capital city. Any management function, including the setting of policies, can and should have a participatory dimension to it.

Can irrigation users—farmers—perform the sophisticated management functions necessary to operate a large, modern irrigation system? The answer to this question depends on the management role we are talking about. Can farmers perform irrigation engineering functions? Probably not. But neither can most of us repair the engine of our car if it needs major work. Our lack of knowledge about mechanical engineering does not prevent us from driving the car or owning the car. We make our own decisions about when and from whom to seek technical assistance. The same type of relationship applies to farmers who control the operation of their irrigation system. They need not do the technical work themselves. They can employ specialists who work on their behalf.

Is participation always necessary? Does participation interfere with efficient management in some circumstances? Do we have to allow farmers to come into our board rooms and advise us on how to do our jobs? Are there some natural limits to what irrigation professionals should be responsible for and what farmers should become involved in?

A good rule of thumb is that a participatory dimension is important to all management functions. PIM means "participation" not only in operation and maintenance (O&M) and financing, but in making any decision that will affect system operation and performance, including design choice, contracting arrangements, or O&M costs or financing that farmers will be responsible for under PIM. Farmers should participate in decisions about both the physical design (layout, type, and placement of structures, and so on) and the institutional design (type of organization and its functions) of their irrigation system. Let farmers suggest and decide on the roles that they would like to perform and the roles that they want government to perform.

The focus on participation within the field of irrigation management has emerged naturally from a concern about management functions. The question that participation addresses is "Who is best suited to carry out which management functions?" When this question is asked objectively by someone with a knowledge of comparative experience from such countries as Mexico and Turkey and who is familiar with locally managed traditional irrigation systems in many countries, the answer involves a greater degree of user participation than is typically the case at present. The emphasis on participatory irrigation management is an attempt to rationalize the present lopsided management arrangement between government agencies and farmers. Governments are trying to do too much and have far exceeded their realm of comparative advantage. Farmers have been excluded from irrigation management decisions that they can and should—from an efficiency perspective—be involved in.

This volume reports on four countries where the state's role in irrigation management has undergone fundamental change and where the result has been a much greater management role for farmers. Are we placing an onerous burden on the farmers, or are we creating an opportunity for a new type of productive partnership to emerge between the community of irrigators and the state?

In the cases presented in this volume, the net result for most farmers is clearly positive. Overall, farmers are receiving better service in return for their involvement in system management. Farmers are paying more for this service than they did under the government's management; in some cases (Mexico) they are paying much more. But the results appear to be worth it. So far we do not see irrigation system management reverting back to the state once transfer has been made to the irrigators. The experience, as the case studies show, is not without problems, and it is fair to say that full management transfer to farmers is not the appropriate solution in every case. But it is clear that a participatory approach to irrigation management can help revitalize the irrigation sectors in many countries. The cases in this volume have much to teach us.

Benefits and Second-Generation Problems of Irrigation Management Transfer in Mexico

Enrique Palacios V.

Summary

Mexico has served as a model for other countries considering irrigation management transfer programs. The transfer program there began in 1988 following a set of sweeping economic reforms that were introduced in 1986. A powerful new water resources agency, the National Water Commission (CNA), was created in 1989; a new water law was enacted in 1992 and approved by Congress in early 1994. By the end of 1996, 87 percent of the area under medium and large irrigation districts in the country had been transferred to users' associations to manage.

The CNA had the lead responsibility for carrying out the transfers of management responsibility. They held extensive preliminary meetings with both ejidatarios and landowners, touting better and more responsive service and greater efficiency before the user' associations were formed. They also promised government assistance with system rehabilitation and equipment purchases, promises that were only partially kept.

Because of tensions between ejidatarios and landowners, an arrangement was worked out whereby a representative of one group served as the president of the board of directors of the association, while the post of treasurer was filled by a representative of the other group. These posts alternate between groups at every election. A general assembly, usually made up of all landowners and representatives of the various ejidos involved, elects the board of directors. The capability and energy of the directors selected by the general assembly have been critical determinants of association effectiveness and sustainability.

Federations of users' associations are being established at the whole system, or district, level to manage the main system. A representative nationwide federation has also been established to represent the irrigator's interests.

In a farmer opinion survey, about four farmers out of five indicated they thought irrigation service and maintenance had improved since the transfer. Data on water use, however, indicate that, on average, systems are using somewhat more water per unit area after the transfer than before. Systems are generally in poor condition and in need of rehabilitation.

The most dramatic results of transfer have been financial. In the early 1980s, the government was providing about 80 percent of the funds needed for system operation and maintenance (O&M). Today the figure is about 25 percent. At the same time, irrigation fees have increased more than fourfold. Many associations are branching out into other economic ventures, including credit provision, joint input purchase, and farm equipment rental to members.

Second-generation problems are emerging. These include conflicts over water, often with municipalities, due to poorly specified rights; insufficient revenue to support proper O&M; poor accounting and bookkeeping practices; widespread firing and hiring of staff when directors change; nepotism in staff appointments; and the use of director positions as political springboards. Other problems stem from the poor condition of the irrigation infrastructure and the failure of the government to fulfill rehabilitation and modernization commitments and duplication of effort and poor coordination between associations and the CNA. After its downsizing, the CNA is top-heavy with managers and directors and requires a thorough reorganization to adjust its structure to its new role.

Introduction

The climate and soil conditions in most of Mexico are not suitable for rainfed farming. Almost two-thirds of the country is arid or semiarid. Average expected annual rainfall with a 50 percent likelihood is 684 millimeters, whereas the average evapotranspirative demand is around 1,400 millimeters—twice the demand of rainfall. Rainfall is generally distributed in the summer and early fall months.

As to the soils, the conditions are not favorable either. Thus despite the nearly 2 million square kilometer surface of the country, two-thirds of the surface is mountainous or hilly with steep slopes unsuitable for agriculture, and another portion is desertlike. Only 30 million hectares (ha) have suitable slopes for farming, most of them in barren lands. Under these conditions, irrigation is essential to obtain economically productive harvests. Table 2.1 shows production data for 1993.¹

The value of the irrigated yield is 56 percent of the total, though the irrigated harvested area is only 29 percent. The productivity of irrigation farming is 3.2 times that of rainfed farming, which shows the importance of irrigation to the supply of food and raw materials.

The area under irrigation is divided into two types: irrigation districts and irrigation units. The irrigation districts, of which there are 82, encompass about 3 million hectares.² The size distribution of the 79 completed districts is shown in table 2.2. District irrigation is also called *la grande irrigación* (large irrigation) and was, until recently, managed by the government. There are more than 30,000 small irrigation units with a nominal area of about 2.5 million hectares. Unlike the irrigation districts, such units have always been operated by their users.

According to the Federal Water Law of 1971, irrigation districts should be managed by the federal government. However, by the end of the 1980s the government was subsidizing almost 75 percent of the

Table 2.1.	Production	Data.	Mexico.	1993
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Туре	Area cultivated (hectares)	Area harvested (hectares)	Value of production (millions of US\$)	Productivity (US\$/hectare)
Rainfed	13,967,621	12,393,870	3,078	250
Irrigated	5,238,254	5,029,456	3,997	<i>7</i> 95
Districts	3,100,662	3,004,142	1,970	656
Units	2,137,595	2,025,314	2,027	1,000
Total	19,205,875	17,423,326	7,075	406

Source: SARH (1994).

Table 2.2. Sizes of Irrigation Districts

Irrigated area (hectares)	Number of districts	Total area	
Less than 10,000	23	131,900	
10,001 to 50,000	39	980,821	
50,001 to 100,000	9	690,256	
100,001 to 200,000	3	374,817	
More than 200,000	5	1,158,377	
Total	79	3,336,171	

Source: Author's research.

^{1.} This chapter uses an exchange rate of US\$1 = M\$8.

^{2.} Three irrigation districts are under construction and only partly operational.

costs of operation, maintenance, and administration of the districts. This fact, contrasted with the total absence of support to the users of the smaller irrigation units, created a privileged group of producers in irrigation districts. Moreover, in spite of the large governmental subsidy, districts were not receiving adequate maintenance, causing deterioration of their infrastructure. Mainly for these reasons, beginning in 1988 the federal government decided to transfer responsibility to operate, maintain, and manage the irrigation districts to organizations of users.

Many problems arose as the transfer process began, as discussed later. The most important problems are the following:

- The Water Law forced the irrigation agency to divide districts into smaller irrigation units that would later be called modules in order not to confuse them with units.
- Water charges were raised more than 400 percent in order to achieve financial self-sufficiency as a precondition for transfer.
- Opposition arose within the National Water Commission (CNA), because staff thought they would be negatively affected by the transfer.³
- Organizing water users' associations (WUAs), which would be in charge of operating the modules, was difficult.
- The process of dividing the irrigation districts into modules proved to be challenging.

Despite initial difficulties, the process has been carried out successfully, and so far (1997) more than 88 percent of the districts' area has been transferred. However a second generation of problems is being detected. These problems require study, analysis, and action to resolve.

National Context

After the convulsive phase of the Mexican Revolution from 1910 to 1920, another 20-year period of adjustments and socioeconomic changes followed, during which an industrialization policy was formed, and major hydraulic works were begun. These innovations allowed agricultural production to increase. In the 1950s, a stabilizing period of growth began. Financial, fiscal, and monetary policies suppressed inflationary pressure and created a suitable atmosphere for increased internal savings and expanded private and foreign investment. A change in agriculture took place in this period with the advent of the green revolution, which led to significant increases in the production of food and raw materials and kept the peso stable (Wionczek 1971).

However, from the 1960s on, the Mexican government pursued a closed economic policy in order to strengthen national industry. In the agricultural sector, a policy of subsidies was defined, both for inputs and outputs. During the 1970s, the policy of subsidies was expanded, along with government takeover of many companies. This provoked a significant increase in the government's internal and external debt. The resulting instability of the peso brought about its devaluation, after being stable for more than 20 years.

These policies compelled the government to increase significantly the external debt; it grew from US\$4 billion in 1970 to more than US\$80 billion in 1982 when government subsidies were covered mostly with the funds obtained from foreign credits. The discovery of large oil reserves in the southeast of the country provided collateral for borrowing; however, when the price of oil fell, the ability to borrow was reduced.

By the end of 1981, the economic situation was serious, with an overvalued peso and a large government debt that required foreign currency for the payment of the interest. This forced the government to devalue the peso once again in early 1982. Eventually, the government could not pay its international

^{3.} Most of the acronyms for names of Mexican organizations represent the Spanish names rather than their English equivalents and thus do not correspond with the translations given. The reason for this is that the acronyms have often become words in themselves and would be unfamiliar to both Mexican and international readers if they were changed to represent the translation.

creditors, and another devaluation took place that affected the entire national economy. Nevertheless, policies of protectionism and subsidies were retained for another five years. The price was a considerable increase in the rate of inflation, which reached an annual rate of 200 percent in early 1988, and a contraction of the gross domestic product (Inter-American Development Bank 1984).

This dire situation forced the government to modify its economic policies significantly. Starting in 1986, a series of changes was introduced—economic liberalization, entry into the General Agreement on Trade and Tariffs (GATT), reduction of subsidies, fiscal policy reform, and the initiation of a privatization program.

As the six-year presidential term (1988–94) started, the new National Plan of Development 1989–94 was presented, and a new economic program to open all sectors of the economy was ordered. The plan also called for the privatization of most state companies. These policies served as the basis for a change in agricultural policy. Based on the new National Plan, the Integral Program for Agricultural Modernization 1990–94 was elaborated.

Among the most noteworthy changes in agricultural policy, the modification of Article 27 of the constitution stands out. The outcome of this change was a policy that allowed *ejidatarios* to become owners of their plots and to form mercantile associations with private entrepreneurs for the exploitation of their lands. Another change in the Water Law allowed the creation of a market of rights to water and established a Public Register for Water Rights (REPDA). Moreover, fiscal policy was significantly modified to support the processes of privatization. One consequence of those changes was the government's decision to transfer the operation, maintenance, and management functions of irrigation districts' infrastructure to organizations of users created for that purpose.

Agriculture

Water is a vital element for agricultural production and for economic development in general. However, the spatial and temporal distribution of water in Mexico restrains its use. Because of this distribution, it has been necessary to build a large infrastructure to capture, store, and allot this element among water users.

Profitability. Table 2.1 illustrates the importance of irrigation to the country's agricultural production. More than half of agricultural production is obtained by irrigation farming, though the harvested area represents less than 30 percent of the total. The productivity of irrigation farming is 3.2 times that of rainfed farming. Economic productivity in irrigation units is 50 percent greater than in irrigation districts, both because the cultivation patterns are more profitable (table 2.3) and because their smaller size and reliance on groundwater induces them to use resources more efficiently. Nevertheless, productivity in the smallest units is low, removing them from the range of market profitability.

Table 2.3. Distribution of Crops in Irrigation Districts and Units, 1993

Стор	Irrigation districts (percent)	Irrigation unit (percent)	
Basic grains	49.2	41.5	
Oil seeds	15.2	3.6	
Sugarcane	3.0	6.2	
Vegetables	3.8	6.3	
Orchards	3.5	14.2	
Forage	14.0	21.8	
Fibers and tobacco	2.7	1.2	
Other crops	8.6	5.2	
Total	100.0	100.0	

Source: Author's research.

Agricultural productivity has increased in recent years for two reasons: first, less efficient producers have gone out of the market, which can be confirmed because harvested areas have decreased since 1987 in both the rainfed and irrigated areas. Second, producers have acquired better technology to compete in the North American market. However, due to the intense competition in this market, the withdrawal of subsidies, the decrease in the prices of many products, and a raise in input costs, many producers are facing serious financial difficulties.

HOLDING SIZE AND LAND TENANCY. As shown in table 2.4, 536,438 users on 3,522,323 hectares were registered in irrigation districts in 1993. Of those users, nearly three-quarters are *ejidatarios*.

The average areas per user are relatively small, particularly in the irrigation units. However, disparities in holding size are pronounced, because both *ejido* and private plots of less than one hectare per user are common. At the same time, many landowners have farms of more than 50 hectares. And when family firms are established by combining the landholdings of individuals, land areas may surpass 500 hectares. According to the new Agrarian Law, it is now possible to establish family farms with areas of up to 2,500 hectares. Sometimes small farmers do not earn enough profit to make a living from agriculture, so they take other off-farm jobs to increase family income.

WATER Cost. Because water is a scarce resource in many parts of the country, its marginal cost should be very high. When water comes from overexploited aquifers, such as those in the Lagunera region or in the Bajio, pumping depths are often greater than 100 meters, and the total cost of water supply, including fixed and variable costs, can be over US\$15 per thousand cubic meters.

In spite of water's value, the cost for gravity irrigation service is relatively low. This is because, first, water is generally not priced by volume, and second, even when it is priced by volume, the cost is less than US\$4.40 per thousand cubic meters.

Water Resources Development

Starting in 1947, the government defined a clear policy of water resources development and management and founded a state secretariat for that purpose, the Secretariat of Water Resources (SRH). The SRH was divided into three undersecretariats, one of which was responsible for irrigation. All decisions about the use, exploitation, and management of water were concentrated in this agency. In 1976 the secretariat was merged with the Secretariat of Agriculture and Livestock into one single secretariat, the Secretariat of Agricultural and Hydraulic Resources (SARH). In subsequent years, more changes followed as secretariats disappeared and new ones were created every six years (in accordance with the presidential cycle) until 1989. In that year, the National Water Commission was created with a mandate that encompassed most aspects of hydraulic policy, similar to the situation that existed under the SRH many years earlier.

Table 2.4.	Land Tenancy	in Irrigation	Districts and	Units, 1993

	4	Area (hectar	es)		Users			ea/user ctares)
System type	Ejido	Private	Total	Ejido	Private	Total	Ejido	Private
Districts	1,948,423	1,573,900	3,522,323	388,712	147,726	536,438	5.0	10.7
Share (percent)	55.3	44.7	100.0	72.5	27.5	100.0		
Units	1,070,395	828,270	1,898,665	378,453	140,518	518,971	2.8	5.9
Share (percent)	56.4	43.6	100.0	72.9	27.1	100.0		

Note: Units not registered are not considered. Area without irrigation rights is considered to be within the irrigation district. Source: CNA (1995).

BUDGETARY CONSTRAINTS. From 1971 to 1988 investment in the hydro-agricultural sector was consequential, representing an average of 80 percent of the public investment in agriculture. Since that time, investment has declined significantly. After most irrigation districts were transferred to users' associations, funding for both capital investment and operation and maintenance declined even further. The enormous public debt, internal and external, still restricts government budgets and makes a return to the days of massive investments in the water sector unlikely.

Farmers in irrigation districts and irrigation units are concerned about the lack of government resources for the rehabilitation of deteriorated hydraulic infrastructure. They are also worried about the reduction of governmental technical assistance to water users, a result of the decreasing budget that has shrunk operating funds and reduced the hiring of new technical staff.

STAFF COMMITMENT. When SARH existed, a technical group responsible for the management of irrigation districts was formed. Another group provided technical assistance to users in irrigation districts and units.

During the critical period from 1982 to 1988, most of the qualified staff providing this technical assistance left the agency. Technical training for government personnel was significantly reduced, and many laboratories built in irrigation districts disappeared. A training center that had been created in the 1970s in Carrizo, Sinaloa, for the SRH staff and irrigation district personnel also closed.

When the CNA was created in 1989, it made worker's training and education a part of its strategy to improve management of irrigation water. The agency involved the Mexican Institute of Water Technology (IMTA) in preparing technicians to manage irrigation districts. These technicians, in turn, trained many of the technicians who were hired by the new user-controlled irrigation management organizations after the transfer. Many of the technical staff who provided this training have now left government service, so there is a need to create a new system that can provide ongoing training and assistance.

THE CIVIL SERVICE. When it existed, SARH operated within the civil service system and filled most vacancies from within. This allowed the agency to retain qualified staff with experience in SARH's different areas of work. There was a similar situation in the Secretariat of Agriculture and Livestock.

This situation has now changed, and many qualified staff have been laid off or have left their posts because of turmoil caused by the extended period of instability and change in the structure of the water-related government institutions that characterized the sector until 1989. New personnel who have replaced the previous technicians are often not as technically knowledgeable as their predecessors.

Legal and Institutional Framework

Under Article 27 of the constitution in Mexico, surface water is generally the property of the nation. Groundwater is not clearly defined as national property, notwithstanding the fact that the federal executive is to regulate its exploitation and use, as established in that article of the constitution. The same article also establishes that the state has the right to grant the control of water to legal entities for its use, exploitation, and harnessing through titles of concession.

To implement Article 27, several laws on the use and management of national waters were enacted, starting with the Law on Irrigation and Federal Waters of January 1926. The National Water Property Law was issued in 1929 and modified in 1934 and defines *Juntas de Agua*, users' organizations that would receive irrigation districts after their construction. Implementing regulations were issued in March 1936. Additional implementing regulations relating to groundwater were issued in December 1956. Other complementary laws were the Law on Irrigation, the Federal Law on Sanitary Engineering, and the Law on Cooperation for the Allocation of Drinking Water.

In 1971 these laws were reviewed, and a new federal water law was formulated that authorized a major role for the state in administering hydraulic resources. The Federal Waters Law was enacted and approved in December 1971, but implementing regulations were never issued.

In the 1980s it became apparent that the Federal Waters Law needed to be complemented with fiscal laws that could control the overexploitation of groundwater aquifers and water pollution. The Federal

Law of Rights, enacted in 1982, divided the country into zones according to the availability of groundwater and established charges for the right to use water that reflected the degree of scarcity of the resource.

At the beginning of the present decade, the legal framework regulating water resources was modified again to bring it into line with new liberalized economic policies of the government. In 1992 the new National Water Law was enacted. Implementing regulations were approved in January 1994.

Water Rights in the Agricultural Sector

According to Article 20 of the National Water Law, the use and exploitation of national waters by *civil personae* (*personae* físicas o morales in Mexican legal parlance) would be carried out through concessions granted by the federal executive through the CNA. Article 50 of the same law states that concessions are granted to *civil personae*, such as the WUAs, for the individual use and exploitation of national waters for farming purposes and to *civil personae* for administration and operation of irrigation systems or for shared exploitation and use of national waters for agricultural purposes.

The granted rights, expressed as average volumes obtained from natural or artificial water supplies, are to be registered in REPDA and can be transferred temporarily or permanently. This implies that it is possible to establish a market of water rights across a basin, aquifer, district, or irrigation module that would be regulated by the law.

Articles 51 and 66 of the law contain regulations that define appropriate management practices for concessioned resources and the irrigation districts that manage them, and they spell out sanctions that apply when regulations in the law are violated. More serious infractions require the intervention of authorities with legal power such as a government ministry or municipal authorities.

The lack of clear implementing regulations relating to the management of water at the level of districts, units, and associations leads to conflicts, many of which are resolved by the CNA. These problems should be easier to work out when the respective implementing regulations are approved, because the resolution of conflicts will not depend on a limited number of public officials but on a set of established rules.

Government Organizations

The institutions created to regulate the exploitation and use of the hydraulic resources of the country changed considerably after the revolution. An early creation was the National Irrigation Commission (CNI), which was principally responsible for planning, design, construction, and operation of irrigation and drainage infrastructure. In 1946 this commission became the Secretariat of Water Resources. Later it was merged with the Secretariat of Agriculture and Livestock to form SARH, creating a gap in all water resource management sectors except agricultural. In 1989, acknowledging that water is a natural resource independent from the economic sectors that exploit it, the CNA was created as a decentralized institution of SARH. Then, in December 1994, the Secretariat of Environment, Natural Resources, and Fishing (SEMARNAP) was created and the CNA attached to it as a decentralized body, administratively independent from the secretariat.

NATIONAL WATER COMMISSION. The CNA's mandate is to:

- Manage all national surface and groundwater resources, both in its amount and quality.
- Assume responsibility for the efficient use of water resources and the maintenance of their quality for all uses and by all users.
- Introduce economic mechanisms and the financial incentives that foster efficient use of water and, at the same time, increase financing possibilities of the sector.
- Preserve hydraulic works as a basis for the sustainable development of the country and the welfare of the population.

SECRETARIAT OF AGRICULTURE, LIVESTOCK, AND RURAL DEVELOPMENT (SAGAR). At one time, SAGAR was the parent secretariat for the CNA. Under the new organizational setup, the two are separate, and SAGAR is

responsible for agricultural planning. Coordination with the CNA is carried out through the directive boards of rural development districts, within which the irrigation districts and units are located.

SAGAR has direct responsibility for supporting irrigated farmers, providing technical assistance for production and assistance in obtaining inputs such as seeds, fertilizers, and pest treatments. Some of these inputs are made available by a SAGAR branch, the National Institute of Forestry, Agricultural, and Livestock Research (INIFAP).

Local Organizations

Under the 1992 water law, two levels of local irrigation organizations were established. The lower level is that of the irrigation module, managed by a water users' corresponding association and to a hydrologically defined subset of an irrigation district. Several of these modules may be federated into a legally defined society of limited responsibility (SRL).

Water Users' Associations. Organizations whose main function is the operation, maintenance, and management of the irrigation infrastructure can be established as civil associations and granted certain fiscal privileges. The boards of directors of these associations are selected by an assembly composed of water users of the irrigation modules in the irrigation districts or units. When the number of users is considerable, as with the modules of many *ejidatarios*, the members of the assembly are delegates who are elected from each *ejido*.

A board of directors is formed by a president, a secretary, and a treasurer, with their respective alternates. These posts are usually held for two or three years, and sometimes the same people can be reelected. Positions on the board of directors are not compensated. In addition, there is an oversight committee composed of a board member and representatives of *ejidos* and of small farmers. This committee serves an inspection and auditing function to prevent blatant corruption.

FEDERATIONS OF WUAS. In several irrigation districts that have been transferred, federations of WUAs are being established (nine so far) as SRLs, which are given charge of the operation and maintenance of the major canal, drain, and road networks and serve all WUAs within their jurisdiction. In some relatively large districts, more than one SRL has been formed.

At a national level, a federation of the WUAs called the National Association of Water Users (ANUR) has been established and represents the WUAs in negotiations with the CNA, SEMARNAP, and SAGAR.

Contractual Agreements

To transfer the responsibility to operate, maintain, and manage irrigation infrastructure, and to operate the equipment and installations that the government previously managed, each WUA receives a concession title, or concession, issued by the CNA. An appendix to the concession contains a technical instruction booklet in which regulations for operation, maintenance, and management of the infrastructure works and equipment are specified. Rights and obligations of the WUAs and the CNA are stated in the concession and in the attached appendix.

The CNA is the supervising organization for the operation, maintenance, and management of the transferred infrastructure and equipment. The CNA also provides the WUAs with technical assistance in carrying out operational activities.

Promotional Activities

Organizing meetings with water users of the district was the first action carried out in all transferred districts. The purpose of these meetings was to explain the transfer program, its advantages, and the responsibilities the organization of users would take on. Hundreds of meetings to introduce and promote transfer were held.

These informational meetings were organized mainly by CNA staff, though IMTA and, later on, some private companies also participated. Existing organizations of farmers were utilized in setting up these

meetings. Of particular importance were the organizations of *ejidos*, whose members can be assembled quickly by summoning their common-land commissioners. This group of users required clear information about the potential advantages of the transfer. Other important farmer organizations were credit unions, producers' associations of particular commodities, the Farmers' National Confederation, the Independent Farmers' Confederation, and other groups at the local level.

Various advantages were described to users in these meetings, starting with the advantages that management by a users' organization has over management by the government. This was a convincing argument in many areas, due to the slow response from the government agency to problems that required immediate solution. Not only were responses slow, they were also expensive. Another advantage described was better service given by staff hired by water users, compared with services provided by unionized government workers.

One serious obstacle to transfer was the low irrigation tariffs then in force, which were grossly inadequate to cover the cost of proper operation and maintenance. Convincing water users of the need to raise tariffs was not easy. Yet users eventually accepted that they were the principal beneficiaries of good irrigation service and good maintenance of the infrastructure and so they should be in charge of it. Before 1989, agreements reached with the users were to raise water tariffs gradually until financial self-sufficiency could be achieved. However, once the process started, the increases were expedited, and agreements on this acceleration were reached with the WUAs.

At the beginning of the transfer process, most districts were told that the deteriorated infrastructure would be rehabilitated and that new machinery and equipment for maintaining that infrastructure would be acquired. However, the government has allocated insufficient funds to rehabilitate the infrastructure works in all irrigation districts. Funds to be used for that purpose were from a loan by the World Bank, which, along with a corresponding contribution from the government and a joint financing from the Inter-American Development Bank, totaled about US\$1.25 billion. Thirty-five irrigation districts were actually updated. During 1998–99 the World Bank loan will support a strong modernization program sharing the costs with the WUAs. The plans are to modernize more than 250,000 hectares.

The CNA has been providing some of the districts with new machinery and obtained a new loan from the World Bank for farm-level improvements of irrigation and drainage infrastructure in the transferred modules. However, because of the government's financial problems, this program has not proceeded smoothly.

Forming Water Users' Associations

Before the current transfer program, there was already significant experience with users' organizations that operated, maintained, and used the irrigation infrastructure. Irrigation units have long been operated successfully by organizations of users. Within irrigation districts, however, experience was limited to the Rio Yaqui district in Sonora. The operation and maintenance of secondary systems of canals and drainage channels had been transferred to users' associations as a pilot.

Taking into account these antecedents, several possible forms of users' organizations were considered by the government. It was decided to create civil associations, because they offered certain advantages from the fiscal point of view; they would be considered nonprofit, untaxed associations that were to operate profit-making ventures.

At the beginning of the transfer process, an important legal obstacle for transferring responsibility to operate and maintain the infrastructure emerged. According to the Federal Waters Law, the only body that could legally operate and maintain irrigation infrastructure in the districts was SARH. In order to clear this obstacle, districts were artificially divided into smaller irrigation units, called modules, which could be legally operated and maintained by their users. These modules were formed by taking into account existing infrastructure, topography, the number of users, and the extant administrative division of the district for water distribution.

Establishing an association involves a series of steps. In organizing the association, the water users select a board of directors comprising a president, a secretary, and a treasurer and their corresponding

substitutes. This was not easy at the beginning because of the different forms of land ownership. Some *ejidatarios* would not accept a landowner as a president, and landowners would not accept an *ejidatario* in this position. To solve this problem, the users agreed to form mixed boards in which a board with an *ejidatario* president would have a landowner as the treasurer, and vice versa. They further agreed that these roles would reverse at the next change of the board.

Operation and Maintenance in Transferred Modules

The transfer program includes a period of shared management between the CNA and the WUA. During the first phase, there is parallel management of the works of the minor network of canals, drains, and roads, in which the CNA and the WUA staff jointly carry out O&M so that the new staff receives on-the-job training in these activities. This shared O&M generally lasts for about six months. After that, the CNA staff is removed, and operation and maintenance of the minor network of canals, drains, and waterways are performed by the WUA.

During the second phase, the WUAs operating and maintaining the minor network become part of a SRL, which assumes charge of the operation and maintenance of the major networks of canals, drains, and waterways. The CNA's responsibilities after that time are limited to operation and maintenance of the headworks, drainage and irrigation technical assistance, and the supervision of the activities carried out by the WUAs and the SRLs.

At present, most irrigation districts are formulating new regulations, according to the instructions contained in the National Water Law. These regulations are to include a specific chapter on water management under conditions of scarcity. One interesting aspect of this chapter is the instruction to restrict the area that would be possible to irrigate with the normally available water. The redistribution of the available water is up to the WUAs. Two proposals are offered to accomplish this. The first proposes distribution of the available amount of water in proportion to the volumetric water right that each user has registered. The second proposes distribution of the available amount of water among the registered plots. Where the amount of water assigned to a plot is more than the average water duty of the district, the remaining water would be distributed among other water users. The first alternative is advantageous for users with small irrigation areas, and the second one is advantageous for users with larger irrigation areas. The alternative chosen by the WUAs is specified in the module regulations.

Status of the Transfer Process

By the end of December 1996, 92 percent of the total gross area of the irrigation districts in Mexico had been transferred to 386 WUAs. Of 82 irrigation districts, 64 had been totally transferred to the WUAs, 11 were partially transferred, including 3 that were still under construction, and 10 that were initiating the transfer process. The transfer process is expected to be completed by late 1999. In table 2.5, a summary of the progress of the transfer process is shown.

Results of Management Transfer

The Colegio de Posgraduados (CP) carried out a study of WUA performance in a sample of transferred districts by administering questionnaires to the WUA directors and users (CP 1994). The survey questioned 700 users from four transferred irrigation districts to learn their opinions about the service offered by the WUAs in terms of water distribution and system maintenance (table 2.6).

Water Distribution

A study was carried out in Alto Lerma, Guanajuato, to learn how water in the Salvatierra module is being distributed. The study employed indicators estimating the adequacy, efficiency, reliability, flexibility, and

		Annual		Cumulative			
Year	Area (ha)	Users	Modules	Area (ha)	Users	Modules	
1990	130,564	14,128	19	130,564	14,128	19	
1991	425,158	43,520	53	555,722	57,648	72	
1992	945,076	128,246	114	1,500,798	185,894	186	
1993	726,090	105,301	97	2,226,888	291,195	283	
1994	232,086	32,844	33	2,458,974	324,039	316	
1995	295,087	70,628	45	2,754,061	394,667	361	
1996	162,224	32,967	25	2,916,285	427,634	386	

Table 2.5. Area, Users, and Modules Transferred, 1990-96

Source: CNA files.

Table 2.6. Users' Opinions about Water Distribution in Four Transferred Districts

Торіс	Percentage of users
Water distribution is improved	84
Enough water is received	79
Water is received when needed	79
Water is measured accurately	64

Source: CP (1994).

equity of irrigation service. The study found that the operational performance was, by and large, good during the agricultural year 1995–96. It was found that there are limitations in the capacity of some structures that prevent better performance (Melgarejo 1996).

According to the National Water Law, users are entitled to receive an amount of water from the allocation the CNA provides to each module proportional to the size of their plots. However, at present, water is not being distributed by volume, as specified in the law. It is expected that allocational rules will be developed and approved by the modules in the near future and that the delivery of measured volumes of water will improve the quality of irrigation service.

As water management shifts to a volumetric basis, some problems are expected, particularly in districts with varied crop patterns. In some districts in northwestern Mexico, for example, where crops with high consumption demands such as sugarcane and rice are grown along with shorter season crops such as beans and vegetables with lower water demands, growers of high consumption crops will not have enough water to meet their crop needs. It is expected, therefore, that they will be forced to buy additional water rights from those users who have a surplus.

Maintenance

In most districts, infrastructure is in bad condition. In some cases, this is because the infrastructure is old. In other cases, it is because there has been poor maintenance due to a lack of funds. Although many WUAs have started programs to clear away the maintenance backlog and to modernize their systems, funds are generally insufficient to carry out these tasks.

In the CP study (CP 1994), about 80 percent of those interviewed considered that maintenance had improved since the WUAs have been in charge. However, these studies also show that not all modules perform adequate maintenance.

The CNA checks the annual maintenance programs that the WUAs propose and makes corrections and suggestions. Funding the programs is the responsibility of the WUAs. The WUAs are thought to do

a better job of carrying out maintenance of the infrastructure than the CNA, because unit costs have gone down and the WUAs are more flexible in administering funds.

Because of the poor condition of much of the infrastructure in many districts, it is essential to rehabilitate and modernize these works. ANUR has recently come to an agreement with the CNA on cost sharing for rehabilitation. Under the agreement, the government will pay 50 percent of the cost and the users pay the other 50 percent. Large districts are expected to have an easier time mobilizing their share of the funds through credits than are smaller districts. Some special assistance for the smaller districts may be needed.

Agricultural Production

Several changes in irrigated agricultural production are evident before and after the transfer period. These include a notable reduction in oilseed production, an increase in the production of grains, an improvement in land productivity, and a reduction in harvested areas as the less competitive producers drop out of the market. However, because the transfer program was a part of a much larger liberalization of the agricultural economy, it is not possible to assert that the changes taking place in the crop patterns and productivity are due to the transfer. These changes are more likely due to the changing price structure of agriculture, including the reduction of subsidies on production inputs, increases in output prices, and the disappearance of guaranteed output prices.

Although the productivity of water has increased in nominal terms following implementation of the economic reforms, in real terms there have been declines in both output per unit land and output per unit water since 1992 (table 2.7). These declines are most probably due to severe drought that affected the northern part of the country where much of the irrigation is located, rather than to the transfer program. For 1996, prices of outputs went up and the water availability diminished, so productivity should also have improved, but data are not yet available. A 1994 CP survey in four transferred districts indicates that 80 percent of the producers interviewed think that association management has led to an improvement in agricultural production (CP 1994).

Somewhat surprisingly, water duty increased even during the drought years of 1993 and 1994. This may suggest a tendency for user-controlled districts to use more water per unit area, but district-level figures should be consulted to evaluate this possibility. For 1995, duty values returned to pre-transfer levels, perhaps indicating a learning period following the transfers during which the new managers developed their operating skills.

Table 2.7. Harvested Areas, Water Volumes, Value of Production, and Productivity in Irrigation Districts, 1990–95

Year	Area (millions of ha)	Volume (billions of m³)	Value (billions of M\$)	Value	Duty (m/ha)	Land productivity (billions of 1990 M\$)	Water productivity (1990 M\$/m³)
1990	3.0320	30.6720	10.3099	10.3099	1.01	3,400	0.336
1991	3.0976	33.6582	13.1164	11.0407	1.09	3,564	0.328
1992	2.8410	29.9858	14.1957	10.6780	1.06	3,759	0.356
1993	3.0041	33.7730	15.7573	10.9751	1.12	3,653	0.325
1994	3.1033	35.9223	16.7818	10.9507	1.16	3,529	0.305
1995	2.7979	29.8443	19.9053	8.5453	1.07	3,054	0.286

Note: Values in columns 5, 7, and 8 deflated to constant 1990 M\$ using the national index of consumer prices. Source: CNA files.

Finances

An essential requirement for successful transfer was the financial self-sufficiency of users. Consequently irrigation water charges went up in a majority of districts. As financial self-sufficiency was attained, the transfers were carried out. However, this process was not easy: the necessary increases to achieve financial self-sufficiency were as much as 400 percent. For example, in the Rio Lerma irrigation district, the cost of service per hectare per irrigation went up from M\$9.50 to M\$55, an increase of 578 percent.

The share of the O&M district budget recovered from users reached crisis levels in the late 1970s and early 1980s, when M\$4 of every M\$5 spent were coming from the central government. This situation helped precipitate the subsequent transfer reforms that had reduction of subsidies as an important goal. Since that time, cost recovery levels have risen to the point where nearly M\$4 of every M\$5 come from the users.

However, financial sufficiency is hard to retain for several reasons. First, the associations' income not only depends on the level of the tariffs but also on the amount of water that the districts have. This dependency is even stronger when tariffs are volumetric or quasi-volumetric, because the amount of available water will largely determine the income received. A lesson to be learned is related to the tariff structure that should include two items (irrigation right or abstraction fee and the volumetric consumption). This structure would in principle minimize the risk of the WUAs' income failure during extreme years (both drought and rainy) when the WUAs' income is severely reduced. Another important factor affecting the associations' financial sufficiency is the high inflation rate in Mexico. Although the WUAs should index their tariffs to adjust for this, most do not.

Users' share of O&M costs rose sharply in the years just before transfer, peaked in 1994, and has declined slightly since that time, due to the failure of fee levels to keep pace with inflation (table 2.8). The government subsidy, provided in terms of unreimbursed expenditures on main system operation and maintenance by the CNA, is steady at 15 percent.

According to the Federal Law of Rights, the WUAs are exempt from paying for the right to use water—they must pay only the cost incurred by the CNA in the bulk delivery of water to the module or district. All charges should be based on the volume of water supplied.

To prevent variation in the WUAs' income based on the water supply, the instruction booklet attached to the concession right indicates that the tariff should be calculated each year by dividing the estimated O&M budget by the amount of water that is authorized to the module. This approach supposes that water fees are charged by volume. In fact, irrigation tariffs are not charged this way. The WUA directors have to negotiate with the users over the amount users will have to pay for irrigation service. In many modules, fees are assessed per hectare. In others they are assessed per irrigated hectare, in others by type of crop and area planted, and, in a few cases, it is assessed by volume. One very important point to highlight is that with the transfer, maintenance technology and management efficiency changed

Table 2.8. Distribution of O&M Costs of Transferred Districts, 1990–96 (percent)

Year	Users' share	Government subsidy	Deficit
1990	39	35	26
1991	52	22	26
1992	62	17	21
1993	72	15	13
1994	78	15	7
1995	73	15	12
1996	72	15	13

Source: Author's research.

significantly. The machinery mix was completely modified, changing from old, expensive, and inefficient machinery to a modern mix of light and productive machinery. Also the machinery operators hired by the WUAs are much more productive than the government staff that operated the machinery before farmers. New technologies, such as chemical and biological pest control, were also introduced. The service provided now is much better than before the transfer.

COLLECTION. In most irrigation districts, users are required to pay the irrigation tariff in advance of service. This form of charging for service is an advantage for the WUAs, because it provides income from the beginning of the irrigation cycle. Even during 1995–96, when severe drought and attendant financial crises occurred, more than 90 percent of users paid water charges.

The user's instruction booklet states that irrigation tariffs are to be paid to banks where banks are available, which is the case in most irrigation districts. This makes the process of collecting the tariffs relatively simple. The user who wishes to irrigate applies to the module's administration, where the user's personal information is requested and the plot for which the user will pay is verified to be in the census of water users. The user is then given an invoice that indicates the amount to pay, according to the prevailing assessment in the module. The user then goes to the bank with the invoice, pays it, and receives a receipt that he will show to the ditch tender when he requires irrigation service. Because the money is managed through a bank account and most of the WUA's expenses are paid by check, the control of entries and expenses is relatively easy.

Investments. The irrigation tariff should include sums for the creation of a contingency fund and the amortization of machinery and equipment indebtedness. In the past, the CNA forced users to maintain an amortization fund. However, national financial regulators did not permit the use of the accumulated funds. The constant devaluation of the peso and the high inflation rate also actively discourage the establishment of such funds. Such financial discipline is unlikely to be achieved until national level policies that discourage it are altered. ANUR is attempting to create a national contingency fund to cover financial problems in the WUAs caused by weather-related disasters.

As mentioned earlier, the CNA transferred existing machinery to districts by means of loans. Most of this machinery was in bad condition. The CNA has also provided some WUAs with new equipment. However, the equipment at the WUAs' disposal is, in most cases, inadequate to meet maintenance needs. On their own, many WUAs have made considerable investments in new or reconditioned equipment.

Many WUAs have made significant investments to repair or modernize their infrastructure. To do this, they have turned to bank loans in which the irrigation tariff serves as a guarantee. A number of these WUAs have been negatively affected by the significant increase in interest rates that took place in 1995.

Change in Public Institutions

Institutional changes have been taking place since the irrigation sector reforms began with the creation of the National Water Commission in 1989. In 1994, SEMARNAP was established and the CNA became part of it.

In 1996, IMTA was founded. The institute is a decentralized unit of the CNA; it is in charge of capacity building and generating and transferring technology to water users. Among other functions, it supports the transfer process by promoting the program in user meetings and by training irrigation district staff.

Changes within the CNA have not all been positive. Among the problems is a proliferation of general assistant offices and management offices, although a decentralization of functions to the state level has started. It is expected that many CNA functions will be carried out by the states as a result of this decentralization process. For this purpose, specialized hydraulic departments are being created at the state level, such as the new water office in Guanajuato state. Some of these changes have caused confusion among the agricultural producers, because the responsibilities of the new federal and state government agencies are not yet clear (CP 1996).

Water Users' Associations

In general, the WUAs have fulfilled their role better than was expected. Of course, there are deficiencies. Sometimes these shortcomings are due to a lack of qualifications on the part of the directors and the new staff. At other times they are due to the directors' failure to supply leadership or because of the directors' conflicting responsibilities and lack of attention to WUA affairs (CP 1994).

The degree of participation of water users was evaluated in a 1996 study, which concluded that participation by *ejidatarios* is less than that of landowners (CP 1996). Users' interest in WUA activities is generally stronger in those districts that were transferred some years ago, as evidenced by their greater attendance at assembly meetings and their more active participation.

Elections for the directive boards have become more complex because of the strong interest of users both in the election of directors and in the form of electing them. This interest has caused conflicts in many modules. Nevertheless, the interest and participation of users are compelling directive boards to improve their performance.

In many districts, the WUAs are not only distributing water and maintaining works but also organizing themselves to assist members of their district in commercializing agricultural production. In the Alto Lerma district, Guanajuato, several WUAs, such as the Jaral del Progreso and Valle de Santiago, distribute fertilizers at a cheaper price than does the local market, rent machinery for minimum tillage, and offer other services to association members. In other WUAs, members are trying to organize themselves as credit unions to provide their users with loans for repairs to machinery and equipment and to support them in adjusting to the new commercialized production environment. Similar moves are taking place in the WUAs in the Cortazar and Salamanca irrigation districts. This kind of effort is spreading to other parts of the country as well, particularly in the north and northeast where levels of organization are high. Here association members receive loans for purchasing inputs, principally from companies and business people.

During late 1997, 25 WUAs began to operate a new program of modernization and rehabilitation, sharing the investments with the CNA under a 50/50 basis. This program is modernizing and improving roads, drains, canal linings, control and measurement structures, and saline land rehabilitation.

WUA Federations

As of December 1996, 11 SRLs had been established, 8 of which were in complete operation. New societies were being established in five other districts. Like the WUAs, many SRLs are interested in expanding their efforts beyond operation, maintenance, and management of the major infrastructure of the districts into other activities.

ANUR, a federation of most of the WUAs in the country, was founded in 1994 and their directive board reelected in October 1996. In negotiations with the CNA and other government institutions, ANUR succeeded in obtaining an agreement to share the costs of rehabilitation and improvement work evenly with the districts, a concession for the use of the Carrizo Training Center, and several other minor agreements.

Training Programs

Various training initiatives were conducted as part of the transfer process. Both government staff and the farmers themselves required training in the new arrangements that had evolved with the transfer of management.

Training for CNA Staff

When the CNA was created in 1989 and placed under SARH, irrigation districts were integrated into existing rural development districts and staff reassigned, reducing the support and training capability of

irrigation field staff. Training of personnel to operate the irrigation systems thus became highly important. Training for temporary staff to operate the districts was provided by the CP and later by IMTA through a contract with the CNA. Technicians who had experience in operations and maintenance were hired as trainers, working with professors from the CP who had formerly worked in the irrigation districts. These technicians then provided training to the new WUA directors and technicians.

Training for WUA Board and Staff

The training program for the WUAs involved the promotion of the transfer process among users and the training of the WUA directors and operating personnel. Initially it was thought that the training program could be coordinated by the United Nations Food and Agriculture Organization (FAO); however, an agreement to this effect was not reached and most of the coordination was carried out by IMTA staff with some FAO assistance on communications technology. However, staff from the irrigation districts were in charge of the training and of the in-service training that took place during the parallel operation period.

In-Service Training

Operational, technical, and managerial training should be continuous, because continuous changes occur in the irrigation districts.

As result of negotiations among the WUAs, ANUR, and CNA, a program of continuous training, with the participation of the various state governments, is about to start. In order to establish this program, it is necessary to form a group of trainers at a regional or state level with knowledge of basic water management, in addition to obtaining staff from involved universities and state and national technical institutes. Funding for the training is to come from the federal government and the WUAs. As a first step in organizing these programs, the National Center for Training on Irrigation, located in the irrigation district of Valle del Carrizo in Sinaloa State, has been transferred from the federal government to ANUR.

Second-Generation Problems

Since the districts, divided into modules, were transferred to their corresponding associations of users, new problems have appeared. These are termed second-generation problems, so that they are not mistaken for ongoing problems, as mentioned earlier. Of course, some problems of the second generation are related to the first one. It is important to point out that they are also related to the socioeconomic problems that burden the agricultural sector in general, mainly because of the crisis affecting the entire country.

Among the problems faced by users' organizations, the following types can be pointed out as the most important: legal problems; financial self-sufficiency and investment financing; water management, maintenance, and repairs; inter-institutional coordination; environmental impacts; and leadership, management, and support of the WUAs.⁴

Water Rights and Other Legal Issues

The new National Water Law provides a suitable framework to solve most of the problems related to the use, exploitation, and management of hydraulic resources. Water rights are generally defined, a registry for water rights is being established, and the outlines of a market for water rights are given. However, although implementing regulations for this bill already exist, there are many legal gaps. Guidance is needed on ways to solve specific problems at the level of the basin, irrigation district, and users' organization, as the law itself requires.

Problems are not arranged in order of importance.

The most important legal deficiency is the lack of definition of rights to water—rights that the WUA should have. A volumetric right of water was not part of the concession title given to the modules. Titles only indicate that the CNA will annually define the supply of water in order for the irrigation districts and the corresponding modules to make plans. In this respect, there is great confusion, because neither the law nor its regulation explain the difference between a water right and a water allocation.

It is supposed that rights to surface water flows relate to the average water runoff to which a particular water user is entitled, whether by concession (for individuals or civil associations) or by appropriation (for government institutions). This is the value considered in REPDA. Each year, according to the supply of water, the CNA will authorize a water supply that should be proportional to the right that was assigned or granted.

This lack of definition about volumetric amounts of water granted to the modules is a cause of many problems and conflicts among the water users. An example is the conflict between the users of Irrigation District 26 and Monterrey city over use of water from the Rio San Juan. Other conflicts include those in the Las Lajas River in Guanajuato, the Atoyac River in Puebla, and others where construction of works in the upper parts of the basin has been undertaken, even though the water supply was already assigned to the lower area.

The lack of regulations at the levels of the basin, district, and association leaves the solution of problems and conflicts to the CNA, creating problems that could be prevented if regulations existed. Among the present problems, the ones generated by the lack of water in the north tend to get worse with the increase of urban and industrial demand, as is the case in the Rio Bravo Basin.

Other legal issues that must be clarified through the issuance of new regulations are:

- The priority to be given to the use of water for human consumption in the districts, because there
 is confusion about what domestic, human, and urban uses are and how the priority rights for these
 uses should be established over the agricultural use of water, mainly during water shortages
- The need to include amounts of water for ecological purposes in the irrigation plans of districts and modules to keep pollution levels at acceptable concentration
- Definition of rights to water at the users' level—irrigation district hydraulic committees should clearly propose such definitions in accordance with Article 26 of the National Water Law.

Considering the similarity of many problems whose solutions relate to new regulations, ANUR is already working with the CNA personnel in the development of new regulations at the district and users' organization levels.

Financial Requirements

Two-thirds of the members of boards of directors in surveyed modules indicated that the funds obtained through water charges were insufficient to cover operation, maintenance, and management costs (CP 1994) at adequate levels. They also confirmed that maintenance is reduced when money is in short supply. In most cases, fee levels have been raised, but at a rate less than inflation because it was felt that water users were facing economic difficulties.

At the same time, more than half of the directors surveyed acknowledged that they have not been able to reach a satisfactory agreement concerning the payment of fees to the CNA for bulk water supply. The study concluded that regulations on quantifying such fees were inadequate (CP 1994). This is because the methodology proposed in the instructions attached to the concession titles is not followed, and those fees are often charged as part of the quotas but not in volumetric terms as established by the law. The percentage has generally been negotiated with the CNA by the directors of the individual modules and, therefore, the amounts vary, even in similar conditions of operation.

Because there are no regulations about reporting expenses and keeping books, considerable differences are found in the way accounts are kept among modules. This makes auditing accounts, and comparisons among the modules, difficult.

FIXED AND VOLUMETRIC TARIFFS. There are many ways to charge for irrigation service, from the simplest method of using annual area irrigated to the more complicated volumetric methods. When charges are levied volumetrically, associations risk not being able to recover costs in years of water shortage. Because of this risk, mixed methods are recommended that contain both a set fee to help cover associations' fixed expenses and a volumetric component linked to the amount of water delivered, which make the user conscious of economy in water use.

Sinking Funds and Reserves. Most associations establish neither a sinking fund that would enable them to replace equipment nor a financial reserve that could be used for emergencies. Inquiries carried out among module directors indicate that they do not think it advisable to set up a reserve fund, given the current high inflation rate and the risk of a new devaluation and consequent loss of value of the reserve.

Water Management, Maintenance, and Repairs

Problems have arisen in irrigation and maintenance services since the WUAs have been in charge of operating the irrigation systems. These problems are due to the lack of adequate operational staff training, to a lack of operational regulations at the association level, and to the poor condition of the irrigation infrastructure that was transferred without a complete rehabilitation.

Most of the main and distribution systems are unlined and operate through outdated control and water measurement structures. Losses as well as maintenance and operation costs are high.

OPERATIONAL PROBLEMS. A problem that has become common in many modules is that the amounts of water in the irrigation plans are not sufficient to satisfy the water demand of the established crops. This situation can be due to the irrigation of a larger than planned area or to the use of more water than the amount considered in that plan or to a combination of both.

In either case, if water is available in other modules, the deficit module could buy water from those with a surplus. However, when no such surplus exists, the modules lacking water will repeatedly request it from the CNA, which will eventually supply it because crops cannot be lost according to Article 68 of the National Water Law. As a consequence, a larger amount of water than that authorized is being extracted from supplying resources. This, in turn, reduces the water supply available for other modules and districts.

If water were delivered to the users by volumetric allocation, its management could be significantly improved, the marketing of water and rights could be facilitated, and many problems could diminish. However, in many cases, the infrastructure to measure water at the users' level does not exist. This is considered the main obstacle to establishing a system of delivery by volumetric allocation in the districts. Actually, the will to deliver the water in such a way does exist, and in some districts in the north of Mexico water is delivered volumetrically. This is a solvable problem, and efforts should be made to implement volumetric deliveries.

Infrastructure. Much of the irrigation and drainage infrastructure as well as the maintenance machinery were transferred to the modules without being repaired. Most of the facilities and equipment is still in bad condition, not only because of its antiquity but also because of inadequate maintenance. In some districts repairs to facilities were made as part of the transfer process. However, in most cases, the CNA did not have enough funds at their disposal to complete that task. When the transfer process started, the CNA promised that at least the most damaged infrastructure would be repaired. However, these repairs were not made adequately.

As a result, modules have difficulty in providing adequate irrigation service. Some modules state specifically that it is impossible to provide water in the amounts and at the times required by users because of the poor condition of the infrastructure. In other cases, soil has become saline because drains do not function properly.

There have also been complaints about the lack of machinery for maintenance. Because repair costs are high, it is sometimes more economical to buy new equipment. Some modules have done so with their own funds.

The problem of deferred maintenance has been exacerbated in many cases, because service fees have not been raised to keep pace with inflation, making fewer resources available to provide maintenance and to preserve infrastructure works.

Coordination

According to a survey carried out by the CP, there is, in many cases, a lack of coordination between the activities of the WUAs and the CNA, resulting in duplication of effort and inefficiency (CP 1994). The CNA's functions in the irrigation districts where the SRLs have been created are now supervisory rather than operational.

Environmental Effects

Irrigated agriculture can cause serious negative effects in the natural environment. Incorrect handling of water for irrigation tends to raise the water table, causing waterlogging and salinization of the soil. This is common in irrigation districts. Agrochemical residues from intensive agriculture can pollute drainage water, which eventually moves into streams and water bodies with the resultant pollution.

Irrigated agriculture is also seriously affected by environmental effects created elsewhere. Significant damage is caused in upper basins by deforestation, which affects irrigation systems downstream with changed hydrographs and increased silt loads. Moreover, other water users, such as those from the neighboring towns and industries, pollute water that is withdrawn by irrigation systems, restricting its use. Complaints from the WUAs about this problem deserve consideration.

Leadership, Management, and Support Skills

Elections for the boards of directors in the associations have been the key to their effective functioning. Directors with strong managerial skills achieved sound management of the transferred infrastructure and provided good irrigation service to association members. Where directors lacked managerial skills, modules faced managerial, financial, and operational problems.

Many financial and operational variations in module management exist. A great part of the success in achieving good operation and maintenance in the modules depends on the skills of the hired staff and, particularly, of the technical manager. In this regard, the need for a national or regional system of training and of continuous assistance for the technical and managerial staff of the modules is great. That system should also provide assistance and training to the directors who request them, considering the frequency with which they change.

Another important human resource problem is the frequent change in operational staff as membership on directive boards changes. Often, a number of the new personnel are not even technicians but are the new director's relatives or friends. Unfortunately, this situation, common in the government sector and sharply criticized because of its negative effects, also exists in some associations of water users in the private sector. Of course it is definitely legal and advisable to replace personnel not adequately fulfilling their duties. But the unjustified replacement of technical staff and the waste of expensive training must be stopped.

Another problem that requires attention relates to the power acquired by directors, because they control a resource of such importance in the agricultural sector. In some cases, directive posts in associations are used as springboards to political positions. There has been at least one case (in Nayarit) where, according to representatives of these associations, association funds were reportedly used for a political campaign. Such actions disrupt O&M and threaten the very existence of the association.

Problems and Solutions

Progress in addressing water resource problems over the last eight years has been impressive. The CNA, a new national water agency, was created as were a set of WUAs, which now manage modules covering 85 percent of the irrigation district area in the country. SRLs have been established to manage entire districts, and subsidies have been reduced from 90 percent to only 25 percent in just five years.

From these successes have come second-generation problems. The CNA, the WUAs, and ANUR are addressing many of the problems that have been described, contributing to solutions. For instance, the provisions of the new National Water Law have been elaborated through court cases and issuance of regulations; the Law of Rights has been modified to define groundwater zones according to the availability of water, and water taxes are set accordingly; and WUAs and SRLs are exempted from income taxes on irrigation tariffs.

The establishment of REPDA and the possibility of commercializing water rights will help to regulate water demand. Negotiations with the users to apply the National Water Law and its regulations will enable those users to improve water management.

Nevertheless, much is still to be done; a new culture of water has begun, and the progress so far is little compared to the work that remains. The major problems are elaborated in the following paragraphs, along with some suggested solutions.

Legal Issues

The solution to second-generation legal problems involves developing acceptable implementing regulations to the National Water Law at the level of the basin or aquifer. This process will take time, yet steps have already been taken. The CNA has requested the CP to develop regulations in eight districts that have had problems with water in the past farming cycle and to gain agreement of water users with the new regulations. The CP was also asked to prepare a set of model regulation for the modules.

The elaboration of regulations at the level of the basin will be more complex. Nevertheless, negotiations with water users in two important basins in the northeast of Mexico, the Rio Fuerte in Sinaloa and the Rio Yaqui in Sonora, where all water is already allocated and used, have started. These "high-stress" districts provide an ideal laboratory in which to develop procedures that will permit the balancing of water supply and demand. Ways to regulate demand, including an assessment of conditions in which water markets can be established, must also be developed.

As to environmental improvement, it is still hard to convince water users to use "ecological" amounts of water whose runoff is necessary to guarantee the survival of aquatic plants and animals. In order to achieve this objective, it will be necessary to carry out a promotional campaign directed to water users from the agricultural, the urban-domestic, and agroindustrial sectors.

It is necessary to regulate the overexploitation of aquifers. The CNA has contracted for studies to define the actions that will stop the overexploitation and then begin the process of restoration. Actions considered include using more efficient irrigation methods, advertising campaigns alerting users to the importance of maintaining this resource, limiting rights of water extraction, and reducing energy subsidies. Currently, the CNA is organizing committees of aquifer-level users (COTAS) to seek their participation.

Financial Requirements

At present it is difficult for many WUAs to generate sufficient income to achieve financial self-sufficiency. Several solutions have been proposed. One calls for indexing irrigation tariffs to the prices of agricultural products. Another proposes a tariff structure with a fixed component, estimated in terms of water rights, and a variable component, based on water delivered. These proposals are in the regulations currently being negotiated with users in pilot districts. The users' agreement to the allocation of part of their payment to a contingency fund will depend on successful government efforts to control inflation or on the creation of a national contingency fund.

A nationwide set of standard bookkeeping practices is needed for the WUAs. It is also necessary to mandate both technical and accounting annual audits in all the WUAs. ANUR could recommend bookkeeping and accounting standards and develop software to improve financial management.

The CNA is seeking a new loan from abroad to support the repair of the infrastructure in the irrigation districts. ANUR and the CNA have agreed that the WUAs and the federal government should share the costs of rehabilitation equally. During 1997 this new cofinancing mechanism began to work on a pilot basis with the World Bank's assistance. A robust program for modernization is planned for fiscal 1998 and 1999.

Water Management, Maintenance, and Repairs

The lack of water measurement and flat rate charging systems for irrigation water have fostered waste, lack of equity in water distribution, low yields, soil salinization and waterlogging, and aquifer mining. The obligations of managers and the tariff system are being considered in the regulations that are being negotiated. Still, users' concurrence is necessary for the regulations to be effective.

Training the directors and operating technicians hired by the WUAs is essential to improve the management of water. Users agree on this need, and it is being negotiated at present with the CNA and state governments.

Problems generated by the poor condition of the infrastructure are significant, because they make the delivery of water more difficult, diminish the flexibility of the network, delay the delivery of water, and lead to delivery of too much or too little water. For all these reasons, the WUAs are trying to solve these problems by modifying the infrastructure, working around it, and improving maintenance. However, in many cases major rehabilitation is needed, which generally requires more funds than the WUAs are able to muster. The proposed cost-sharing arrangement with the CNA will contribute greatly to the solution of this problem.

Coordination. It is supposed that the roles of WUAs, SRLs, and the CNA are well defined in the instructions for system operation, maintenance, and management. Instruction booklets are given to the WUAs as annexes attached to the concession titles. However, good coordination in system operations is not always achieved in practice, in part because the CNA's structure in the irrigation districts has not adapted to its new supervisory functions. For this reason, the posts of heads of units, maintenance residents, and chiefs of zones, in some cases, are still kept. This situation contributes to high CNA operating costs.

The CNA's structure should be modified and adapted to its new roles and functions. Also, since some of the CNA's operational functions are to be transferred to state governments, the prospective role of state governments should be considered in the restructuring.

Environmental Effects. Irrigated agriculture plays a role in environmental deterioration, although it is relatively modest when contrasted with the damage caused by urban and industrial sectors. Some of the legal and managerial solutions suggested earlier will help ameliorate these impacts. Moreover, new regulations tighten control of the dumping of agrochemical wastes. Nevertheless, the need to make users aware of the importance of preserving the environment should be emphasized.

At the same time, it is of utmost importance to propose practical actions to prevent the dumping of sewage water from towns and industries and to reduce the pollution of rivers and aquifers, because irrigation users are the ones directly affected. Not only are they forced to use polluted water, but water quality constrains their crop choices, particularly the more profitable fresh fruits and vegetables.

Leadership and Sociopolitical Problems

The election of the WUA directive boards generated conflicts in the beginning when the associations were formed. Since that time, however, water users are participating more actively in the election of their

executives, and conflict has decreased. These processes will improve as experience is gained, particularly if additional training is made available.

The problem of changing the WUAs' qualified staff without justification following the selection of new directors can be solved if the new regulations for the modules define the guidelines to be followed in laying off qualified personnel. Such provisions are being considered in the preparation of draft regulations.

Also, regulations may help to control the politicization of the directive posts and the misuse of the operation and maintenance funds for political purposes. The problem that is experienced in some modules—using a director's seat as a springboard to political office and neglecting association duties—should be eliminated.

Lessons Learned

There is no doubt that much has been learned in the process of transfer. In the beginning, the WUA directors did not know clearly what their duties were. How they would react to operational, maintenance, and management problems was unknown. Results show that the directors are learning quickly and have acted responsibly to solve problems. Most modules are managed well and, in the opinion of the users, they offer better service than that offered by government staff in the past.

Yet challenges remain. Only 6 irrigation districts remain to be transferred, but another 11 irrigation districts have been transferred only partially. These districts have social and infrastructure problems that have to be corrected before transfer can be completed. Nevertheless, with the knowledge acquired so far, it should be possible to design a strategy to complete the transfer. From the experience gained in Mexico, several suggestions can be offered to other countries considering similar programs.

- Promotional programs explaining the advantages of participatory irrigation management are essential initial activities for successful transfer programs. They can be implemented through meetings, workshops, and distribution of pamphlets.
- It is important to raise irrigation tariffs to the level of financial self-sufficiency before the transfer so that the WUAs can support adequate operation and maintenance programs.
- Government agencies should provide for ongoing programs of rehabilitation and modernization of infrastructure and support for the WUA directors.
- The larger the module, the cheaper will be its operational costs per unit area.
- The election of a WUA's first set of directors is critical for the future of the association. When the
 directors are representative of the membership and have leadership capacity and managerial spirit,
 the WUA will likely be successful.
- Successful transfer requires an appropriate legal framework. This framework defines clearly the
 rights to water, forms of organization, the responsibilities of each party, and the manner in which
 activities should be regulated. Fiscal benefits must also be considered for companies that manage
 the irrigation and drainage infrastructure.
- A transfer program should be accompanied by training for both the WUA directors and their operating staff. The system of training should be ongoing.
- To finance programs of support, the government should provide subsidies. It should also foster
 the participation of users in support programs and, if possible, the participation of state or county
 governments. Users' participation will guarantee not only better management of funds but also
 the users' interest in the programs.
- Once the process of transfer is carried out, public agencies previously in charge of water management should be restructured. Their new roles should be oriented toward guidance and supervision of the new managing entities and acting as a link between the WUAs and the government. To perform this new role, they must have an adequate staff with an appropriate mix of skills. In the case of Mexico, because investment in constructing new hydraulic structures will

be significantly reduced, the CNA's role should be oriented to helping to solve problems of operation, use, negotiation, and management of water, and to supervise and support the WUAs and the application of the National Water Law.

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Irrigation Management Transfer in Turkey: Process and Outcomes

Mark Svendsen and Gladys Nott

Summary

Turkey began an accelerated program of transferring management responsibility for large irrigation systems to locally controlled organizations in 1993. Within three years, the national irrigation agency, the Turkish General Directorate of State Hydraulic Works (DSI), had succeeded in transferring nearly 1 million hectares, or 61 percent of the publicly managed irrigation in the country, to local government units or to special-purpose irrigation associations (IAs) created at the local level. Important motives driving this fast-paced implementation were (a) the rapidly escalating labor costs, (b) a hiring freeze in government agencies, and (c) the consequent concern over the agency's ability to operate and maintain systems serving the expanding irrigated area for which it was responsible. Also, World Bank pressure for improved cost recovery provided added impetus for change. Bank-funded study tours to Mexico and elsewhere gave DSI managers a vision of what could be accomplished through a program of management transfer to locally controlled organizations.

The transfer program was undertaken entirely with existing DSI staff and was implemented in the field by regional DSI operation and maintenance (O&M) division personnel. Extensive training and orientation programs were held to acquaint field personnel with the program and the approach to be used. A defining feature of the program was the initiation of action through existing local government structures and leaders rather than through the grassroots organization of farmers. In this respect it differs sharply from many of the management transfer efforts that preceded it, especially those applied in Southeast and South Asia.

Another characteristic of the program was the size of units transferred and the numbers of farmers served by each unit. Sizes of the IA-managed units averaged 6,500 hectares, much larger than the units organized to receive management responsibility in Indonesia, the Philippines, and Sri Lanka in the 1980s. The organizational structure employed was a unified one, not the federated type found in large indigenous systems such as those in Nepal. Organizational structures are similar, in some respects, to those of irrigation districts in Australia, Canada, Germany, New Zealand, and the United States and drainage districts in the Netherlands. There are strong similarities to the module organizations in Mexico, which is unsurprising given the interactions that took place early in the program.

Initially the transfer resulted in a doubling of irrigation fee collection rates and a shifting of O&M expenditures from the public to the private sector, an accumulation of reserves in some IAs for future capital purchases, a reduced wage bill for system O&M personnel, and indications of expansion of irrigated area in some transferred schemes. DSI personnel levels have been strongly resistant to reduction, even with the diminished need for staff as a result of the transfer program, limiting the actual cost savings to the government. There are indications, however, that O&M staff levels are beginning to decline, and significant financial savings by the government may lie ahead. The number of farmer complaints fielded by the DSI has fallen dramatically in the wake of the transfer program, although it is not known if the number of total complaints has declined, or if complaints are being handled at a local level rather than by higher-level offices of the DSI. The transfer program in Turkey is still young, and time is required before its true impacts will be known.

Second-generation problems and challenges are emerging in the wake of the early successes of this initiative. These can be categorized in terms of the party on which they have their primary effect. Challenges for the DSI

include (a) the difficulty in reducing overall staff levels in general, and O&M staff levels in particular, following transfer; (b) the absence of a charging mechanism for bulk water supply to the IAs and the consequent absence of an economic restraint on demands for water; and (c) the indistinct vision of a new role for the agency in supporting existing irrigation in the post-transfer era.

Nascent problems for the IAs include (a) the undefined nature of water rights in Turkey and the consequent insecurity of their claim on irrigation water; (b) the restricted options for obtaining heavy maintenance equipment; (c) the lack of a legal basis for forming federations of the IAs for joint purchasing and supplying major services such as equipment maintenance; (d) the lack of a clear de facto policy on capital cost sharing for rehabilitation and new system construction; (e) the need to increase direct farmer participation in the IA governance and reduce dependence on village and municipal leaders in filling the IA leadership roles; and (f) the weak support service systems for the IAs in some areas and regions.

The flexible and pragmatic conduct of the transfer program to date and the enthusiasm and capability apparent in many association leaders offer reason for hope that problems will be met and addressed. In some areas action is already underway. A World Bank loan currently being appraised will help to ease the equipment constraint with subsidized purchase arrangements for the IAs. The water rights situation, however, presents a potential problem of major dimensions that will require upper-level action to remedy. Other constraints will require concerted action by the DSI, the IAs, and other organizations. The real danger is complacency, in which the government washes its hands of irrigation management entirely and fails to apprehend its ongoing role in monitoring and addressing emerging problems in the areas of policy, finance, regulation, oversight, and supporting services.

Introduction and Background

Since 1954, Turkey has had a legal framework allowing the transfer of management responsibility for publicly constructed irrigation schemes to local control. Such transfers proceeded at a modest pace until 1993, when the program received new impetus and the rate of transfers accelerated sharply. The World Bank played an important catalytic role in this acceleration, and since that time the program has successfully transferred about 1 million hectares to local management. The study on which this chapter is based documented the process of transferring management responsibility for state-run irrigation schemes from the state hydraulic agency, DSI, to local institutions; assessed impacts, benefits, and costs; looked ahead to potential future problems and challenges; and identified factors that have facilitated the transfer process.

The study was commissioned by the Economic Development Institute of the World Bank and was carried out during one month in early 1996 by the two authors and three staff members of the DSI Operations and Maintenance (O&M) Department.¹ Following discussions in Ankara, the study team traveled to three of the four pilot transfer regions in the country, visiting regional, branch, and scheme level DSI offices; 20 irrigation associations; an irrigation scheme transferred to a municipality; a groundwater irrigation scheme operated by a cooperative; and a private village irrigation scheme. Secondary data assembled by the DSI was analyzed to provide quantitative time series assessments.

This chapter is organized in seven sections.

- An introduction and background section that reviews selected features of geography, government, the economy, hydrology, agriculture, and irrigation in Turkey
- A discussion of the organizations involved in irrigation development and management, indigenous management practices, and the transfer process as developed and practiced in Turkey
- A description of the structure and functions of a typical irrigation association
- A description of scheme operation, maintenance, and financing under irrigation association management

^{1.} Mr. Ergun Doker, the head of the Management Transfer Program; Mr. Faruk Erdogan, the deputy head of the program; and Mr. Gokhan Ozgen, monitoring and evaluation specialist.

- An assessment of the results of transfer in terms of service costs, cost recovery, farm income, quality of irrigation service, changes in the DSI structure and functions, and conflict management
- An assessment of the effectiveness and sustainability of the DSI transfer program
- Conclusions and a discussion of emerging second-generation problems likely to affect the DSI and irrigation associations in coming years.

Country Context

Turkey is located at the eastern end of the Mediterranean Sea between 35 degrees and 42 degrees north latitude, with a total area of 779,452 square kilometers. Water is a limiting factor for agriculture over much of Turkey. Average annual precipitation is highest in the Black Sea region (1,120 millimeters), and it exceeds 800 millimeters a year in some of the coastal areas. However, in the remaining 70 percent of the country, which includes some coastal areas, Thrace and eastern Anatolia, precipitation averages less than 500 millimeters a year. In the highland plains of central Anatolia, it averages less than 400 millimeters.

GOVERNMENT. Turkey is a parliamentary democracy. The Turkish Grand National Assembly is composed of 550 deputies elected by direct general ballot for a term of five years. Turkey is administratively divided into 78 provinces (*il*) and 900 districts (*ilce*). Locally elected assemblies include the general provincial assembly, the municipal assembly, and the village council of elders. Mayors of cities, district centers, and towns and village heads (*muhtars*) are also directly elected. The provincial governor (*vali*) and the district administrator (*kaymakam*) are civil servants appointed by the Ministry of the Interior.

Demographics. The population of Turkey is approximately 63 million, based on an average annual population growth rate of 2.2 percent per year since the 1990 national census. The high population growth has been associated with high rates of migration. Emigration abroad, particularly to Europe, has slowed considerably since the mid-1980s. Currently most of the migration takes place within Turkey, much of it to industrial cities including Izmir and Adana in the Accelerated Transfer Program (ATP) pilot provinces. Although the number of people living in villages has changed little since 1980, remaining at just above 23 million, overall population growth has reduced the share of village residents from 75 percent of the population in 1950 to just 37 percent today. The three biggest cities (Istanbul, Ankara, and Izmir) together contain about one-quarter of the nation's population.

The accelerating migration from rural areas to urban centers reflects recent developments in agriculture, where mechanization and the loss of prime land near coastal regions to other land uses (hotels and other tourist facilities in particular) have led to more capital-intensive cultivation practices on pastures and grasslands previously devoted to extensive animal husbandry. Urban migration, in turn, has increased the need for further mechanization. This same intensification and mechanization of agriculture has created environmental problems, such as erosion and salinization of the soil, and pollution of surface waters and aquifers.

ECONOMY. At the beginning of the 1980s, Turkey's economic strategy changed from a policy of industrialization based on import substitution to a policy aimed at allowing a greater role for markets. Between 1979 and 1993 the Turkish economy expanded at an average rate of around 5 percent per year, with even faster growth in recent years. The gross national product (GNP) per capita in 1994 was US\$2,184, and in 1995, the provisional figure was US\$2,200.

Turkey has experienced continuing problems with inflation. The average annual inflation rate between 1974 and 1993 was 50 percent (minimum 21 percent, maximum 113 percent) with a rate of 149.6 percent in 1994 and 64.9 percent in 1995.

An important contributor to inflation has been heavy state investment in several large-scale infrastructure projects. Between 1986 and 1987 the ratio of the public sector borrowing requirement (PSBR) to GNP rose from below 5 percent to almost 8 percent. In subsequent years real increases in public sector wages and rising interest payments, mainly on debt owed by the central government and state-owned enterprises, brought the PSBR/GNP ratio to an estimated 16 percent in 1993.

During this period there have been significant structural shifts in the Turkish economy, with the share of agriculture in overall output and employment decreasing, the share of the service sector increasing, and the relative size of the industrial sector remaining about the same. In 1993, agriculture accounted for 16 percent of total output and 42 percent of employment.

The growth in economic activity overall has not been accompanied by a narrowing of the gap between rural and urban incomes. In fact the gap probably remains constant or is widening. Agricultural incomes are estimated to be around one-fifth to one-quarter of those in nonagricultural sectors. Regional disparities in income and other measures of development remain significant.

AGRICULTURE. Turkey's varied agricultural land and climate permit a diverse range of crops to be grown (table 3.1).

Yields for major grain crops, sugar beets, oilseeds, potatoes, and cotton grown in Turkey have increased steadily (table 3.2). There are often wide regional differences in yields, which for field crops are generally two or three times higher in the milder coastal regions of the Aegean and Mediterranean than in the colder and generally drier areas of central and eastern Turkey. On average, cereal yields in Turkey are half those of the Organisation for Economic Co-operation and Development (OECD) in Europe, but are the same or greater than those of Australia. Between 1979 and 1993 the overall volume of agricultural production increased on average by around 2 percent a year.

Table 3.1. Regional Variations in Agricultural Production Patterns

Climatic zone	Major crops
Mediterranean	Citrus, vegetables, cotton
Black Sea	Tea, hazelnuts, maize
Aegean	
(Western Anatolia)	Olives, cotton, tobacco, horticultural crops
Central Anatolia	Wheat, wine grapes, sugar beets

Source: Authors' research.

Table 3.2. Yields of Major Crops in Turkey, Selected Years, 1979–93 (tons/hectare)

Crop	1979	1984	1989	1990	1991	1992	1993
Wheat	1.6	1.7	1.6	1.9	1.9	2.0	2.1
Barley	1.6	1.8	1.2	2.0	2.1	2.0	2.2
Maize	2.1	2.5	3.6	3.9	4.0	4.2	4.5
Rice	3.0	2.6	3.0	2.6	3.0	3.0	3.0
Chickpeas	1.1	1.0	0.8	1.0	1.0	0.9	0.9
Dry beans	1.5	1.5	1.1	1.2	1.2	1.2	_
Lentils	1.0	0.9	0.5	0.9	0.8	0.8	1.0
Tobacco	0.9	0.9	0.9	0.9	0.9	1.0	1.0
Sugar beets	32.5	31.4	30.9	36.8	38.6	37.8	36.9
Cotton	0.8	0.8	0.9	1.0	9.0	9.0	1.0
Sunflower	1.3	1.2	1.6	1.2	1.4	1.5	1.4
Soybeans	1.0	2.1	2.1	2.2	2.2	2.1	2.4
Potatoes	17.0	16.8	16.8	22.4	23.0	23.6	24.2

⁻ Not available.

Source: OECD (1994) and State Institute of Statistics (1995a).

Farms in Turkey are characteristically family-owned, small, and fragmented. The average holding size in 1990 was 5.8 hectares (ha), with 68 percent of holdings being less than 5 hectares (table 3.3). Ninety-five percent of holdings, with 63 percent of the land, were less than 20 hectares.

Most farms rely on family labor. Tenant farming and sharecropping have played a role in a few regions, such as in the southeast, but are declining in importance. The effects of the high degree of fragmentation of ownership on agriculture may have been partly alleviated by the fact that some farmers are operating farms on behalf of absent family owners.

Between 1979 and 1993 the total work force in Turkish agriculture was unchanged. Participation rates among women and children in rural families are high. About 55 percent of rural women between the ages of 15 and 64 do agricultural work on a regular basis, mostly as field hands. Participation rates among those 12 to 14 years of age in 1992 were 33 percent for males and 37 percent for females. The literacy rate in the agricultural sector was 69 percent in 1990. Illiteracy among female agricultural workers was twice as high as among males.

Irrigation

The gross irrigation potential in Turkey is estimated at 8.5 million hectares (table 3.4). Of this amount, 93 percent is surface water potential. By 1993, while just under half of the total surface irrigation potential

Table 3.3. Agricultural Holdings, by Size of Holding, 1990

Size class	Holdings (number)	Area (ha)	Number share (%)	Area share (%)	Average size (ha)	Cumulative number share (%)	Cumulative area share (%)
Landless	101,610	0	2.50	0.00	0.0	2.50	0.00
< 0.5	251,686	66,706	6.19	0.28	0.3	8.68	0.28
0.5-0.9	381,287	251,109	9.37	1.07	0.7	18.06	1.36
1.0-1.9	752,156	1,004,250	18.49	4.28	1.3	36.54	5.64
2.0-4.9	1,274,609	3,866,896	31.33	16.49	3.0	67.87	22.13
5.0-9.9	713,149	4,675,069	17.53	19.94	6.6	85.40	42.06
10.0-19.9	383,323	4,921,663	9.42	20.99	12.8	94.82	63.05
20.0-49.9	173,774	4,648,743	4.27	19.82	26.8	99.09	82.87
50.0-99.9	24,201	1,498,249	0.59	6.39	61.9	99.69	89.26
100.0-249.9	10,266	1,385,662	0.25	5.91	135.0	99.94	95.17
250.0-499.9	1,930	653,808	0.05	2.79	338.8	99.99	97.96
500+	441	478,943	0.01	2.04	1,086.0	100.00	100.00
Total	4,068,432	23,451,099	100.00	100.00	5.8	n.a.	n.a.

n.a. Not applicable.

Source: State Institute of Statistics (1994).

Table 3.4. Irrigation Potential

Gross irrigated area	Area (millions of ha)	Share (%)	Potential developed (%)	
Potential	8.500	(100.0)	n.a.	
Surface	7.900	92.9	n.a.	
Ground	0.600	7.1	n.a.	
Developed (1993)	4.156	(100.0)	48.9	
Surface	3.729	89.7	47.2	
Ground	0.427	10.3	71.2	

n.a. Not applicable. Source: DSI (1995c). had been developed, more than 70 percent of the much smaller groundwater potential had been exploited. The most important development possibilities in Turkey lie in the surface water sector. Current irrigation management issues also cluster here.

Surface irrigation commands have been developed through a variety of mechanisms in Turkey. These include private development by individual farmers and informal groups of farmers, development by the General Directorate of Rural Services (GDRS), and development by the DSI. The distribution of the GDRS-developed irrigation by type is shown in table 3.5.

The total net surface irrigation area developed up to 1993 was about 3.22 million hectares.^{2,3} It is shown sorted by developer in table 3.6. There are, however, various ongoing formal and informal policies that transfer management responsibility from constructing agencies to other organizations. A more relevant breakout is one made in terms of the entities currently managing the developed schemes. Unfortunately this is more difficult to do. Little information exists on privately developed irrigation, though these schemes tend to be small. The one such scheme visited was operated by the village government; this is said to be a common practice. The GDRS has no O&M capacity, and so the small surface schemes created by it are operated by others. Because of the difficulty of creating new cooperatives, it is assumed that the bulk of the GDRS-developed surface irrigation schemes are operated by local governments. This background leads to the display of net surface irrigation area by type of managing entity as shown in table 3.6. Assumptions made are shown in the table.

From 1970 until 1993, when the DSI began transferring the management of many systems to local water users' associations, the total commanded area of the DSI-constructed schemes expanded from 0.521

Table 3.5. Schemes Developed by the GDRS, as of 1990

Type of scheme	Number	Area (million ha)	Share (%)	
Groundwater	1,340	0.238	22.3	
Surface water	12,554	0.723	67.7	
Small dams	· 527	0.107	10.0	
Total	14,421	1.068	100.0	

Source: World Bank (1993, annex 8).

Table 3.6. Estimated Net 1995 Surface Irrigation Area, by Builder and Manager

	Total area	Area under management (millions of ha)					
Builder	(millions of ha)	DSI	IA	Local government	Cooperatives		
DSI	1.467	0.572	0.850	0.036	0.009		
Private	0.864	0.000	0.000	0.864	0.000		
GDRS	0.891	0.000	0.000	0.802	0.089		
Total	3.222	0.572	0.850	1.702	0.098		
Shares (percent)	100.0	17.8	26.4	52.8	3.0		

Note: Ten percent of the GDRS surface scheme area has presumably shifted to cooperative management. The DSI area is allocated according to pilot region shares transferred to various managers. The DSI irrigation area is estimated on the basis of 36,000 ha annual increments in the net area, 1993–95. The private and the GDRS area is assumed unchanged from 1993 to 1995.

Source: DSI data.

^{2.} The DSI uses a factor of 0.864 to adjust gross irrigation area to net area, which excludes areas occupied by roads, houses, cemeteries, and so on.

Note that this is area equipped with facilities and not area actually irrigated. Area irrigated in a given year is smaller by one-fourth to one-third.

million hectares to 1.341 million hectares (figure 3.1), an expansion of around 36,000 hectares per year. As seen in the figure, however, the actual irrigated area was considerably less than the potential commanded area. Irrigation ratios (area irrigated over commanded area) averaged just 0.66.

Water Rights. The basic principal governing surface water use rights in Turkey provides that water is a public good that everyone is entitled to use, subject to the rights of prior users. Surface water use is normally free of any obligation to obtain prior authorization. Conflicts are resolved first by referral to local customary rules and regulations. If the dispute cannot be resolved in this way, rights are settled by court decision. There is no registration system for water rights or water use. In large basins where impacts of new diversions are diffuse, this system is generally unable to resolve conflicts with claimed prior rights; this is leading to serious problems of overallocation in some basins, such as the Gediz Basin in Izmir. This is a problem that has important implications for the future sustainability of transferred schemes.

IRRIGATED CROPS. Crops grown under DSI-developed irrigation in Turkey are dominated by cotton, cereals, maize, and sugar beets, which together constitute nearly two-thirds of the mix (table 3.7).

Management Institutions

There are two major government agencies with jurisdiction over irrigation management: the General Directorate of State Hydraulic Works (DSI) and the General Directorate of Rural Services (GDRS). The roles of these two agencies are outlined in this section.

General Directorate of State Hydraulic Works

The DSI is the main executive agency of the government of Turkey for the country's overall water resources planning, execution, and operation (box 3.1). It was established in 1954. Until 1996 it was part of

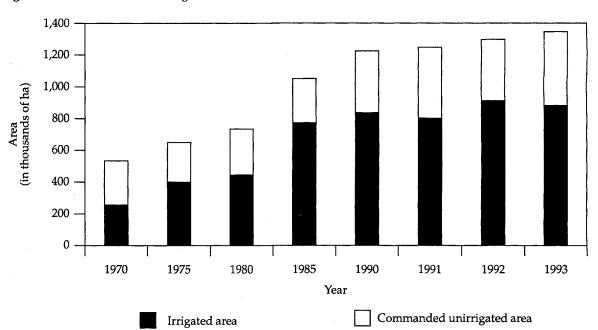


Figure 3.1. Commanded and Irrigated Areas, Selected Years, 1970-93

Source: DSI files.

Table 3.7. Average Cropping Pattern in DSI Irrigation Schemes, 1991–93

Стор	Share (%)
Cotton	21.6
Cereals	19.1
Maize	12.9
Sugar beets	9.9
Vegetables	5.9
Fruit	3.4
Forage	2.7
Citrus	2.4
Other	22.0

Source: DSI files.

Box 3.1. Organizations Managing Irrigation in Turkey

The following organizations manage approximately 3.3 million hectares of net surface irrigation area:

- Village and municipal governments (about one-half)
- Irrigation associations (about one-quarter)
- The DSI (most of the remainder).

the Ministry of Public Works and Settlement. In that year it was transferred to the Ministry of Energy and Natural Resources. The mandate of the DSI is "to develop water and land resources in Turkey" (DSI 1995b). It is responsible for major irrigation, flood control, drainage, hydropower development, and supplying water to cities with a population over 100,000. It also has responsibilities related to river basin planning, water quality monitoring and improvement, outdoor recreation, basic studies on stream gauging and soils classification, and research on water-related structural design and construction materials. the DSI centralizes most of the state functions involved in planning and developing large-scale water resources. Until recently, the DSI's policy has been to manage the schemes it designs and constructs.

STRUCTURE. The DSI maintains offices for O&M at the following levels.

- General directorate office—This is the top level of management with offices in Ankara.
- Regional directorate offices—There are 25 regional directorates in Turkey.
- O&M division offices—These cover a number of schemes.
- O&M engineering offices—These serve one or more of the schemes within an O&M division.

The general directorate office and the regional directorate offices are divided into functional departments, of which O&M is one. The departments are, in turn, divided into divisions. Within the central O&M department, the planning and coordination division has had primary responsibility for developing and implementing the transfer of irrigation system management under the Accelerated Transfer Program (ATP). This division is composed of eight members: six engineers, a director, and one training assistant. Within the division, a three-person team, headed by the division director, has taken the lead role in the transfer process

STAFF. Each department at the general directorate and regional directorate level is headed by a director who is supported by engineers, technicians, and clerical staff. At the O&M division office level, the branch

chief engineer is supported by division chief engineers for operations, maintenance, pumping and electromechanics, and machinery operation and maintenance. Other staff include technicians, clerical staff, and skilled and unskilled laborers. Staff at the O&M engineering office level include the chief engineer, plus an operations engineer, a maintenance engineer, technicians, clerical staff, and skilled and unskilled laborers.

In December 1994, when the ATP began to gain momentum, the total number of staff employed by the DSI was over 25,000. Of these about 10 percent were in headquarters and 90 percent were in the regions. About one-quarter were employed as regular civil service employees and three-quarters were laborers or contract staff. Of the civil service employees, about two-thirds were technical staff and one-third were clerical and other support staff (table 3.8).

General Directorate of Rural Services

The General Directorate of Rural Services (GDRS), a part of the Prime Ministry, is responsible for developing small-scale groundwater resources for irrigation, surface water sources with flows of less than 500 liters per second for irrigation, and on-farm irrigation and constructing rural roads and village water supplies. The GDRS's minor irrigation schemes are transferred to farmers' cooperatives or local governments upon completion. The GDRS does not have an operation and maintenance capacity.

Participatory Irrigation Management

The international literature on irrigation management has long used the terms water users' association (WUA) and irrigation group (IG) in discussing irrigation management institutions. The term water users' association usually refers to a local-level organization based on the active involvement of water users who come together to organize and practice irrigation system operation and maintenance. The term irrigation group suggests a less formal grassroots collective effort aimed at operating and maintaining lower level facilities in an irrigation scheme.

In contrast with these concepts, the ATP in Turkey has been founded on a downward reaching link between the DSI and local administrations, rather than through the bottom-up organization of village-level associations of irrigators. In order to avoid misunderstandings regarding the social and institutional characteristics of the organizations involved, this chapter therefore uses the term irrigation association to refer to the organizations that have been formed for the purposes of managing irrigation units covering more than one village or municipality. The term irrigation group, which correlates

Table 3.8. DSI Staff, by Location and Type of Work, as of December 1994

		Services								
Category	General administration	Technical	Legal	Health	Auxiliary	Total civil service	Contract staff	Permanent labor	Grand total	Regional share (%)
Headquarters	581	697	10	21	90	1,399	4	807	2,210	8.7
Regions	1,505	3,555	54	74	104	5,292	9	17,802	23,103	91.0
Revolving fund	·	,						•	·	
operations	4	1	0	0	13	18	0	54	72	0.3
Total	2,090	4,253	64	95	207	6,709	13	18,663	25,385	100.0
Share of civil	.,							,	/	
service (%)	31.2	63.4	1.0	1.4	3.1	100.0				
Share of total (%)	8.2	16.8	0.3	0.4	0.8	26.4	0.1	73.5	100.0	

Source: DSI (1995b).

^{4.} The Turkish term is Sulama Birligi.

literally with the corresponding Turkish term, will be retained but given a somewhat special meaning, referring to a subunit of a local administration that participated in an earlier DSI program to promote village-level involvement in irrigation system operation and maintenance.⁵ The term irrigation management organization (IMO) is used to refer generically to the different organizational forms that are serving as receptors of responsibility in Turkey's transfer program.

Indigenous Management Practices. About one-quarter of the irrigated area in Turkey has been created independently of central government support. This irrigation may have been developed by individuals (particularly for groundwater irrigation or pumping from natural watercourses) or by village groups.

In village-based schemes, the *muhtars* operate as the coordinators of operation and maintenance activities. When requested by farmers in the village, or when they think the time is appropriate, they inform the irrigators that preparations for the irrigation season are to start. Necessary activities, such as construction of diversion structures and canal reconstruction and cleaning, have traditionally been done on the basis of *imece*, a form of communal exchange labor. Most structures are built with local materials contributed by the irrigators. For example, weirs might be made from woven sticks, mud, and matting. These structures frequently need reconstruction in the course of the irrigation season. Irrigation schedules are agreed upon informally by the irrigators who share an irrigation channel, with the *muhtar* acting as mediator if required.

The increase in migration from rural to urban areas is weakening the traditional arrangements for village-based irrigation. Contributions in labor and in kind are being replaced with payment in cash. As younger people are often away at critical times for system maintenance and operation, older residents are faced with heavy tasks that they find difficult to do in a timely fashion. A *muhtar* interviewed by the case study team foresaw the death of his village irrigation scheme, at least in its current form, within the next ten years. Still there is a clear tradition in Turkey of joint action to provide a common good. This tradition is also reflected in the cooperative form of management discussed in the following paragraphs.

SCHEMES DEVELOPED BY THE GDRS. Approximately one-quarter of the irrigation area in Turkey has been developed by the GDRS or by the GDRS in conjunction with the DSI. The GDRS has had a long-standing policy for its groundwater schemes of requiring the formation of a cooperative before the construction of the irrigation project begins. In 1992 this policy was extended to new surface water schemes as well.

A cooperative is a legally constituted economic entity formed under the aegis of the Department of Cooperation and Maximization of the Ministry of Agriculture and Rural Affairs. It is owned and operated by its members who share its profits or benefits.

For surface schemes established before 1992, O&M responsibility is transferred informally to the village *muhtar*. An effort has also been made to transfer older GDRS-constructed surface water schemes from the GDRS to cooperatives.

The absence of an O&M capacity in the GDRS, combined with the ambiguity of the informal transfer arrangements between the GDRS and the village administration on older surface schemes, has sometimes led to poor scheme maintenance. When surface schemes have cut across lands of more than one village, difficulties have also arisen over such issues as irrigation schedules and assessment and collection of water tariffs.

Under the GDRS procedure for establishing cooperative-based schemes, the first step is a petition from interested farmers. If the proposed development is found to be technically feasible, 15 people must form a cooperative under the provisions of national cooperative legislation. The original founders elect a cooperative board of directors. During construction, the board of directors recruits additional members, all of whom then comprise the general assembly of the cooperative. After construction the cooperative employs a staff and takes over full responsibility for scheme operation and maintenance.

^{5.} The Turkish term is Sulayici Grubu.

In the case of groundwater schemes, the cooperative is accountable for 100 percent of O&M costs and must repay the initial capital cost of the DSI-installed wells, pumps, and electrification. It is given a five-year grace period and a loan with a 30-year maturity and no interest for this purpose. The GDRS investments, such as canal construction and on-farm drainage, are free of charge. For the GDRS surface schemes, as for groundwater schemes, the village that will operate the scheme is responsible for 100 percent of O&M costs. There is no capital repayment obligation.

THE IRRIGATION GROUP PROGRAM. Since the early 1960s, the DSI has had a program to transfer O&M responsibility for secondary and tertiary distribution networks to IGs. Under this program village headmen (*muhtars*) or mayors of municipalities, designated as heads of irrigation groups, enter into a contractual arrangement with the DSI to take administrative responsibility for tasks such as collecting and submitting farmer water demand application forms to the DSI, managing water distribution below the secondary canal, and cleaning and minor repairing of canals, siphons, and *kanalets*, raised concrete canal sections. (The glossary contains a more elaborate definition.) The *muhtar* or mayor is responsible for hiring laborers for maintenance work and ditch riders for water distribution. In exchange, the DSI agrees to give farmers a discount of between 20 and 40 percent on the DSI irrigation fees due. The local administration then has the right to collect the value of this discount from farmers to finance the costs incurred in irrigation O&M. The local administration is allowed to keep any savings from the difference between fees collected and actual O&M expenditure as a contribution to the local administration budget.

Some observers have considered the IG system more cost-efficient than the DSI in implementing O&M tasks, with local administration using less labor at lower cost. They also claim that the system improves the effectiveness of water use. For example, in 1990 the IGs were found to have achieved an irrigation ratio of 77 percent, compared with 60 percent on the schemes run entirely by the DSI (World Bank 1993).

However, the IG program has had only a limited effect on overall scheme O&M costs, on cost recovery rates, and on DSI staff levels and personnel costs. Several fundamental problems weaken the program. Among these are lack of direct farmer involvement in IG establishment and operation, reluctance by some IGs to assume management responsibility, and variations in the DSI staff commitment to the IG program. The IGs have also faced difficulties associated with the fact that IG boundaries are based on settlement areas rather than irrigation boundaries, complicating operation and maintenance of canals that cut across village boundaries. Perhaps the most serious constraint, however, has been the absence of any mechanism for articulating local units into a structure that could manage entire schemes or hydrologic units. Without such a mechanism, the potential impact on public O&M expenditures, staff levels, and cost recovery rates is extremely limited, even if IGs work effectively and efficiently.

Nevertheless, the presence of the IGs has provided an important foundation for Turkey's irrigation management transfer process. In 1994, at the outset of the ATP, approximately 600,000 hectares, or about 40 percent of the DSI-developed area, were partly managed by irrigation groups. This has generated widespread experience within village and municipal administrations with irrigation management tasks and has created sizable cadres of local workers familiar with operation and maintenance practices. The DSI regions have utilized this experience in different ways in developing irrigation associations, as discussed later.

The Accelerated Transfer Program

The Accelerated Transfer Program (ATP) was begun in 1993 to promote irrigation management transfer within the existing legal framework (Water Law of 1954). Under the ATP, the government actively encouraged local political leaders and farmers to set up legally constituted water users' associations and to petition the DSI to formally transfer management responsibilities to the association.

Origins

Since the 1950s the DSI has had a policy of transferring O&M responsibility of smaller and more remote projects to local administrations. However, until 1993 the pace of this transfer activity was slow. The average area transferred for the first 40 years of the program was only about 2,000 hectares per year. Transfer rates accelerated dramatically from 1993 onward, as shown in figure 3.2.

Motives for Initiating the ATP. The impetus for this dramatic change was the combined effect of a national budgetary crisis and rapid growth in the wage costs of unionized labor in the early 1990s. The budgetary crisis led to a squeeze on financial allocations to the DSI in general and to the O&M department in particular. The growth of wage costs raised the proportion of expenditure on operation and maintenance personnel while reducing the funds available for materials and equipment. This brought on the prospect of an approaching need for widespread rehabilitation of large-scale irrigation schemes caused by deferred maintenance resulting from the underfunding of O&M.

The existing cost recovery system offered no help in this regard. In the first instance, collections were taken up and retained by the Ministry of Finance, and amounts collected bore no relationship to the DSI budget. In the second, the fee collection rate was low, averaging 37.2 percent of collectibles in the period 1990 to 1993. Moreover the charging system, which was designed to collect fees two years after the year in which expenditures were incurred with minimal late payment penalties, coupled with inflation rates in excess of 50 percent per year, meant that by the time farmers did pay fees, the real value of the payments had decreased substantially. It was estimated in 1993 that there was a shortfall between O&M allocations to the DSI and collected tariffs of 83 percent (World Bank 1993, p. 38).

There were also national restrictions on agency growth. Since the mid-1980s the state has restricted new hiring in state agencies. The last general examination for government service was held in 1983. This restriction applies to the DSI and restricts even replacement of retiring workers, although there are several minor pathways for new entrants. Internal DSI policy had stopped entirely any new assignments to the O&M department. New hires are typically assigned to construction-related departments.

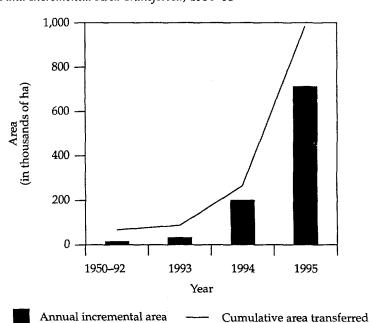


Figure 3.2. Annual and Incremental Area Transferred, 1950–95

Source: DSI records.

A program devolving responsibility for irrigation system O&M to the local level was also highly consistent with more general national policies promoting privatization. This may have encouraged the DSI to undertake a transfer program and helped convince farmers and local officials of the correctness, and perhaps the inevitability, of such a change.

World Bank Participation. During the early 1990s, the World Bank supported a drainage and on-farm development project in Turkey. World Bank supervision missions for this project participated in discussions on the crisis facing the irrigation sector, and they encouraged the DSI to explore new ways to put O&M financing on a more secure footing. Turkey's previous experience with the transfer of O&M responsibilities to IGs, IAs, and cooperatives was seen as a valuable precedent. Funds available from the drainage and on-farm development project were made available to broaden the experience of the DSI staff by supporting study tours to other countries with experience with devolution of authority. Ultimately, more than 50 DSI personnel participated in these tours. Most of these tours focused on Mexico, where a similar program of establishing locally controlled irrigation districts had been underway for several years. These visits turned out to be extremely influential in helping create, among the Turkish participants, a vision of what was possible and in providing examples of how to undertake such a program.

Preparatory Stage

Inspired by their observations abroad, senior DSI managers developed a program for the accelerated transfer of O&M responsibilities to local management. The program was initiated in four pilot regions, Adana, Antalya, Izmir, and Konya. The initial intention was to start with smaller schemes (that is, those less than 3,000 hectares) and to expand the area covered gradually.

In practice the transfer process rapidly gathered momentum and far exceeded the original anticipated rate of transfer. As illustrated in table 3.9, by 1995 the area transferred was more than three times the area planned for transfer by that year. The areas projected to be transferred by 1996 and 2000 have now been significantly increased by the DSI. It is anticipated that by the end of the century 1,500,000 hectares will have been transferred, virtually the entire current stock of the DSI-developed irrigation in the country.

Mode of Implementation. On the government side, the transfer program has been implemented entirely by the DSI O&M staff. It has been organized and coordinated by the three-person transfer team of the DSI's O&M department. The heads of the regional O&M departments took the lead role in the pilot regions. In some cases, as in Izmir, the head of the regional O&M department has assigned an officer on his staff to take responsibility for the transfer program. In other cases, the department head himself has been the prime mover. The heads of branch offices and operations engineers for each of the schemes have also been involved in promoting and implementing the program. The operations engineers and their supporting technical staff have then provided follow-up support to the newly formed IMOs.

Table 3.9.	Planned and Actual	Cumulative Area	Transferred	1994-2000
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Area	1994	1995	1996	1997–2000
Originally planned (ha)	176,000	316,000	436,000	916,000
Achieved (ha)	267,362	978,576	_	Pending
Revised plan (ha)	n.a.	n.a.	1,200,000	1,500,000

[—] Not available. n.a. Not applicable. Source: DSI data.

^{6.} Other tours included the United States, which provided, in a way, the conceptual model for the Mexican program, and Pakistan, which has (as yet unrealized) aspirations similar to those of Turkey.

CREATING DSI CAPACITY TO IMPLEMENT. The study tours funded by the World Bank provided an important learning experience for DSI staff and an incentive to promote the transfer program. In addition, the transfer team of the DSI's O&M department embarked on a full program of staff orientation meetings and seminars for DSI headquarters and regional personnel and for IA chairmen. Between October 1993 and October 1995 the team organized 41 in-country meetings and seminars each lasting between one day and one week. Most of these were held in the regions for technical staff and IA representatives, but they also included a number of World Bank missions and programs for visiting delegations from Bulgaria, the Arab Republic of Egypt, and Macedonia (table 3.10).

Pilot Regions

Four of the twenty-five basin-based regions into which Turkey is divided by the DSI for administrative purposes were selected as pilot regions for the ATP? Three of the pilot regions (Antalya, Konya, and Adana) are located in the southwestern portion of the country. The fourth pilot region, Izmir, faces the Aegean coast to the west. Together, these pilot regions comprise just under one-fifth of the country's land area (19.5 percent). They contain a slightly larger share of its actual cropped area (22.4 percent) but only 13.3 percent of the population.

Some basic geographic and demographic data for the four pilot regions and for Turkey are shown in table 3.11. As seen, population densities in these regions are below the national average, except for Izmir, which is dominated by the city of Izmir, third largest in the country. Population growth rates are above the national average in all four regions, with Antalya growing nearly 5 percent per year due to internal migration. Antalya is a booming tourist destination and is witnessing a rapid conversion of irrigated agricultural land to other uses. Regional literacy rates are at or above the national average of 80.5 percent in all four regions.

Table 3.10. Summary of IMT Information and Training Activities, October 1993-October 1995

	National po	ırticipants	Foreign visitors		
Type of activity	Participants	Activities	Participants	Activities	
Training	209	12	137	6	
Information	1,135	16	15	7	
Total	1,344	28	152	13	

Note: Participants in national training programs: DSI staff and IA representatives and staff, participants in national information programs: local administrators, mayors, muhtars, farmers. Participants in foreign visitor training programs: from Albania, Bulgaria, Egypt, Macedonia, and Turkmenistan; participants in foreign visitor information programs: World Bank missions.

Source: DSI transfer team.

 Table 3.11.
 Area, Population, Literacy Rate, and Road Density for Pilot Regions, 1993

	Area		Population				Roads			
Region	Total (sq. km.)	Cropped (sq. km.)	Share (%)	1985	1990	Growth rate (%)	Density (no./sq. km.)	Literacy rate (%)	Length (km.)	Density (km./sq. km.)
Antalya	20,591	3,332	16.2	891,149	1,132,211	4.90	55.0	84.2	3,362	0.16
Izmir	30,581	9,368	30.6	2,317,829	2,694,770	3.06	88.1	87.1	5,172	0.17
Konya	61,909	15,880	25.7	1,560,375	1,750,303	2.32	28.3	84.2	4,548	0.07
Adana	38,580	10,436	27.1	1,725,940	1,934,907	2.31	50.2	79.4	4,646	0.12
Turkey	779,452	174,481	22.4	50,664,458	56,473,035	2.19	72.5	80.5	59,770	0.08

Source: State Institute of Statistics (1994).

^{7.} Regions usually consist of several provinces and take the name of the most important province in the region.

IRRIGATION. At present there are about 1 million hectares of irrigation area in the four pilot regions. Of this amount, about one-half is currently under IA management, about two-fifths is under village and municipal management, and the remainder is managed by the DSI and cooperatives. However, the majority of this irrigation is based on surface water diversions. Groundwater use, especially private groundwater use, is locally important in all four regions.

AGRICULTURE. The four pilot regions occupy three distinctly different agroclimatic zones. Cropping patterns for these four regions for the period 1991 to 1994 are shown in annex table 3A.1. The DSI-constructed irrigation schemes in Konya, on the Central Anatolian Plateau, produce grains (69 percent) and sugar beets (16 percent) on their irrigated area. Izmir, in the Aegean zone, produces cotton (49 percent) and grapes, the principal component of the "other" category in this region (41 percent). Adana and Antalya represent the Mediterranean zone, growing varying proportions of cotton, maize, vegetables, citrus, and other crops, of which dry beans, melons, and sesame are major components. The particular cropping pattern of a region appears to have had little effect on the pace of its transfer program.

The DSI indicates that the following considerations were applied in the selection of the pilot regions for the ATP.

- A range of experience with irrigation groups—Adana and Izmir had wide coverage (80 to 90 percent), Antalya about 50 percent coverage, and Konya 17 percent coverage of total irrigation area by IGs.
- Representation of coastal regions and Central Anatolia—Konya is in Central Anatolia, the other three regions are coastal.
- A range of experience with small-scale transfer—Adana, Antalya, and Konya had transfer experience dating back to the 1960s. By 1990 they had transferred between 5,000 and 10,000 hectares to local management (annex table 3A.2). There had been very little transfer activity in Izmir before the 1990s.
- Active and receptive staff was characteristic of all four regions.
- Irrigation ratios—Out of the 22 DSI regions reporting in 1994, Adana ranked 5th, Konya 10th, Antalya 15th, and Izmir 16th in the fraction of irrigation area irrigated (table 3.12).

The selected pilot regions were also four of the five largest DSI regions in terms of irrigation area.

Transfer Experience in the Pilot Regions. The earliest experience with transfer to irrigation associations can be observed in Adana and Antalya. By the end of the 1970s, each had transferred two schemes to the IAs, but the area this represented was very small, totaling only 3,000 hectares in Antalya and 3,340 hectares in Adana. In the 1980s Antalya transferred irrigation units to four additional IAs, covering a total area of 5,550 hectares, but there was no additional IA formation in the other three pilot regions. However, Konya

Table 3.12.	Irrigation	Ratios in	the DSI	Pilot	Regions	1994
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Region	Irrigation area (ha)	Irrigation ratio	National rank
Adana	265,297	68	5
Konya	159,325	53	10
Antalya	58,545	49	15
Izmir	114,243	45	16
Regional total	597,410	n.a.	n.a.
Turkey	1,359,906	56	n.a.

n.a. Not applicable.

Note: Rank is out of 22 regions reported.

Source: DSI (1995g).

did become more active in the transfer of schemes to municipalities and villages. It was in the 1990s, particularly after the start of the ATP in 1993, that the transfer of schemes really took off (annex table 3A.2).

Types of Management Organizations in the Pilot Areas. Four forms of local irrigation organizations act as recipients of O&M responsibility in the transfer program: cooperatives, villages, municipalities, and irrigation associations. As described earlier, cooperative management is most common among schemes developed by the GDRS, though the GDRS also engages in informal transfers to local public administrations. The DSI's transfer program is based on shifting O&M responsibilities to local administrations, to irrigation associations that are based on local administrations, and, occasionally, to cooperatives. Irrigation associations differ from villages and municipalities, though, in that the IA constitutes a new institution with a legal personality that is distinct from any existing government body.

- Village management—Where the irrigation scheme serves only a single village, the transfer of the
 scheme is undersigned by the DSI and the *muhtar*, with the approval of the village council of
 elders. The transfer requires the approval of the Minister of Public Works and Settlement. The
 responsibility for scheme operation and maintenance then passes to the village administration,
 with the *muhtar* functioning as the executive officer for irrigation management. The *muhtar* may
 select one or two people to assist him with O&M administration.
- Municipal management—Where the irrigation scheme serves only a single municipality, the transfer of the scheme is undersigned by the DSI and the mayor of the municipality, with the approval of the municipal assembly. As with transfer to the village administration, transfer requires the approval of the Minister of Public Works and Settlement. The responsibility for scheme operation and maintenance then passes to the municipal administration, with the mayor functioning as chairman and the municipal assembly functioning as the "general assembly" for irrigation management. The mayor usually appoints several existing staff members to assist with O&M administration. Alternatively, the mayor may hire new staff for this purpose.
- Irrigation association management—This is the form of transfer used where the irrigation scheme
 covers more than one local administrative unit (village or municipality). In this case, a new institution is created under municipal law. The transfer agreement and the "statutes" or articles of association are the legal basis for the creation. The transfer agreement requires the approval of the
 Minister of Public Works and Settlement while the articles of association require the approval of
 the cabinet of ministers. In large schemes composed of two or more hydrological units (for example, left and right main canals) a separate association is often formed for each segment.

The general assembly of the IA is made up of *muhtars* and mayors of participating villages and municipalities plus additional members. Selection procedures for additional members differ among regions. They can be selected by *muhtars* and mayors or directly elected by irrigators. Elected members may be from local assemblies, representatives of farmers' organizations such as the Union of Farmers or the Farmer Protection Organization, or members of the community. In most cases, additional members appear to be selected by *muhtars* or mayors from among the members of local assemblies.

As would be expected, units managed by villages, municipalities, and cooperatives tend to be small. In the four pilot regions the average irrigation area of these three types of units is less than 700 hectares, with a range of from 10 to 2,210 hectares. In contrast, the average size of an irrigation unit managed by an irrigation association is approximately 6,500 hectares, with a wide range of 60 to 34,782 hectares. Irrigation associations are the most important management form, both in terms of area (95 percent of the total irrigation area transferred) and of number (58 percent of the total number of organizations). There is some variation among the regions, with Konya retaining the largest IA-managed unit (34,782 hectares). The average size of a transferred irrigation unit is smallest in Antalya (1,980 hectares), and of the four pilot regions, village and municipally managed units are most significant in terms of area and number in Antalya (annex table 3A.3).

The Transfer Process

There are five basic steps in the transfer of irrigation management from the DSI to a local IMO. The steps, and the individuals and agencies involved in each step, are summarized for each of the forms of local irrigation management in annex table 3A.4. The transfer process generally takes six to nine months from initiation to implementation.

- 1. Initiation—The first step is to create the interest or willingness of the receiving group to participate in the transfer process. The DSI takes the initiative in informing local administration representatives of the need for, and possible benefits from, participating in the transfer. Introductory information meetings initiated by the DSI are followed by internal meetings and discussions involving the relevant local administration representatives and irrigators. Initial approaches have often been met with suspicion, which must be allayed through additional discussion.
 - Each IA must be legally established with the approval of the Council of Ministers. The articles of association for the IA spell out the method of formation and selection of the governing bodies, the qualifications for membership on the governing bodies, the obligations and authorities of the governing bodies, staff requirements and conditions for staff appointment, required provisions for financial management and reporting, and provisions for the liquidation of the association. This step is not necessary for transfers to village or municipal administration.
 - Once the IA has been formally constituted, a general assembly meeting is called. The chairman and the management committee (also referred to as a council) are elected by the general assembly.
- 2. Transfer agreement—This document sets out the rights and responsibilities of the new IMO and of the DSI. This agreement is developed by the DSI with the approval of the association chairman and the management committee of the IMO. It is signed by the chairman and the DSI regional director. The transfer becomes effective with the approval of the Minister of Public Works and Settlement after all other steps are complete.
- 3. Transfer protocol—After the transfer agreement is approved, the regional director of the DSI and the chairman of the IMO sign the transfer protocol. This catalogs and describes all of the characteristics and facilities of the irrigation unit being transferred (for example, principal components, type of irrigation, electrical and mechanical components of pumping stations, and so on) and includes a map of all irrigable lands. Special instructions concerning the operation and maintenance of the transferred unit are attached as appropriate.
- 4. **Preparation of operation and maintenance plans**—Once the transfer agreement is cleared and the transfer protocol is prepared and signed, the DSI staff work with representatives and staff of the IMO in preparing operation and maintenance plans and budgets for the first post-transfer irrigation season.
- 5. Implementation—The IMO begins unit operation with help from the DSI.

Variations. There are some variations between regions, and indeed between branch and scheme offices, in the extent of the DSI involvement with irrigator consultation before the transfer. In some cases DSI staff appear to work almost exclusively with local administration representatives, leaving it to these representatives to inform and consult with local irrigators. In other cases, the DSI staff have more direct contact with the irrigators in promoting the transfer, though formal transactions are made with local government leaders.

What Is Transferred. Under the transfer agreement, the IMO becomes responsible for providing all services related to the operation and maintenance of the specified irrigation facilities and for bearing the

costs of providing these services. Neither water rights nor ownership of facilities are transferred to the IMO but remain with the state.

THE TRANSITION PHASE. During the transition phase the IMO takes a progressively greater financial and management responsibility for operating and maintaining the unit below the main canal. The DSI provides on-the-job training to field and administrative staff, backstops their work, and operates and maintains various portions of the unit above the main canal. The level and pace of the transition varies, and the "endpoint" sharing relationship is still undefined.

DSI regions and branches are given flexibility in reaching agreements with the IMOs regarding the amount of support that the DSI will provide at different stages in the transfer process. The main variation can be observed in the extent of material and service support provided free of charge by the DSI to the IMO. For example some IMOs have paid for fuel costs on DSI-operated heavy equipment from the outset, whereas other IMOs have not had to pay in the first year. In general both the DSI and the IAs have been remarkably pragmatic in developing and refining the transfer process. This has contributed importantly to its successes.

Farmers and the ATP Program

This program gives little appearance of being geared to farmer demand. It is a program that is driven by pressing national budgetary and programmatic needs, reinforced by the support, advice, and encouragement of an international body. Farmers have often responded skeptically to the idea at the outset, and many are still adopting a wait-and-see attitude.

The main incentive to participate in the program appears to be that it represents a way of avoiding the terminal deterioration of schemes and the quality of irrigation services they provide, which many irrigators felt they were facing. In the early 1990s financial constraints led to the curtailment of overtime work by DSI field staff.⁸ This served as a convincing example of the need for local groups to take over scheme management. Other incentives include the material, service, and technical support that the DSI promised and is providing to the IMOs to set them on a firm footing.

The response of farmers interviewed by the study team in coffee houses (nonmembers of the IMO assembly or committee) to the transfer program can be characterized as guarded acceptance. The transfer appears to have been presented to them as an accomplished fact. Their principal concerns relate to fee payment (after years of relaxed treatment of obligations), to the quality of service that can be provided by the smaller IMO staff, to the technical competence of the IMO staff relative to that of the DSI, and to the accountability and fairness of association management to farmers' needs and wishes.

That said, the leadership of most associations visited has embraced the concept enthusiastically and is taking vigorous steps to implement it. If this results in high-quality irrigation services at a reasonable cost, then the farmers will be satisfied.

Current Status of Program

By the end of 1995 the cumulative irrigation area transferred nationwide represented 61 percent of the total irrigation area developed by the DSI (annex table 3A.5). This is an impressive accomplishment. The transfer program has reached 86.3 percent of the schemes and 91.1 percent of the total area of DSI schemes. The task of transfer in the pilot regions is thus largely complete. What remains is to continue the transition process, providing a declining level of support to newly formed IAs while identifying long-term support needs that the DSI must organize to supply on a continuing basis and identifying emergent

^{8.} One DSI staff member pointed out that by working one weekend as overtime, union technicians receive additional pay equivalent to one-half of their monthly salary.

second-generation problems. In other regions of the country, the DSI must continue to extract the lessons learned from its experience in the pilot regions and intensify the programs there.

The Irrigation Association

Governance functions for the IAs are exercised by a 30- to 70-person general assembly made up of representatives of the component local administration units and others, the DSI, and the Ministry of Interior. Note that the general assembly is composed principally of representatives of various local administration bodies and is not a general meeting of scheme water users. Moreover, the members of the association are local administrations and not individual water users. Individual water users generally participate through the general electoral process for local administration officials. The general assembly is responsible for electing from among its members every five years the chairman of the association, who functions as its chief executive officer. It also elects annually four members of the IA management committee, which works with the chairman to plan and implement the association's activities.

The general assembly typically meets twice a year and can be called together by the chairman for extraordinary meetings. Its actions include electing the association chairman and approving the annual budget. Key functions are shown in box 3.2.

The DSI is responsible for technical oversight of IA activities. Its governance-related responsibilities, according to the model agreement, are (a) to conduct an annual maintenance review of unit facilities, (b) to review and approve annually the maintenance and repair budget of the IA, (c) to approve annually the tariff rate for irrigation service, and (d) to repossess scheme facilities upon failure of the IA to operate and maintain them adequately.

The Ministry of the Interior is responsible for reviewing and approving the entire annual budget of the IA and for periodic reviews of financial accounts submitted by the association.

Legal Standing

Irrigation associations are formed under a 1954 Municipality Law (No. 1580), which allows for associations made up of local government entities to be established. Once established, IAs are treated under the law as municipalities, and various provisions of a number of other laws apply to their operation. Municipal legislation and implementing regulations were obviously not written with irrigation associations in mind, however, and questions related to the appropriateness of municipal law as applied to the IAs have arisen. A number of IA chairmen interviewed expressed a desire for a separate legal base for the IAs through the passage of a national irrigation association law.

One concern underlying this sentiment relates to the uncertainties involved in interpreting and applying municipal law to this new organizational form. Association chairmen seek out advice from

Box 3.2. Key Governance Functions of the IA General Assembly

- Elect the chairman
- Elect four members to the management committee
- Approve work plans and programs
- Approve the annual budget and financial plan
- Approve chairman's annual report
- Approve capital purchases
- Establish regulations for the working of the IA
- Dissolve the IA

municipal authorities but complain authorities are unable to give clear interpretations and guidance. Also, advice varies from one municipality to another, resulting in a variety of interpretations of the law. One chairman in Antalya has established contact with counterparts in Adana who have successfully resolved the question of the tax status of associations in purchasing vehicles. Other jurisdictions have rejected the contention of tax-free status. The question of whether or not heavy equipment purchased by associations will be taxed is another outstanding issue in some locations.

Another example is the recent unilateral change by the provincial administration of the dates for the IA general assembly meetings in Antalya, shifting them from May and September to June and December, so that they match routines used by the provincial administration. The new dates, however, do not fit well with the agricultural calendar or with the IA's needs. In the words of one DSI official, "It's not practical, but it's legal."

The larger question raised by this uncertain status relates to the public versus private stature of the IAs. This can have implications for taxation, hiring and firing of staff, and the ability to engage in non-irrigation related functions and enterprises in the future.

The DSI is taking a hands-off stance with regard to new legislation, not opposing it, but preferring to let the associations take the lead in advocating it. Ironically, the present law apparently does not allow associations to federate into higher level bodies, thus limiting, to some extent, their ability to promote this position. It appears, however, that many of the difficulties being experienced at present do not reflect fundamental deficiencies in the law itself, but rather a failure of the administration to provide timely and authoritative interpretations and guidance on applying existing law. It would be useful for the Ministry of the Interior and the DSI to establish a small task force in Ankara to clarify issues such as the tax status of the IAs and to respond definitively and consistently to questions posed to it by the IAs.

Structure and Staff

The Articles of Association for an IA specify responsibilities for a management committee, a chairman, a general secretary, and an accountant. Other personnel are added as needed.

Management Committee. The management committee forms a link between the association general assembly and the operating staff. The committee is made up of the chairman of the association, the general secretary, the accountant, and four members selected by the general assembly. It is required to meet at least once every 15 days and serves as an executive committee to discuss budgets and plans and provide advice to the chairman. One important additional function is to act on behalf of the general assembly in matters reserved for it between its scheduled meetings. Decisions made on behalf of the assembly in this way must be ratified during its next session.

Chairman and Staff. The chairman is elected by the assembly, as indicated, and holds this position for five years. In almost all cases, the chairman is concurrently a village head or mayor of a member municipality. The chairman the key figure in the association and provides leadership, direction, and executive action. Responsibilities include representing the IA; preparing and submitting annual budgets, financial plans, and reports; implementing the decisions of the general assembly; executing the association's work program; and ensuring collection of revenues. Duties and obligations are detailed in the articles of association.

The general secretary serves as the chief operating officer of the association. It is generally remarked by the DSI officials that this position must be filled by an engineer, but this is not so stated in the articles of association or in the model transfer agreement. Most general secretaries met were, in fact, agricultural engineers. The specific duties of the general secretary are determined by the chairman. He can thus be given a widely varying range of responsibilities relating to O&M, fee collection, and other aspects of the IA's work. The one responsibility specifically assigned to him in the articles of association is the supervision of association staff.

The accountant is responsible for preparing budgets, collecting income, keeping accounts, and submitting accounts for review and approval by "competent authority." The accountant must abide by the provisions of the Municipal Accountancy Statute.

Additional employees are hired by associations at their discretion. Both permanent full-time and temporary technical personnel and laborers are hired to operate and maintain scheme facilities. Other common positions in the IAs are secretaries, additional accountants, drivers, and office helpers.

One chairman, who was also a municipal mayor, drew on the staff of the municipality to provide a number of supporting services including office remodeling. Payments were not always rendered for these services and the interactions between the IA and the municipality were numerous and blurred. This association also spent little on maintenance and repairs for the previous year and apparently accumulated a large unprogrammed cash surplus. This case suggests the need for clearer rules on contracting and accounting relationships between an IA and its member municipalities and villages and stricter oversight of the budgets and financial transactions of associations, particularly during their formative stages.

Women's Roles

Women's roles in the structures and processes described here are distinctly limited. In the three regions visited, only one association general assembly includes a female member. One small association, of 20 visited, employed a female general secretary. Several associations employed female accountants and many hired female office assistants and secretaries. It appears that local politics are largely closed to women's participation, at least in these regions, leading automatically to their exclusion from the IA general assemblies and chairmanships under current selection practices.

Facilities and Equipment

All associations visited have established offices in borrowed (from the DSI), rented, or purchased quarters and equipped them with standard office furniture, typewriters, calculators, a portrait of the founder of the republic, and a tea kitchen. Decor varies from extremely lavish in one case to quite basic in others, but most appeared comfortable and functional. Many have hand-colored scheme layout blueprints on the walls, obtained from the DSI. Usually offices are located in central towns, in part, perhaps, because of the dual roles played by the chairmen.

Computers and Communications. Virtually every IA visited in the Konya and Izmir regions has purchased and set up a personal computer. In the Antalya region, by contrast, only one IA has so far purchased a computer, though others have plans to do so. This difference probably reflects the priorities in advice given by regional DSI O&M staff. Computers are used for a number of functions. The most common application is budgeting and accounting, which is done on computer by most, if not all, associations with one. A related application of tracking irrigation fee payments is also common, as is managing the employee payroll. Another application encountered in Antalya is use of software developed by the DSI to update and rationalize lists of farmers and owners of parcels served by an irrigation unit. Other software is purchased commercially and sometimes customized under contract with private software consultants.

Many IAs also have acquired two-way radio systems based on small hand-held units and an unmanned repeater station. These are usually linked with local DSI networks, at least on the unit used by the chairman, and may be linked with the radio nets of neighboring associations as well.

^{10.} Herve Plusquellec of the World Bank reports visiting two 8,000-hectare IAs in Adana district managed by female secretaries, which is encouraging. The conclusion must remain, however, that IA management and governance in the pilot regions is largely a male activity.

Vehicles and Heavy Equipment. Early capital purchases by newly formed IAs include automobiles for use by the chairman, and possibly the general secretary, and motorcycles for use by field staff. The DSI regional office in Antalya advises the IAs to purchase these items first and rent maintenance equipment. One association in Izmir avoided the purchase of motorcycles by requiring that applicants for jobs as field technicians already have a motorcycle. The IA then simply provides the fuel.

A universal desire is to acquire heavy equipment for canal maintenance. This is particularly important for the majority of schemes that were constructed using the Italian system of raised concrete *kanalets* for distributing water, especially at the secondary and tertiary levels. Precast *kanalet* sections are heavy and require machines for lifting and transport. The machine of choice for most IAs is a tractor with backhoe and front-end loader, which can also be used to raise and place *kanalet* sections. Alternatively, the tractor can be equipped with a crane for raising *kanalet* sections. Several of the associations have acquired one or two tractors so equipped during their first year of operation, and most others have plans to do so. Equipment purchase plans by one 17,000-hectare IA in Antalya, which has already purchased two tractors with accessories, include two trucks, a grader, and a wheeled excavator within the next two years.

DSI branch and scheme offices have a considerable amount of serviceable maintenance equipment that has now become redundant with the transfer of most of the large schemes in the four pilot regions to the IAs. The DSI branch office in Manisa, Izmir region, for example, has an extensive inventory of 67 pieces of heavy equipment, in addition to personal transport vehicles, but now operates only 4,790 hectares of irrigation (as well as several dams and barrages and some main canals and drains). Under present regulations, however, none of this equipment can be sold or transferred to the IAs. This is an obvious problem that needs to be remedied through directive or legislation.¹⁰

Some of the equipment in DSI inventories is specialized or is too large to be economically owned and operated by a single IA. There are several options available to the IAs and the DSI for dealing with this scale issue.

- The DSI can continue to provide services that require this equipment to the IAs, either on a costshared or a payment-for-service basis.
- The IAs can rent such equipment services from other administration or private entities.
- Several associations can jointly purchase and operate such equipment. There is an existing contractual protocol that specifies in advance the responsibilities and rights of participating IAs with respect to the purchased equipment, although there can be only one purchase invoice in the name of one association that will then own the equipment.
- Associations in a given area or basin can form a higher level federation that could then purchase
 equipment and provide certain large-scale services to member IAs. It is the DSI's opinion that
 present law does not allow the formation of such a federation, however.

Operation, Maintenance, and Finances

This section describes the post-transfer operation of irrigation units managed by IAs. The time frame is one to two years after hand-over. It thus captures a transition phase in which neither the IA nor the DSI is fully responsible. The intended ultimate situation, as described in the model transfer agreement, is that the IAs are fully responsible for all operation, maintenance, repair, and administration required for sustainable unit operation.

Although the ATP is a national program, it has been implemented differently in different DSI regions. Moreover, the IAs responded in individualized ways to problems and local conditions. As a result, functions are performed somewhat differently from IA to IA. There are strong common themes in these re-

^{10.} The World Bank is currently processing a US\$100 million loan to Turkey that would supply equipment to the IAs at 80 percent of cost. Associations would reimburse their share of the cost over time.

sponses, however, and this section describes them. Where there are significant variations, or noteworthy local innovations, these are described also. Unless otherwise noted, practices described are common to most or all of the 20 IAs visited in Konya, Izmir, and Antalya regions.

Objectives

The model transfer agreement defines the service delivery objective of the IAs as the "delivery of water to farm terminals and distribution and utilization of it in an equitable manner." Most IA chairmen are also concerned about the timing of deliveries, as are the farmers themselves. Many of the articles in the Model Transfer Agreement also stress the sustainable provision of irrigation service, which becomes an additional aspect of the objective set.

In addition to these service provision objectives, the transfer agreement and interviews with chairmen also suggest objectives related to administration and financial management. These include containing operating costs, maximizing fee collection rates, and acquisition of maintenance equipment. An implicit general objective set for the IAs, based on these observations, is given in box 3.3.

Standard DSI Practices

The operations and maintenance functions performed by the DSI are discussed in the following sections.

OPERATION. In untransferred schemes, the DSI operates all irrigation structures and canals down to the level of the village using both permanent and temporary workers (box 3.4). If the IGs are involved, DSI operational responsibility ceases at the village. If the IGs are not involved, then DSI staff operate structures and deliver water down to the level of the individual farm. Operation involves the development of general irrigation plans based on expected cropping pattern, available water supply, and system capacity; preparation of operations maps; and operation of control structures and pumping facilities. Water delivery programs are based on daily, weekly, 10-day, monthly, or seasonal allocations. For scheduling farm-level deliveries, water demand requests are submitted by farmers to the office of the scheme operations engineer three days before water is required. The daily water allocation for each tertiary canal is based on the crops and crop areas shown on farmers' request forms. Flow rates and total water use are measured and recorded at each major canal branch.

MAINTENANCE. The DSI maintenance and repair activities are guided by a maintenance and repair manual adapted from a U.S. Bureau of Reclamation manual. Maintenance requirements are assessed annually by the DSI inspection teams. These teams inspect irrigation and drainage facilities and prepare a priced list of maintenance and repair requirements for each scheme. Maintenance reports are submitted

Box 3.3. IA Objectives

Service Objectives

- Providing adequate and timely irrigation water supplies to all farmers in the unit
- Providing irrigation service in a reliable and sustainable manner

Supporting Objectives

- Containing O&M costs
- Collecting service fees from all benefiting farmers
- Acquiring mechanical equipment for maintenance and repair

Box 3.4. DSI/IA Operational Responsibilities

DSI

Regular

- Operating dams and barrages
- Sharing main canal operations
- Planning seasonal irrigation calendar
- · Measuring flow rates at diversion points
- Obtaining operational monitoring data from the IA at season close
- Paying drainage pumping costs

Transition

- Paying first-year irrigation pumping costs
- · Training for pump operators and technicians

IA

- · Scheduling and delivering water within the IA unit
- Monitoring deliveries to farms
- Collecting operational monitoring data
- Resolving disputes
- Paying irrigation pumping costs

to the national DSI O&M department through regional offices for evaluation and approval. Because of budget constraints, actual financial allocations are usually substantially less than the requests.

The DSI undertakes most maintenance and repair work under force account with its own machinery and personnel. This work consists mainly of maintenance and repair of canals, *kanalets*, sediment removal and weed control along waterways, and road grading. Only large and complicated work is awarded to private contractors.

Association Practices

The operations and maintenance functions performed by irrigation associations in transferred irrigation systems are discussed in the following sections.

OPERATION. Association operations practices are largely variations on the practices employed by the DSI before transfer. Operations begins with the list of water users in the unit, which was supplied by the DSI at the time of transfer. This list is used as a guide for planning water deliveries and levying fees. This list may require extensive updating by the IA before being used. This has been the case in Antalya where rapid tourism-based growth is changing land-use patterns, in terms both of tenure practices within agriculture and between agriculture and other land uses. As a result, the Koprucay Right Bank IA invested eight months of effort in updating the parcel areas shown on the list used by the DSI in 1994 and the list of names of farmers operating the parcels. The IA also added the name of the owner of each parcel.¹¹

In May or June of each year, farmers fill out demand forms for the coming season that show the area to be irrigated, the crop to be grown, and the name of the farmer. The farmer must countersign this form

^{11.} When seeking fee payments, the first approach is to seek payment from the farmer, but if payment cannot be obtained, then the association seeks out the landowner.

and is given a copy as a receipt. In the IA office, these are consolidated into a billing record for the season. If there are several IA units sharing a water source, the DSI will usually call a meeting of all involved IAs in the spring to report on water availability and to decide on the starting and ending dates of the irrigation season. This is done, for example, in the important Gediz River Basin in Izmir region. Previously the DSI would calculate estimated water demands based on assumed cropping patterns, aggregate these, and compare them with reservoir supply availability. Now, the IAs and the DSI cooperate to perform this function. The DSI will then make an allocation of available supply among the units sharing the supply in proportion to their scheduled irrigated area. The DSI then makes reservoir releases or river diversions in accordance with the planned schedule. IA technical staff distribute the water delivered to their main canal according to the IA's distributional plan.

At this point practices become quite diverse. Differences among DSI branches and scheme units were already present. The IAs have now tailored operational plans to their own particular circumstances, increasing the variety. Some units operate a strict rotation at the secondary canal level. Some operate a continuous flow regime at secondary and tertiary levels. Although gravity schemes usually operate 24 hours a day, some pump schemes, which used to operate only during daylight hours, now operate at night as well. Units that have retained the IGs in their operating structure (principally those in Izmir region) continue to hand over lower level operating responsibility to village *muhtars* or municipal mayors. Almost all schemes employ a large number of temporary workers during the irrigating season to manage water distribution. The number of workers hired is somewhat less when villages assume lower level distribution responsibility, though the total number of workers is not necessarily smaller, because villages also hire temporary workers for this purpose.

At present, operating responsibilities in virtually all larger schemes are shared between the DSI and the IAs. The DSI operates all dams and barrages and the larger supply canals that serve several different IA units. They take the lead in planning, with the IAs, the irrigation calendar for the year. They measure flows at major diversion points under their control and solicit monitoring information from the IAs at the close of the season. The DSI also operates any drainage pumping works that may be present in the scheme, both vertical and horizontal drainage. For their part, the IAs schedule and deliver water to water users within their service units, collect monitoring information for their own purposes, resolve disputes, and, as requested by the DSI, monitor water deliveries day and night.

During the transitional phase the DSI plays some additional roles. It provides on- and off-the-job training to IA pump operators and other technicians and pays irrigation pumping electricity bills for the first post-transfer year. It also pays all drainage pumping bills. There are no specific plans for transferring this responsibility to the IAs.

Maintenance. Routine maintenance and repair is carried out in the spring, before the start of the irrigating season. It is based on a joint maintenance review carried out the previous fall as described earlier in the section Standard DSI Practices. This inspection is required under the terms of the transfer agreement. Included in maintenance are cleaning of canals, *kanalets*, and syphons; replacement of broken *kanalet* sections; repair and replacement of seals between *kanalet* sections; repairing cracks in canal linings; clearing grass and weeds; grading roads; and repairing and maintaining gates.

During the transition phase, there is a gradual shift in responsibility from the DSI to the IA, with the pace dependent on the rapidity with which the IA develops the capacity to carry out various maintenance tasks. Capacity, in turn, depends on employment of technical staff, staff training, acquiring equipment, and generating financial resources to cover variable maintenance costs.

These shifting responsibilities are best described in terms of scheme levels. During the first post-transfer year, an IA typically takes on responsibility for cleaning secondary and tertiary lined and unlined canals, *kanalets*, syphons, and drains within the IA unit; cutting grass and weeds; and repairing minor cracks in canal linings. The DSI maintains water storage and diversion structures, shared main canals, and main drains and repairs all levels of *kanalets*. During the second year, the IA may assume limited responsibility for *kanalet* repair, perhaps using DSI machinery while supplying labor and fuel. As

an IA acquires lifting and transport equipment of its own, more *kanalet* repair responsibility will devolve to the IA, until transfer of maintenance and repair responsibility to the IA unit is complete.

Kanalet sections themselves are sometimes supplied to the IAs at a subsidized price, as in Izmir region, or gratis as in Antalya. This is possible in Antalya because as land conversion to nonagricultural uses continues, kanalets are being removed, and the salvaged sections given to the IAs for use as replacements.

Finances

Data on the finances of 12 IAs in Konya, Izmir, and Antalya were obtained from monitoring reports for 1995 prepared for the DSI O&M department. Background data on the 12 IAs are presented in annex table 3A.6. This was the first year that IAs used this report format, and they varied in their understanding of how to complete it and in the thoroughness with which they did so.¹² Nevertheless, the data provide useful insights into the way IAs are managing their finances.

Sources of Income. The IAs obtain income from four main sources: (a) irrigation fees, (b) membership ("attendance") fees, (c) revenues from the supply of goods and services such as contract machinery hire, and (d) fines. On average, fee income represented 92 percent of total income (table 3.13).

Setting Fees. The DSI updates a nationwide fee schedule every spring for use in the schemes it manages. The schedule includes six different classes of charges, grouped according to level of provincial economic development, services provided (such as gravity irrigation, pumped irrigation, drainage, both irrigation and drainage), and so on. The theoretical basis for the assessment is that the fee should equal 5 percent of value added to crop output by irrigation. In practice, fee levels are based on the

Table 3.13.	Sources of Income for Selected IAs, 1995
(millions of Tu	kish lira)

	Irrigation			Goods and			
Region	association	Service fees	Member fees	services	Fines	Other	Total
Izmir	Gokkaya Pump	1 , 797	209	0	72	384	2,461
Izmir	Gediz	9,169	0	52	0	8	9,228
Izmir	Mesir	11,000	0	272	4	0	11,276
Izmir	Sarikiz	17,111	0	105	0	0	17,217
Izmir	Menemen Sag	10,245	185	0	50	6	10,486
Izmir	Menemen Sol	24,436	500	247	90	133	25,406
Konya	Cumra	13,713	2,050	0	20	0	15,783
Konya	Cumra Ova	17,298	0	0	0	0	17,298
Konya	Ivriz Sag	10,485	1,489	0	110	5	12,089
Konya	Ivriz Akhuyuk Ciller	3,403	425	0	110	69	4,008
Konya	Ivriz Sol	11,751	1,200	1,476	2,121	716	17,264
Antalya	Alara Sag	1,909	0	0	0	0	1,909
Total	-	132,317	6,057	2,152	2,576	1,322	144,424
Share (%)		91.6	4.2	1.5	1.8	0.9	100.0
IAs reporti	ing	12	7	5	8	8	

Source: DSI O&M reports.

^{12.} These data must be treated with caution because (a) expenditures do not cover a full financial year in all cases, (b) IAs were unfamiliar with the report form, (c) form categories are not comprehensive (for example, there is no line covering purchase of land or buildings), and (d) form categories do not correspond to line items in the municipal accounting system.

previous year's O&M expenditures, allocated over the assumed irrigated area, estimated at 85 percent of the irrigation area. Within each of the six categories there are separate fee rates for 29 crops, differentiated by their water demands and assumed profitability. The complete schedule is thus made up of 174 different fee rates. All assessments are made on a per unit area basis. The fee rates proposed by the DSI are modified, and usually reduced, by the cabinet of ministers before being issued.

An unusual aspect of the fee-setting process is that fees are assessed not for the current year but for the year past. Collections are then made in the year after the fees are set. The result is that fees collected in a given year actually relate to expenditures of two years previous. In a climate of low inflation, this might have an advantage of precision, because actual costs would be known when levels were set. In Turkey, with its raging inflation rate, the result is the collection of only a small fraction, in real terms, of the amounts expended, even if all farmers actually paid their fees.

The IAs have adopted an improved version of this system, with different fee rates charged for different crops or groups of crops. Rates are set annually at a general assembly meeting held in May or June for the current irrigation season. Before the meeting, the chair and the management committee prepare a proposed set of fees, based on expected expenditures, which is presented to the general assembly for its approval. This proposal is developed in consultation with DSI staff. Many IAs also consult neighboring IAs in the process of determining appropriate fee levels. Sometimes adjacent IAs, for example, left bank and right bank schemes sharing a diversion, will want their fee levels to be identical. However, if cost structures are different, many will quite readily set lower or higher fees than a neighbor. The review by the general assembly may simply be a formality, or it may generate intense discussion. Discussions with IA chairmen indicated that they were keenly aware of the need to satisfy their irrigator constituency when setting the fee levels and payment conditions. A common strategy was to wait for DSI fee rates to be issued and then undercut them to demonstrate to irrigators the advantages of the new management.¹³

Fee rates reported by the 12 IAs ranged from TL 500,000 (US\$7.81) per hectare for nursery crops in Ivriz (Konya region) to TL 4,000,000 (US\$62.50) per hectare for vegetables in the Gokkaya Pump scheme (Izmir region) (annex table 3A.7). The weighted average fee assessment per hectare irrigated ranged from TL 668,958 (US\$10.45) to TL 2,960,652 (US\$46.26) (table 3.14).

Collecting Fees. In DSI-managed schemes, the first installment of fees are due on the first of March, 19 months after the harvest for which the fees have been assessed. The second installment is due two months later. Payments not received by that date are subject to a once-off penalty of 10 percent of the fees due. Fees are collected by Ministry of Finance collection agents attached to the DSI's regional offices.

The IAs generally have been significantly more stringent in setting payment timetables, in their insistence on payment, and in charging substantive penalties for late payment. Timetables set by the IAs vary widely, from requiring full payment before the first irrigation, to payment in two or three installments during the course of the irrigation season, to payment within three or four months of harvest. Some IAs say that they will refuse water delivery to anyone that has not paid their fees. Others say they will continue to supply water but will pursue payment in court if necessary. The IAs have already brought a number of court cases against nonpayers. All IAs charge a penalty for late payment of 10 percent per month (not compounded), which generally matches or exceeds the rate of consumer price inflation. This penalty rate is legally sanctioned by the administration and can be increased.

The determination of fees due is made by first preparing a map of all the irrigated parcels in the schemes and then registering the name of the irrigator (owner or tenant), the area, and the crop for each parcel. Before the beginning of the irrigation season, farmers fill out a demand form, also called an irrigator information form, giving details about their planned cropping pattern, area to be irrigated, and location within the channel system. During the season, farmers submit irrigation request slips indicating

^{13.} Because the DSI newly announced rates are for the previous year, and the IA rates are for the current year, the IA rates are in fact substantially less than the DSI rates.

Region	Irrigation association	Irrigated area (ha)	Total fee assessment (millions of TL)	Average fee assessment (millions of TL)	Average fee assessment (US\$/ha)
Izmir	Gokkaya Pump	607	1,797	2.960	46.26
Izmir	Gediz	4,807	9,169	1.907	29.80
Izmir	Mesir	5,820	11,000	1.890	29.53
Izmir	Sarikiz	8,808	17,111	1.943	30.35
Izmir	Menemen Sag	4,818	10,245	2.126	33.22
Izmir	Menemen Sol	13,018	24,436	1.877	29.33
Konya	Cumra	20,499	13,713	0.669	10.45
Konya	Cumra Ova	24,922	17,298	0.694	10.85
Konya	Ivriz Sag	12,878	10,485	0.814	12.72
Konya	Ivriz Akhuyuk Ciller	3,942	3,403	0.863	13.49
Konya	Ivriz Sol	9,589	11,750	1.225	19.15
Antalya	Alara Sag	905	1,909	2.109	32.96
Average		9,218	n.a.	1.590	24.84
Highest		n.a.	n.a.	2.960	46.26
Lowest		n.a.	n.a.	0.669	10.45

Table 3.14. Average Fee Assessments per Hectare for Selected IAs, 1995

Ratio of high: low IA

n.a. Not applicable,

Note: Exchange rate used is US\$1 = TL 64,000.

Source: DSI O&M reports.

when they would like water to be delivered and for what area and crop. These forms and slips are used for scheduling water deliveries and for creating a record of irrigators who are liable for irrigation fees.

n.a.

n.a.

4.425

n.a.

Fee collection may take place in the village, with IA staff making a collection round at the time payments are due, or at the IA office. All payments are in cash (as opposed to collection in kind). Sheets listing the amount due from each irrigator are posted in commonly frequented meeting places such as coffee houses and mosques. In the IAs that use the services of irrigation groups, the IG may make some or all of the collections at the village level. All money collected is turned over to the IA, however, which then remits to the IGs any portion due to them.

Capital Costs. Administration policy with respect to investment cost recovery has been inconsistent. Nominally, full repayment is expected with a repayment period of 50 years. Interest on this amount could be charged, with the approval of the government, but in practice a zero rate of interest is applied. However, for political reasons no schemes built after 1985 have been added to the repayment list, and so schemes built since then currently make no amortization payments.

For schemes built before 1985, the repayment policy applies. Because the rates fixed at the time of completion are not adjusted for inflation, and because the rate of inflation in Turkey has been high, recovery of investment in real terms is negligible. The current capital amortization rates have remained unchanged since 1985, during which period wholesale prices have increased by a factor of 58. Schemes where amortization charges are applied are classified into categories based on geographic location, socioeconomic conditions, the amount of the investment, and the year in which the scheme was built. Rates currently charged range from TL 7,500 (US\$0.12) per hectare to TL 3,000 (US\$0.05) per hectare.

Amortization charges are not affected by transfer, though under the transfer agreement, the IAs become responsible for collecting and forwarding amounts due to the Ministry of Finance. Six of the 12 IAs reviewed were collecting amortization charges.

EXPENDITURE PATTERNS ACROSS THE IAS. Recurrent expenditures are reported on the O&M monitoring forms used by the DSI under headings for personnel, travel, services, goods and materials, maintenance and repair, taxes, and other. Of total expenditures, the largest share went toward personnel (22 percent). Approximately 15 percent was allocated for maintenance and repair (annex table 3A.8). Approximately 48 percent of maintenance and repair costs were for cleaning, with the next two most important categories being *kanalet* repairs (19 percent) and concrete repairs (14 percent) (annex table 3A.9). ¹⁴

Capital expenditures are reported under headings for office furniture and equipment and vehicles, machinery, and equipment. The simple average expenditure on capital goods (28.7 percent) was about a quarter of total first year expenditure, while 71.3 percent of the total, on average, was recurrent expenditure. The range in the proportion allocated to capital costs was from 2 to 63 percent (annex table 3A.10).

The difference between total expected income (assuming 100 percent fee collection) and expenditure on recurrent and capital costs was used to assess the expected level of reserves. On average, IA reserves represented 34 percent of total expected income, with an average value of TL 3.645 billion (US\$56,949) (annex table 3A.11). Proportions of total budgets ranged from -2 to 81 percent. It is likely that in most cases, reserves are being accumulated for capital goods purchases. Summing capital expenditures and reserves gives an average of 51.3 percent of total budgets. The accumulation of reserves and the extensive capital goods purchases being made are largely consequences of the fact that the IAs are charging full fees for services but are still receiving DSI assistance with maintenance during the transition period. This is a reasonable strategy to follow, allowing the IAs to generate start-up surpluses for capital purchases. The IAs will need to reassess their financial positions once the transition period is ended to determine needs for funds for additional capital purchases and to create sinking funds for future equipment replacement.

Inflation and Interest Rates. The rate of inflation in Turkey is high. At the time of this study (1996) the wholesale price inflation rate was around 90 percent. High rates of inflation create a powerful incentive to delay any payment due as long as possible and has resulted in the IA imposing the maximum allowable penalty for overdue payments. Under the DSI policy of charging a one-time penalty of 10 percent on overdue fee assessments, the incentive to delay is undiminished.

Another implication of such a high rate of inflation is that prices must be constantly raised to keep pace, and increases must be anticipated in, for example, setting irrigation fee rates six months in advance. Because of general uncertainty about the true rate of inflation, it is also difficult for irrigators to judge the validity of rate increases, at least over the short run, thus hampering accountability.

Lending Rates. A pair of IA chairmen in Antalya district each suggested that the cost to their association of a commercial equipment purchase loan would be 130 to 140 percent per year. This is consistent with the commercial bank loan rate quoted in Antalya on February 19, 1996, of 140 percent for a secured loan, but extremely high in the face of savings interest rates, which averaged about 63 percent per year for one-month time deposits and 91 percent per year for one-year time deposits. A subsidized lending program for agriculture is available from the state-owned agricultural bank at an interest rate of about 50 percent per year for both short-term production and capital loans, which is a negative real rate of interest. For tractors and harvesting machines, the current rate is 55 percent, and for other capital items the rate is 43 percent. Loans from this source have been discussed as a possible source of credit for equipment

^{14.} The IAs were not consistent in reporting maintenance and repair costs. Figures shown in a detailed breakdown of costs did not match summary figures. This may be related both to the format of the information request and to IA unfamiliarity with filling it in.

^{15.} The large spread between bank savings interest and lending rates is explained by the government's dominant position as a borrower. Banks can earn healthy profits by purchasing government bonds and treasury bills, in effect relending to the government, while avoiding the risk associated with private lending. This leaves little credit (and high interest rates) for the private sector.

purchases by associations, although to date no such loans have been made. There may thus be some justification for a below-market-rate lending program for equipment purchase, given the high commercial rates prevailing, but in no event should this rate be lower than the interest rate on savings available to the associations, in light of the substantial reserves that many are accumulating.

Results of Irrigation Management Transfer (IMT)

In this section the impact of transferring management from the DSI to the IAs is discussed in terms of these major categories: (a) the fees that farmers pay for their irrigation services, (b) the quality of that service, (c) farmers' income from irrigated agriculture, (d) the organizational impact on the DSI itself, and (e) the levels of types of conflict related to irrigation service.

Costs of Irrigation Service Provision

Although the IAs have generally set their fees below those set by the DSI, the fact that the IAs are actually collecting the fees, whereas the government frequently did not, has meant an increase in the cost of irrigation service for many farmers.

The DSI's operating costs, after falling in the late 1980s, rose 26 percent in real terms from 1985 to 1993. Because actual irrigated area expanded by 13 percent over this period, however, O&M expenditures in DSI-operated systems on a per hectare basis increased by only 12 percent.

This overall increase masks significant internal distortions, however. Over the 10-year period, 1985 to 1994, while operations expenditures rose by 81 percent, maintenance expenditures fell by 32 percent. Within the operations category, personnel expenditures were the largest single category, accounting for 53 percent of total O&M expenditures, on average, over the period. Moreover, increases in personnel expenditures clearly drove the increases in operations expenditures. The share of personnel expenditures rose from about one-quarter of total operations expenditures in 1985 to about two-thirds of the total in 1993. Between 1993 and 1994 there was a modest reduction in personnel costs and in their share of total operational expenditures, to which the IMT may have contributed. Nevertheless, total operating expenses also rose between 1993 and 1994. With certain constraints though, DSI personnel expenses can be expected to continue to decline as more schemes are transferred. It is reasonable also to expect total O&M personnel expenditures (the IA and the DSI together) to decline as IA laborers replace much more costly DSI staff.

A general decline in both the absolute maintenance expenditure and in its share of total O&M expenditure is evident over the 10-year period. In 1985, the split between operations and maintenance expenditures was about even. However, by 1994, the share of maintenance in the total had decreased from 47 percent to 25 percent. This trend has contributed to a worrisome decline in the condition of many systems (World Bank 1993, annex 5, 7) and may mean that IA maintenance expenditures will need to go up post-transfer if the deterioration is to be arrested and scheme performance is maintained or improved.

It was not possible to assess the effect of the IMT on the overall cost of service provision. Aside from the lack of complete O&M cost data for 1995, the IAs reviewed took up O&M responsibilities on different dates in 1995. Furthermore, costs during initial years are probably not representative of long-term average costs because of some duplication of O&M capacity by the DSI and the IAs and the added short-term costs of training.

FEE COLLECTION. The IA O&M fee collection takes place against a background of government laxness in the pursuit of irrigation fees. Political and administrative factors have contributed to government O&M

^{16.} This represents the last year before the ATP took effect.

fee collection rates averaging only 38 percent between 1989 and 1994 (table 3.15). Consequently, IA rigor in fee collection has come as a shock to many farmers.

In this light, the average collection rate of 72 percent as of the end of 1995, for the IAs reviewed by the team, can be seen as a significant achievement (table 3.16). Furthermore, chairmen and general secretaries of a number of the IAs visited indicated that collections for 1995 continued after the monitoring reports were prepared. Most IAs were confident of collecting at least 90 percent of the fees due.

IA fee collection thus appears to be off to a good start. Key issues for the future will be how the IAs handle nonpayment and whether they will be able to maintain their credibility and commitment to fee collection. Independence from political interference and populist "relaxation" of financial discipline will also be critical.

FEE LEVELS. As described earlier, the IAs generally set their fee rates at or below the DSI rates. In principle, fee rates set by the DSI are to cover 100 percent of O&M costs. In practice, a combination of

Table 3.15. O&M Cost Recovery for DSI-Operated Systems (thousands of Turkish lira)

Year	Collectible (1)	Collected (2)	Collection rate (%) (2/1)
1989	44,181,651	16,964,181	38.4
1990	65,786,896	24,276,843	36.9
1991	109,408,941	35,860,343	32.8
1992	175,676,514	58,319,017	33.2
1993	255,342,818	107,295,687	42.0
1994	435,598,165	183,280,193	42.1
Average collection rate (1989–94)			37.6

Note: Collected amounts do not include penalties paid.

Source: DSI O&M reports.

Table 3.16. 1995 Season Fee Collection Rates for Selected IAs as of the End of 1995

Region	Irrigation association	Fees assessed (thousands of TL)	Fees collected (thousands of TL)	Collection rate (percent)
Izmir	Gokkaya	1,797,116	1,260,517	70.1
Izmir	Gediz	9,168,600	8,370,456	91.3
Izmir	Mesir	11,000,000	9,400,000	85.5
Izmir	Sarikiz	17,111,443	15,156,867	88.6
Izmir	Menemen Sag	10,244,748	5,072,610	49.5
Izmir	Menemen Sol	24,435,727	17,507,652	71.6
Konya	Cumra	13,713,118	8,348,065	60.9
Konya	Cumra Ova	17,298,124	9,500,000	54.9
Konya	Ivriz Sag	10,485,210	7,334,433	70.0
Konya	Ivriz Akhuyuk Ciller	3,403,359	3,119,678	91.7
Konya	Ivriz Sol	11,750,972	9,156,839	77.9
Antalya	Alara Sag	1,908,883	1,352,726	70.9
Average				72.2
Lowest				49.5
Highest				91.7

Source: DSI O&M reports.

factors, including fee structures set to recover less than actually incurred O&M cost, fee collection two years after O&M costs are incurred, high inflation, and an overestimated irrigation ratio, has meant that even if collection rates were high, DSI fee rates could only recover a fraction of the DSI's O&M costs. ^{17, 18} This suggests that even with strong collection performance, so long as the IAs model their O&M fees on the DSI's rates, they may be unable to cover their full O&M costs.

The extent to which maintenance expenditures continue to be shared during the transition to the IA management is illustrated in table 3.17.

The table shows that, in the selected schemes, the contribution of the IAs to anticipated 1996 maintenance expenditures ranges from 5 percent to 45 percent, with the DSI making up the balance. Table 3.18 shows 1995 per hectare irrigation fees for selected IAs as a percentage of total per hectare maintenance expenditures. At current fee rates, some IAs could not cover even the full cost of system maintenance, much less the combined cost of operation and maintenance.

Table 3.18 also shows the variation in total estimated per hectare maintenance cost among schemes. Total annual maintenance expenditures range from TL 673,573/hectare (US\$10.52) to TL 5,251,687/hectare

Table 3.17. Allocation of Estimated Maintenance Expenditures for 1996

		Estimate	d maintenance exp	enditure			
Irrigation scheme	Net irrigation area (ha)	(millions of TL)	Share (%)	(TL/hectare)			
Izmir region			,				
Ahmetli	54,717						
IA		21,059	44.8	384,871			
DSI		26,000	55.3	475,172			
Total		47,059	100.0	860,043			
Sarigol	1,927						
IA		544	5.4	282,304			
DSI		9,576	94.6	4,969,382			
Total		10,120	100.0	5,251,686			
Alasehir	11,807			•			
IA		7,691	23.3	651,393			
DSI		25,353	76.7	2,147,286			
Total		33,044	100.0	2,798,679			
Konya region							
Ivriz	32,253						
IA		11,276	33.0	349,600			
DSI		22,895	67.0	709,834			
Total		34,171	100.0	1,059,434			
Cumra	59,704						
IA		7,841	19.5	131,331			
DSI		32,380	80.5	542,342			
Total		40,221	100.0	673,673			

Source: DSI regional offices (1996).

^{17.} In some years the government has stipulated that only 90 percent of the actual O&M costs of the past year will have to be recovered (World Bank 1993, annex 7).

^{18.} An optimistic irrigation ratio of 85 percent has been used when determining the nationwide fee rates necessary to cover O&M costs. In fact the irrigation ratio is usually closer to 70 percent (World Bank 1993, annex 7).

^{19.} The estimates come from the end-of-year maintenance reports prepared jointly by the DSI and the IA in November and December of 1995.

1996 Maintenance Average 1995 fee assessment (TL/ha) Irrigation expenditure (TL/ha) (2) As share Irrigation scheme association (1)(2)of (1) (%) Izmir region Ahmetli 860,043 220 Mesir 1,890,034 Gediz 1,907,343 222 1,942,716 226 Sarikiz Gokkaya 2,960,652 344 Konya region Ivriz 1,059,434 Akhuyuk Ciller 863,358 81 Sol Ve Yildizli 1,225,464 116 814,196 77 Sag Cumra 673,673 99 Cumra 668,965 103 Ova 694,091

Table 3.18. Estimated 1996 Maintenance Expenditures and 1995 Fee Assessments for Selected IAs

Source: DSI data.

(US\$82.06). Presumably this variation can be attributed to the specific characteristics of the scheme (for example, age, design, water source, condition, climate, sediment loads, and so on). Currently fee rates are free to vary among schemes and even among IAs within a particular scheme. This is appropriate from an economic efficiency point of view. It may be, however, that as fees increase to cover the IAs' increasing share of total O&M costs, there will be calls from farmers for cross-subsidization or equalization of fee levels. Such calls would create difficult questions for public policy. Mandating subsidies would open the door to more wide-ranging political interference in irrigation system management.

Nevertheless, the improvement in the rate of O&M cost recovery under IA management is clear and commendable. The challenge will be to maintain current levels of fee collection in the face of the rising real fee levels, which will be required in some systems in the future.

Capital Costs. As indicated earlier, the IA contribution to capital cost recovery takes the form of collecting the official amortization charge, which is then turned over to the government. So long as the government continues to attempt to recover only a small portion of total irrigation investment cost, this amount will remain insignificant compared to O&M-related charges. Assuming that capital charges are collected with O&M fees, rates of recovery for the two fees are likely to be similar.

The larger question is whether farmers should bear all or part of the capital costs of new system construction and rehabilitation costs in the future. Although there is a precedent to build on, government laxness in undertaking any sort of capital cost recovery over the past decade may make the reintroduction of such recovery difficult. Ultimately the answer hinges on general public policy with respect to the irrigated agriculture sector and on farmers' ability to pay. However, while the recovery of O&M costs is an essential integral feature of a successful management transfer program, the question of capital cost recovery is separable and should not be allowed to interfere with the promising transfer efforts under way.

Quality of Irrigation Service

The purpose of any irrigation system is to provide high-quality irrigation service to farmers for growing crops. The effects of any program that modifies the organizational arrangements for providing this

service must therefore be evaluated in terms of the quality of that service. There are several basic dimensions in which quality can be defined and evaluated. These include the amount of water supplied, its distribution over the command area, and its distribution over time. Related measures include the area provided with acceptable irrigation service and the duration of the irrigation season.

This review comes too early in the ATP to be able to assess changes in the quality of irrigation service provided by the associations relative to that of the DSI-provided service. In many locations, data for 1995, the first year of IA operation in most cases, were not yet available. Even were they available, a single year of post-transfer data does not allow for a valid before and after comparison. There are too many intervening factors to confound the comparison.

The data in table 3.19 are only illustrative. They describe the area actually served by three irrigation schemes in Antalya region, which were operated in 1993 and 1994 by the DSI and in 1995 by six IAs, and show increases in the area served after the transfer of 20 to 40 percent. Figures describing the amount of water available to each scheme in the respective years are not available. Annual precipitation figures for a nearby gauging station do show that rainfall was above the long-term average of 1,069 millimeters in 1993 and 1994 and slightly below average in 1995, which should, by itself, produce the reverse of the change in irrigated area observed. Nevertheless, if the change is in response to management transfer, it is in the expected direction and suggests a performance hypothesis for further testing when additional data are available. That hypothesis is that management transfer increases performance of Turkish irrigation systems by significantly expanding the area under irrigation with a fixed water supply, while yields hold constant.

Farm Income and Ability to Pay

Assuming that quality of irrigation service and extent of irrigation coverage both hold constant before and after transfer, any increase in the irrigation fee collection rate will result in a corresponding decrease in farm income. However, at present, farmers pay only a small fraction of their total variable costs for irrigation service and most farmers, at least those farmers growing cash crops, should be able to afford to bear the full cost of O&M. It was estimated in 1991 that irrigation in Turkey increases the tonnage production per hectare by a factor of 7.4 and increases the value added per hectare by a factor of 2.6. It

Table 3.19.	Actual Irrig	rated Area.	. in Hectares.	. in Three Iri	rigation Schemes	. 1993–95

		Irrigated area (ha,)	Increase of 1995 over
Scheme	1993	1994	1995	1993–94 average (%)
Koprucay				
Left bank			11,517	
Right bank	_		4,754	
Total	14,123	12 ,7 61	16,271	21
Manavgat				
Left bank	2,418	2,268	3,460	
Right bank	937	912	1,175	
Total	3,355	3,180	4,635	. 42
Alare				
Left bank	563	634	782	
Right bank	403	410	475	
Total	966	1,044	1,257	25
Annual precipitation (mm)				
Serik, Antalya	1,145	1,381	1,027	(19)

⁻⁻ Not available.

Source: Authors' research.

was estimated that an irrigation fee that would allow for recovery of the total cost of O&M would represent only 7.6 percent of the average increment in net farm income as a result of irrigation development (World Bank 1993, p. 16). The ability of farmers to afford O&M costs is further supported by data for two of the major crops in Izmir region, seedless raisins and cotton. Association irrigation fees for these two crops represented just 3 percent of the total variable costs of production in 1995 (table 3.20).

However, the coastal provinces in which cash crops predominate may not be representative of the situation elsewhere in Turkey. Cotton yields in Izmir, for example, are nearly three times the national average. Regional variations must be considered in setting repayment policies.

DSI Staff Levels, Structure, and Functions

The DSI employs about 25,000 people in carrying out its functions, which include project planning, design, and construction as well as operations and maintenance (annex table 3A.12). Permanent laborers constitute nearly three-quarters of the total. Other significant fractions are technical services (17 percent) and general administrative services (8 percent). Overall staff levels have declined steadily in recent years, falling by 9 percent between 1990 and 1995. The largest share of this decline results from shrinkage in the number of permanent laborers (-12.8 percent) and, to a lesser extent, administrative personnel (-2.8 percent). Professional technical staff numbers have actually increased by 8.5 percent over this period (figure 3.3).

Total staff levels do not appear to respond to the transfer program, because staff levels in 1994 and 1995 are virtually identical. Rather the overall reduction, which has taken place over five or six years, appears to be a result of broader government policies that have generally prohibited the hiring of new staff since 1983. However, it may be unrealistic to expect the ATP to reduce overall DSI staff levels significantly, because these levels include personnel working on a vigorous ongoing irrigation development program as well as O&M staff.

Field O&M staff levels have shown a roughly similar decline of 10 percent between 1990 and 1994, a reduction of about 1,000 staff members (annex table 3A.13). However, here the reductions have taken place across the board (annex table 3A.14). If skilled and unskilled laborers are pooled, the largest reduction has taken place in the numbers of technicians (18 percent) and support staff (20 percent). Engineer and senior technician levels have declined by a more modest 7 percent and labor by just 3 percent. Interestingly, there has been a major shift in the division between skilled and unskilled laborer, with the former increasing by 35 percent while the latter declined by 30 percent. It is not known if this shift represents a major staff turnover, or whether it is simply an upgrading of staff from a lower category to a higher one. Given the strength of trade unions among nonprofessional staff, the later scenario seems more likely. The connection between this shift and the transfer program, if any, is unknown. Because 1995 figures were unavailable, the possible effect of the ATP on O&M staff levels cannot be evaluated, though the overall reduction since 1990 is consistent with the policy prohibition on new hiring noted earlier.

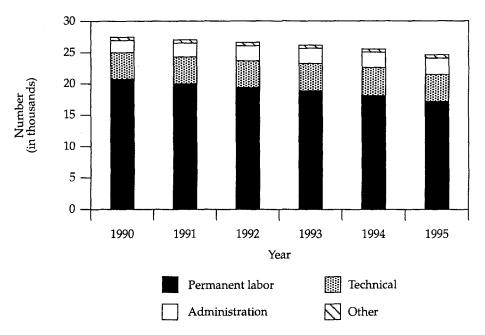
Table 3.20. Irrigation Fees in Relation to 1995 Cotton and Raisin Variable Costs of Production and Gross Margins, Manisa, Izmir

	Seedless	s raisins	C	Cotton
Category	(TL/decare)	Fee share (%)	(TL/decare)	Fee share (%)
Irrigation fee	200,000		300,000	
Value of production	12,012,000	1.7	14,280,000	2.1
Total variable costs	6,295,000	3.2	8,930,000	3.4
Gross margin	5,717,000	3.5	5,350,000	5.6

Note: Seedless grapes yield 260 kilograms/decare at TL 46,200/kilogram. Cotton yields 280 kilograms/decare at TL 51,000/kilogram. One decare equals 0.1 hectare.

Source: Manisa Farmers' Union.

Figure 3.3. DSI Staff Levels, 1990–95



Source: Authors' research.

Within the four pilot regions, where the most significant impacts of the ATP should be felt, a reduction in staff numbers of 11 percent between 1990 and 1994 is observed (annex table 3A.15), roughly the same reduction seen in O&M staff nationwide and in total DSI staff numbers. Interestingly, however, between 1994 and 1995, there was an additional decline in staff numbers of 10 percent in three of the four pilot regions.²⁰ If this trend holds for Adana and other regions as transfer progresses, it could lead to significant reductions in government costs of system operations and maintenance.

Across the four pilot regions the deepest cuts were in numbers of technicians and laborers, especially unskilled laborers. Again there was an increase in the number of skilled workers, which was more than offset by the halving of the number of unskilled laborers, resulting in a net reduction of the combined labor force of about 27 percent. The number of engineers and senior technicians held nearly constant, although in Konya and Antalya the number of engineers and senior technicians actually increased. There were modest reductions in the number of other support staff in most of the pilot regions. This pattern is consistent with a transfer of responsibility for operations and light maintenance from the DSI to the IAs. The need for engineers and senior technicians would be expected to remain constant, at least during initial phases of the program, to manage the transfer process and to manage DSI operations. At the same time, the need for technicians and unskilled laborers responsible for carrying out O&M would decline sharply. Skilled laborers would presumably still be needed for main system maintenance and repair of kanalets, though not in increased numbers. The reason for this increase is thus unclear. The timing of the reductions is also consistent with the requirements of the transfer process, with major reductions occurring mainly in 1994 and 1995.

Due to the strength of employee unions, the DSI has not been able to reduce the number of civil service staff. Staff redeployment and retrenchment have been the subject of intense negotiation between

^{20.} Unfortunately, data for Adana region, which has about as many staff as the other three regions combined, were not available. This result must thus be advanced cautiously.

DSI management and the unions, and the overall reduction in the number of O&M staff in pilot regions has been achieved mainly through internal transfers. The initial expectation of program planners was that O&M staff made redundant by the transfer program could be reassigned to newly developed systems. However, the speed with which the program proceeded reduced staff needs at a much faster pace than growth elsewhere could absorb, leading to excess staff levels in many schemes.

At the same time, the job security enjoyed by the technical staff may have contributed to the speed and effectiveness of the transfer program. Because the technical staff responsible for implementing the IMT program would not feel threatened by it, they may have been more enthusiastic in promoting it.

As transfer progresses, DSI O&M staff responsibilities will shift from O&M implementation to advisory and regulatory functions, plus the continuing operation and maintenance of main system structures. The transfer of main system management responsibilities is likely to be a long-term activity.

Another ongoing responsibility will be the monitoring and evaluation of the technical and financial status of the IA operations. The DSI transfer team has introduced a monitoring report that will be an extremely useful tool for assessing the ongoing performance of the IAs. The experience with the first year of reporting needs to be reviewed, the reporting format refined, especially in relation to the financial information that has been recorded, and a training program for both the DSI regional and field staff and for the IAs implemented.

In addition to evaluating the data provided by the monitoring protocols, in the next year or two independent studies on the quality of irrigation service, agricultural and financial performance, and irrigator experience under the transfer program should be conducted to evaluate the impacts of the program and its sustainability.

Conflict and Conflict Management

Before transfer, the DSI O&M staff are the focus of complaints and resolution of conflicts related to the irrigation system operation. Farmers' principal complaints include dissatisfaction with the quantity and timing of water delivery, unhappiness with bills resulting in refusal to pay fees (particularly when it is claimed that water came from a private well rather than from the DSI system), demands for repairs to system structures, and dissatisfaction regarding the location of irrigation canals. Complaints are made in face-to-face meetings with the DSI staff or local politicians and through letters to the DSI. Farmer-to-farmer disputes, for example, disputes regarding taking water out of turn or head-tail problems, which cannot be resolved by the disputants, are taken up by the *muhtar* and the council of elders or through the courts.

After transfer, complaints regarding system operation are usually directed to the IA chairman and staff, and sometimes to the village representative on the general assembly (for example, the *muhtar*). This has reduced the demands on DSI staff to deal with farmer complaints. The DSI transfer team reported that they have received only a handful of complaints from farmers on schemes that have been transferred (compared with approximately 200 per year pre-transfer).

Effectiveness and Sustainability of the Transfer Program

Having described the preliminary operational results of transferring system management responsibility, this section analyzes the results in terms of the objectives of both government and the irrigation associations. It also examines the effectiveness with which the ATP has been implemented and considers a number of long-term sustainability issues.

National Objectives

Three objectives can be inferred from the earlier analysis of the government's motives in initiating a program of management transfer. These are (a) to reduce public costs of operating and maintaining

public irrigation schemes, (b) to improve the quality of irrigation service in public irrigation schemes, and (c) to free the DSI staff for construction-related work.

REDUCING COSTS. Reducing public irrigation O&M costs is an alternative to increasing cost recovery from farmers. In Turkey, this appears to have been a more feasible course than enhancing cost recovery directly. There are several ways in which costs are reduced by a successful transfer program:

- O&M staff levels can be reduced, saving the cost of salary and benefit payments.
- Certain variable operating costs, such as the cost of fuel, spare parts, casual hired labor, supplies
 and materials, and specialized contracted services can be eliminated.
- Equipment replacement costs can be eliminated by transferring responsibility for procurement directly to irrigators.
- Certain fixed costs, such as building maintenance and replacement, can be reduced over the longer term.

Quantitative evidence indicates tentatively that the ATP is beginning to reduce O&M staff levels, although there is no apparent effect on overall DSI staff levels as yet. Reduction is hampered by restrictive union work rules and the political strength of employee unions. So far, O&M staff reductions have been confined largely to supporting positions. Reduction of variable costs is almost certain, given the nature of the agreements between the IAs and the DSI. Because of the phased nature of the transfer, such reductions in the DSI expenditures will occur gradually. Data to evaluate the magnitude of this change were not available to the study team. Although the mechanism for equipment purchase by, or transfer to, the IAs has yet to be worked out, it seems likely that DSI's equipment-related responsibilities will be diminished, though not eliminated. The DSI will continue to require equipment to operate and maintain storage dams, major regulators, some main canals, buildings, and other facilities. The disposition of surplus DSI building space has apparently not been thoroughly considered. Currently the DSI does provide office space (usually free of charge) to some IAs. Whether it will continue to do so is unknown. Presumably over time, the DSI will reduce the building space that it must service and maintain.

Some DSI facilities, such as equipment maintenance facilities, will be overscaled for their new operational level but may be difficult to downsize. At the same time, the IAs will require new maintenance facilities as they acquire their own equipment. Arrangements should be explored for keeping such facilities intact and either transferring them to the IAs, or groups of IAs, or contracting with the IAs to provide equipment maintenance services on a cost-competitive basis. Plans for disposing of other DSI resources that have or will become surplus, such as heavy maintenance equipment, vehicles, and buildings, should also be developed in conjunction with the IAs.

IMPROVING SERVICE QUALITY. It is too early to draw conclusions about the quality of irrigation services provided by the IAs compared to those previously provided by the DSI. It might be expected that service would become more flexible and responsive to farmers' demands, that the extent of coverage with a given amount of water would expand, and that the timing of deliveries might become more closely matched with farmer and crop demand patterns. At present there is little information with which to evaluate these hypotheses. It will be extremely important for the IAs and the DSI to collect flow and area data over the next several years that will allow before and after comparisons to assess the effect of the IMT on irrigation service quality. Limited evidence from three irrigation schemes in Antalya suggests that transferred systems may be able to significantly increase their effective service area with a fixed amount of water.

Releasing O&M Staff for Construction Activities. Because it has a major water resource development program underway, in the southeastern Anatolian region and elsewhere, one DSI objective is said to be making more staff available for design and construction (D&C) related tasks. This process can take place

by direct transfers of staff or by reallocating vacant O&M positions to D&C. Underlying this process are three important constraints. The first is the pressure the unionized work force exerts against layoffs and transfers. This limits severely the ability of the DSI to release or reassign redundant staff. The second is the need for different skills in the design and construction field, which may limit direct reassignment. The third is the general freeze on hiring by the DSI and other government agencies, which has been in place since the early 1980s. Although there are some exceptions to the freeze, it has served to limit the size of the DSI staff and has been a powerful motivating force behind both the introduction of the ATP and the modest reduction in DSI staff levels that has occurred in recent years. The few recent new hires have been assigned to D&C tasks.

There is another possible dimension to the relationship between D&C staff assignments and the ATP. The World Bank has been advocating improved cost recovery in Turkey for many years, with limited results. The World Bank is also an important financier of water resource development in Turkey. Because management transfer is a partial substitute for improved cost recovery, its implementation may be seen by both the government and the Bank as a more realistic way of satisfying Bank concerns over cost recovery, thereby facilitating additional irrigation lending to the country. There is thus an added complementarity between the ATP and the national water resource development program.

Association Objectives

As inferred from the model transfer agreement, the objectives of an IA are (a) to provide high quality irrigation service to all association members, (b) to do this reliably and sustainably, (c) to contain costs, (d) to collect fees effectively, and (e) to develop the capability for self-reliant O&M. As indicated earlier, it is premature to assess the quality of service delivery; however, collecting data to allow an assessment in several years' time is extremely important. The ability of the IA to contain costs is also somewhat speculative at this point. However, in light of the relative salary levels of DSI and IA employees, it should be possible to sharply reduce this important budgetary expenditure. It should be remembered that more than half of the DSI's operating costs consists of personnel expenses. On the other hand, the IAs, especially the smaller ones, lack certain economies of scale enjoyed by the DSI, such as bulk purchase discounts and the ability to spread major capital good expenditures across a number of schemes. This is a problem that must be addressed. The IAs are clearly better at fee collection than is the government. This is shown by first-year collection percentages that, even though incomplete at the time of the review, were already approximately double those of the Ministry of Finance for DSI-operated schemes. With respect to developing the capacity for self-reliant O&M, most associations in the pilot regions have succeeded in hiring capable technical staff to perform O&M functions. Several have begun to acquire heavy equipment or to accumulate funds to purchase heavy equipment. As noted, however, the scale problem remains to be addressed. Sustainability is discussed in a subsequent section.

Implementation of the Accelerated Transfer Program

The ATP is being implemented effectively by a dedicated group of DSI professionals. Execution has been characterized by a number of important features.

The first is flexibility and experimentation in execution. The program has given appropriate guidance through model transfer agreements and articles of transfer, but has allowed individual IAs and DSI regions sufficient flexibility to adapt to local conditions and constraints.

Second, the approach has been evolutionary, with transfer taking place in phases and with succeeding phases defined in general terms so that learning can be incorporated before implementation. For example, the phased transfer of maintenance responsibility is being carried out flexibly, but with a clear commitment to the IA that support will be available during the transition period. Moreover, the endpoint, or "steady-state" sharing of responsibilities is still only loosely defined, but a clear target of eventual relinquishment of most responsibilities is widely understood and accepted.

Third, the DSI appears to have avoided taking too active a role in the affairs of the fledgling IAs. This is important to maximize learning and to communicate the value of and need for self-reliance on the parts of the IAs.

Fourth, the DSI has made extensive and effective use of national and regional training sessions and workshops to acquaint a wide spectrum of the DSI field O&M staff with the purpose and approach of the ATP. This is responsible for giving the program coherence and direction and for transferring necessary skills to the DSI field staff for implementing the program.

Fifth, the DSI has made effective use of the support made available by the World Bank for acquiring and transferring skills and ideas from other countries to a substantial number of DSI implementors and policymakers. Program managers have cleverly used these opportunities simultaneously as rewards for creative behavior and energetic execution by field staff.

Sixth, pilot regions selected generally comprise regions with large DSI-irrigated areas and with cash crop economies. Implementation began there with larger schemes with some smaller schemes remaining to be transferred. Transferring the remaining schemes in other areas may prove somewhat more difficult. Monitoring implementation in these regions would provide valuable information for other countries regarding management transfer in less favorable situations.

Sustainability

Sustainable operation requires that a system

- Provide a useful service
- Have a secure source of revenue
- Have a stable natural resource base
- Have access to an adequate array of supporting services
- Have a congenial policy environment.

Usefulness. In areas of rapid growth where irrigated agricultural land is being converted to other uses, such as the coastal plain south of Antalya, irrigation service can lose its utility. In this case, irrigation can become superfluous and the system unsustainable, though the water resource itself will certainly have value. There is a larger public policy question here of whether such land conversions should be allowed to take place. But once conversion has taken place, the situation is largely beyond the control of the irrigation managers, and the utility of the irrigation system will have been greatly diminished. In general, however, it seems clear that irrigation water supply is a useful service and remains so throughout Turkey for the foreseeable future.

ADEQUATE REVENUE. The IAs in Turkey have shown a strong ability to collect irrigation fees. However, current fee levels adjusted for inflation may not be high enough to cover the full cost of O&M once DSI support is reduced. This will probably result in the need to raise fee levels above those set in a given year by the DSI, which may lead to farmer resistance. Good communication with farmers and transparency in the tariff setting process will be essential in "selling" such increases.

It would also be appropriate to examine new structures for irrigation charges. The present form, based on area irrigated and crop type, provides little incentive to irrigators to conserve water. Neither does it compensate the IA for making irrigation service available to irrigators who choose instead to use their own well water. A new fee structure might consist of several parts: (a) an area-based connection charge assessed on all farmers whose land can be served by a functional IA channel whether or not they actually use water in a given year; (b) a volumetric charge for water used, perhaps levied jointly on small groups of irrigators sharing a channel; and (c) an energy surcharge levied on farmers whose irrigation supplies require pumping. Some associations already charge the latter. Such a charging system would provide much stronger incentives to farmers to use IA water and to use it efficiently. Many IAs already have most

of the elements of the information system needed to implement such a charging system, especially for groups of farmers within the system.

Secure Water Rights. There is presently no system of registering and securing water rights in Turkey. The right of prior appropriation is recognized, but existing users can be forced into expensive judicial procedures to protect such informal rights. This was less of a problem when the DSI operated schemes. When irrigation associations take over, it is a potentially serious and financially draining problem in regions where water supplies are already extensively allocated. This is an important problem that requires resolution, and efforts should be begun immediately to put a new water rights system in place. Over the short run, the DSI can monitor uses and act as a guarantor of existing irrigation water rights on behalf of the IAs.

IA SUPPORT SERVICES REQUIREMENTS. Local irrigation management organizations will not be able to produce all of the goods and services that they need to manage irrigation effectively. In fact, one implication of a more general national privatization program is that the IAs will rely increasingly on outside providers of specialized goods and services as the sector pursues comparative advantage and economies of scale.

Key support services potentially required by an irrigation system are listed in box 3.5. These supporting services are supplemental to the activities of the irrigation service provider itself. The following discussion focuses on the requirements for sustaining the principal new irrigation management configuration in Turkey, management by irrigation association.

A number of external support services needs for transferred irrigation systems in Turkey appear clear at present. These are services that the IAs cannot or should not generate internally and include training, technical advice, legal and procedural guidance, maintenance oversight, disaster assistance, rehabilitation, auditing, equipment financing, and joint procurement of services.

Box 3.5. Categories of Potential Support Service Needs by Nongovernment Managing Organizations

Types of irrigation system support services

Financial support

- · Accounting systems, software, and advice
- Independent external audits
- A local banking system
- · Short-term credit to even cash flow
- Long-term credit for capital purchases
- · Annual and multiyear planning and budgeting advice
- Subsidies

Managerial support

- Basic management training
- Strategic and operational planning training, assistance, and software
- · Personnel management training
- Human resource development services
- · Resource allocation training, software, and advice

Technical and operational support

- Equipment maintenance and repair facilities and services
- · Facilities design, construction, and repair training and services
- Water measurement and demand estimation training, software, and equipment
- Equipment (machinery, computers, water measurement devices, ratios, and so on)
- Dispute mediation and adjudication
- Maintenance monitoring (on behalf of the facilities owner)

Training

The IAs must attract capable and motivated technical staff and provide opportunities for continuous upgrading of skills. Regular technical training courses should be available to the IAs. In addition to technical training, training is required in other skill areas, including budgeting, financial management, database management and maintenance, computer applications development and use, and relations with users. There is scope for public sector involvement here, as the DSI should have a comparative advantage in providing technical training. However, there is also ample scope for outside organizations to be involved, as in the area of management training, computer consulting, and human resource development, although such services are probably not available in all regions.

Technical Advice

The DSI has been providing technical advice to the IAs during the transition phase. This need will continue for the foreseeable future, especially as regards system upgrading and improvements undertaken by the IAs. However, the overall need for technical advice will decline as the IAs gain experience in managing their systems.

Legal and Procedural Guidance

Because the legal basis for the IAs has been adapted from another purpose, puzzling questions of interpretation arise regularly. Many of these questions revolve around the public versus private status of the IAs and relate to issues such as whether or not the IAs must pay taxes on vehicles and equipment. A central and authoritative source of guidance on such matters is needed, because the IAs are currently receiving conflicting advice from a variety of sources. This should be a joint undertaking by the DSI and the Ministry of the Interior.

Maintenance Oversight

Because an IA holds only the right to manage an irrigation scheme, or a portion of an irrigation scheme and not the ownership of the scheme's physical facilities, the government has a right and a responsibility to monitor the quality of maintenance and upkeep of the facilities. It does this currently through an annual joint DSI-IA maintenance inspection. This practice seems to be working well and should be maintained.

Disaster Assistance

When natural disasters, such as flooding, earthquakes, or major landslides affect an irrigation scheme, there remains a need for public assistance and support, as there would be for other sectors affected by such calamities. This might include assistance in rebuilding damaged structures and facilities and in replacing destroyed maintenance equipment.

Rehabilitation

At some point, irrigation facilities will require rehabilitation. When this point is reached depends on a number of situational factors as well as the quality of maintenance that has been provided by the IAs. The DSI is a natural choice to provide such rehabilitation services; however the question of repayment must then be confronted. This will be a difficult issue to address, given the partial dependence of the need for rehabilitation on the quality of IA maintenance. The absence of effective repayment requirements for comparable new system construction also raises equity questions. A fractional cost sharing arrangement would be an appropriate way to deal with this problem. Requiring the IAs to pay a share of the costs of

rehabilitation would offset the incentive to defer maintenance, while remaining within the irrigators' ability to pay. A similar arrangement should apply to the cost of new system construction.

Auditing

The accounts of each IA should undergo an annual audit by a chartered professional accounting firm. Auditors should insist on the IAs' use of standard professional practices and procedures. The audit report should be reviewed and discussed by the association general assembly and filed with an appropriate public agency.

Equipment Financing

Because of difficult private credit conditions in Turkey, steps should be taken to open a financing window for the IAs, providing medium-term credit for equipment purchases at moderate positive real interest rates. An important goal of many IAs is to acquire the equipment needed to provide a complete range of operations and maintenance services for facilities under their management. Many have already acquired computers, radio communications systems, and vehicles. Some have also purchased pieces of heavy maintenance equipment. At present, because they are not bearing the full cost of O&M, many IAs are accumulating budgetary surpluses that can be used for such purchases. As more maintenance responsibilities are transferred to individual IAs, however, these surpluses will diminish or disappear. Moreover, the equipment is needed now, while accumulation of surpluses will take some associations a considerable time. These factors support the need for a credit facility to provide financing for equipment purchases. Such credit should be subject to standard evaluations of creditworthiness, but because the equipment itself collateralizes the loan, such lending should not be particularly risky. Moreover, the IAs should be definitively accorded the same tax-free status that the DSI enjoys relative to duties on such equipment.

Joint Procurement of Services

Another need is to develop ways to deal with major goods such as road graders and maintenance shops. Economical sizes of such items may be too large for a single IA to afford and make use of effectively. Alternatives are joint procurement and use by neighboring IAs and contracting such services from the DSI or other suppliers. Because of the DSI's high cost structure, it may be most appropriate to consider ways in which groups of IAs could jointly provide such items for themselves.

Policy and Procedural Change

There are several measures by which a government can promote the sustainable operation of transferred irrigation systems. These include (a) maintaining a stable policy environment, (b) avoiding politically expedient populist subsidies that would undermine the commitment and financial discipline of the associations, and (c) monitoring closely the development and operation of new local management entities and providing necessary support. Having embarked on the course of transferring management responsibility to the local level, the government's commitment to it must remain clear and unequivocal. Flipflops in policy on the fundamental point of IA self-governance and financial autonomy will erode the financial discipline and willingness to pay higher fees required to make it work. The government must also watch closely the evolution of the IAs as they acquire more responsibility and experience to identify evolving support needs. Although the DSI is giving up a number of operational responsibilities, a number of new support needs are currently evident and others will emerge in the future. Some of these needs can be met by the private sector, while others will have to be supplied by the DSI, the Ministry of Interior, and other public agencies. The need for public sector support may vary from region to region, depending on the local availability of services in the private sector.

The foregoing discussion suggests a number of areas in which policy or procedural change should be considered by the national government. These include the following.

Water Rights

There is a critical need to review and revise the current informal approach to water resource allocation, use, and reallocation. Current practices result in insecure water rights for the IAs that could be costly for them to protect and defend. Potential costs to other water users are also significant. Needed is a regular system of registration of existing water rights, permits for new users, and simple adjudication of disputes.

Disposal of Surplus Equipment and Facilities

An increasing share of the DSI's O&M equipment and other support facilities is becoming redundant as a result of the success of the ATP. Yet current policy prohibits the sale or transfer of this equipment to the IAs. This policy should be revised and the sale of surplus items allowed. This would be a useful complement to the proposed World Bank loan, which will provide for the modestly subsidized sale of new equipment to the IAs.

Federation of IAs

The municipality law under which the IAs are organized does not allow for higher level federations of IAs. This policy should be reconsidered in light of the likely future need for such federations to achieve economies of scale in equipment purchase and operation, equipment maintenance, and political representation.

A Dedicated IA Law

Although existing municipality law appears to be providing a workable initial basis for the formation of IAs, development and evolution of the IAs may make an establishment law specifically for the IAs increasingly appropriate. The IAs themselves should take the lead in formulating and advocating such a law as they feel the need for it, a need many have already expressed informally. For this purpose, some representational body linking the IAs nationwide would be useful. Again, the IAs themselves must provide the initiative and leadership in establishing such a body.

Water Supply Charges

The IAs currently pay nothing for the water supplied to them by the DSI. The introduction of a modest volumetric charge for such bulk supply services would help to defray the DSI's expenses in providing the water and would create a financial incentive for economical use by the IA.

Broaden the IA Base

The strategy followed by the government of utilizing local political officeholders as a nucleus in forming the IAs has succeeded in creating a large number of functioning associations in a short period of time. The tradeoff has been a somewhat limited involvement of local farmers in the process. This appears to have been a wise and effective strategy. As the IAs mature, however, it will be important to consciously broaden the governance base of the associations. Currently, in most cases, governance is in the hands of local political leaders. Farmer involvement in governance is accomplished indirectly, through their role in electing leaders to local administrative positions in general elections. Securing a greater sense of farmer ownership of the IAs and improving the accountability of the IA leadership to association membership

requires broadening the base of the general assembly through changes in the member selection process. These include selecting assembly members at large rather than from the ranks of existing village or municipal council members, considering a system of proportional representation based on the number of farmers or commanded area, and possibly shortening the current five-year term of assembly members. Ultimately, the goal should be to separate the IA leadership from any connection with local public administration and to provide for direct rather than indirect election of association leaders by irrigators.

Future Roles for the DSI

The DSI is becoming more predominantly a design and construction agency. At the same time, it has acquired a new set of supporting responsibilities for the IAs, as outlined earlier, which are still incompletely defined. In addition there are other major needs related to water resources development and management in which the DSI could play a larger role.

Chief among these is basin-level water resource planning and management. Although a strengthened role here may require legislative action as a prerequisite, there is a strong need to document and record current water usage patterns, preparatory to developing a more formal system of water rights in the country. This will be particularly important to the IAs in heavily allocated basins as pressure on limited supplies from urban and industrial users intensifies.

A related need is for a uniform and rationalized inventory and database of irrigation systems, irrigated area, and water used in the country. At present, the DSI is concerned principally with irrigation systems created by itself. Systems developed by the GDRS are much less carefully documented by the DSI, and privately developed schemes, which together constitute a significant fraction of the national irrigation capacity, are virtually ignored. The DSI should develop and maintain a database of all irrigation in the country, perhaps recording the entity that constructed it, but, more important, the organization that currently manages it and how productive and efficient it is. This step leads naturally to a new role for the DSI in providing technical advice, training, and monitoring support to all types of irrigation schemes in the country, not just DSI-constructed ones.

The DSI currently has two centrally managed monitoring programs for the IAs. These two programs should be coordinated and possibly combined to minimize the reporting burden on the IAs. The first year of post-transfer experience with the newest and most extensive of the monitoring programs should also be carefully reviewed, in collaboration with the IAs, to revise, refine, and simplify the data collection protocols. This should follow a careful analysis and reporting of the current year's data so that a clear use can be identified for each item of data requested (or the item eliminated). The performance monitoring program is an extremely important exercise that can evaluate the outcomes and impacts of the ATP, identify emerging generic problems and needed program modifications, and identify public support needs.

Conclusions

Turkey is a literate, middle-income country with a diversified and growing economy. Agriculture employs a significant segment of the population but is a relatively small component of the national economy. Much of the agriculture is commercially oriented, particularly in the pilot regions for implementing the transfer program. Land holdings are of moderate size, but are large compared with most South and Southeast Asian countries. Turkey has a tradition of strong but democratically elected government; a major ongoing water resource development program; and a large, competent, and highly professional national irrigation agency.

Of course many other features characterize the context of the IMT in Turkey. Those mentioned are basic ones that are not subject to policy-led change over the short run. Some may be significant enabling conditions for a successful IMT program and others probably are not. Nevertheless they constitute the context in which the IMT is taking place in Turkey. Through comparison of these conditions with those in

other countries where successful programs have been mounted, a picture will emerge of those conditions that seem to predispose success and those that are irrelevant to it.

Process

Transfer of government-built and government-operated irrigation systems in Turkey to local control has proceeded at an astonishingly rapid pace. Characterizing the transfer program itself is a remarkably small group of capable people within the irrigation agency who are committed to the program and who have worked energetically to implement it. Implementation has been characterized by flexibility, experimentation, and a learning process approach. It relies heavily on an extensive series of workshops and seminars to communicate values and skills to O&M staff in the field who are implementing the transfer program. At the same time there is a strong emphasis on action.

Turkey acknowledges the important role played by the World Bank in the IMT process. That role included a long preliminary period of pressure to reform cost-recovery procedures and rates, flexible financial assistance to allow a number of DSI staff members to visit Mexico, the United States, and other places where promising transfer programs were underway, the energetic promotion of the IMT idea by a particular Bank staff member during regular visits to Turkey, and the promise of assistance for IA equipment purchases through a new World Bank credit.

Despite the dedication and hard work of a small group of committed people within the DSI, the birth of the program was neither automatic nor easy. As is always the case with a new and somewhat radical idea, it was characterized by argument, cajolery, incentives, and pressure. The importance of "champions" for the idea at the various stages of its development should not be underestimated.

Impacts

Some outcomes of the transfer program are evident at this early stage, while others will not be assessable yet for several years. Public costs of O&M have begun to fall and will very likely continue to do so over the next few years. Private costs have increased and will likely continue to increase as more and more responsibility is transferred to local agencies. Cost recovery has improved dramatically. The DSI's O&M staff levels have fallen marginally, though more dramatic declines will depend on resolving issues of transfer and termination with the powerful unions representing the DSI support staff. Associations have gained control over many operational decisions and secured the opportunity to stabilize and improve system performance. The impacts of transfer on the quality of irrigation service cannot yet be established, although early evidence in three systems suggests that IAs may, in some cases, be able to expand the irrigated area of the system they manage beyond previous averages. And important issues of future sustainability remain. Still, in comparison with efforts in other countries, the early achievements of the ATP in Turkey show considerable promise for achieving objectives held both by the government and by local associations.

Second-Generation Problems

Second-generation problems and challenges are already emerging in the wake of the early successes of this initiative. These can be categorized in terms of the party on which they have their primary effect. Challenges for the DSI include the following:

- The difficulty in reducing overall staff levels in general, and O&M staff levels in particular, in the wake of transfer
- The absence of a charging mechanism for bulk water supply to the IAs, and the consequent absence of an economic restraint on demands for water
- The indistinct vision of a new role for the agency in supporting existing irrigation in the posttransfer era.

Nascent problems for the IAs include the following:

- The undefined nature of water rights in Turkey, and the consequent insecurity of their claim on irrigation water
- Restricted options for obtaining heavy maintenance equipment
- The lack of a legal basis for forming federations of IAs for joint purchasing and supplying major services such as equipment maintenance
- The de facto lack of a clear policy on capital cost sharing for rehabilitation (and new system construction)
- The need to increase direct farmer participation in IA governance and reduce dependence on village and municipal leaders in filling IA leadership roles
- Weak support service systems for IAs in some areas and regions.

The flexible and pragmatic conduct of the transfer program to date, and the enthusiasm and capability apparent in many association leaders, offer reason for confidence that problems will be met and addressed. In some areas action is already underway. A World Bank loan currently being appraised will help to ease the equipment constraint with subsidized purchase arrangements for the IAs. The water rights situation, however, presents a potential problem of major dimensions that will require upper-level action and time to remedy. Other constraints will require concerted action by the DSI, the IAs, and other organizations. The real danger is that of complacency, in which the government washes its hands of irrigation management entirely and fails to apprehend its ongoing role in monitoring and addressing emerging problems in the area of policy, finance, regulation, oversight, and supporting services.

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Annex Tables

Table 3A.1. Area Irrigated in DSI-Operated Systems, Pilot Regions, by Crop, 1991–94

		Gr	ains	Suga	r beets	Co	tton	М	aize	Vege	ables	Fr	uit	Cit	rus	For	age	Ot	ther
		Area	Share	Area	Share	Area	Share	Area	Share	Area	Share	Area	Share	Area	Share	Area	Share	Area	Share
Region	Year	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Izmir	1991	488	0.7	213	0.3	39,525	57.4	1,630	2.4	1,928	2.8	1,130	1.6	61	0.1	433	0.6	23,477	34.1
	1992	1,054	1.9	96	0.2	28,186	50.0	1,254	2.2	1,615	2.9	982	1.7	<i>7</i> 7	0.1	262	0.5	22,825	40.5
	1993	3,360	4.9	70	0.1	28,898	42.3	3,561	5.2	1,652	2.4	1,176	1.7	85	0.1	463	0.7	29,131	42.6
	1994	361	0.7	34	0.1	23,054	46.0	809	1.6	1,213	2.4	998	2.0	82	0.2	300	0.6	23,250	46.4
	Average	1,316	2.2	103	0.2	29,916	49.1	1,814	3.0	1,602	2.6	1,072	1.8	76	0.1	365	0.6	24,671	40.5
Konya	1991	65,781	69.5	15,280	16.1	0	0.0	149	0.2	964	1.0	2,603	2.7	0	0.0	2,335	2.5	7,605	8.0
•	1992	79,303	67.4	17,190	14.6	0	0.0	100	0.1	2,233	1.9	4,489	3.8	0	0.0	3,272	2.8	11,111	9.4
	1993	84,493	67.8	22,621	18.1	0	0.0	226	0.2	1,508	1.2	4,847	3.9	0	0.0	3,478	2.8	7,493	6.0
	1994	59,533	70.6	12,650	15.0	0	0.0	50	0.1	1,307	1.6	3,508	4.2	0	0.0	1,768	2.1	5,488	6.5
	Average	72,278	68.6	16,935	16.1	0	0.0	131	0.1	1,503	1.4	3,862	3.7	0	0.0	2,713	2.6	7,924	7.5
Adana	1991	3,469	1.6	0	0.0	52,570	23.6	64,271	28.9	15,568	7.0	1,599	0.7	16,998	7.6	120	0.1	68,038	30.6
	1992	30,014	10.8	0	0.0	53,990	19.3	97,443	34.9	17,193	6.2	1,652	0.6	17,558	6.3	96	0.0	61,167	21.9
	1993	12,162	4.8	0	0.0	26,785	10.5	131,023	51.5	16,941	6.7	1,550	0.6	18,607	7.3	91	0.0	47,354	18.6
	1994	339	0.2	0	0.0	34,667	20.5	51,450	30.5	8,804	5.2	1,314	0.8	18,312	10.9	111	0.1	53,733	31.8
	Average	11,496	5.0	0	0.0	42,003	18.2	86,047	37.2	14,627	6.3	1,529	0.7	17,869	7.7	105	0.0	57,573	24.9
Antalya	1991	142	0.4		0.0	15,072	42.1	742	2.1	3,489	9.8	495	1.4	1,109	3.1	82	0.2	14,652	40.9
-	1992	164	0.5	157	0.4	18,053	50.1	1,290	3.6	4,432	12.3	603	1.7	1,182	3.3	91	0.3	10,094	28.0
	1993	378	1.2	297	0.9	16,243	49.7	2,797	8.5	3,979	12.2	614	1.9	1,222	3.7	93	0.3	7,091	21.7
	1994	<i>7</i> 7	0.5	331	2.1	5,625	34.9	1,597	9.9	2,561	15.9	273	1.7	778	4.8	70	0.4	4,825	29.9
	Average	190	0.6	262	0.9	13,748	45.6	1,607	5.3	3,615	12.0	496	1.6	1,073	3.6	84	0.3	9,166	30.4
Pilot regions	1991	69,880	16.6	15,493	3.7	107,167	25.4	66,792	15.8	21,949	5.2	5,827	1.4	18,168	4.3	2,970	0.7	113,772	27.0
	1992	110,535	22.6	17,443	3.6	100,229	20.5	100,087	20.5	25,473	5.2	7,726	1.6	18,817	3.8	3,721	0.8	105,197	21.5
	1993	100,393	20.9	22,988	4.8	71,926	15.0	137,607	28.7	24,080	5.0	8,187	1.7	19,914	4.1	4,125	0.9	91,069	19.0
	1994	60,310	18.9	13,015	4.1	63,346	19.8	53,906	16.9	13,885	4.3	6,093	1.9	19,172	6.0	2,249	0.7	87,296	27.3
	Average	n.a.	19.7	n.a.	4.0	n.a.	20.2	n.a.	20.5	n.a.	4.9	n.a.	1.6	n.a.	4.6	n.a.	0.8	n.a.	23.7

n.a. Not applicable.
Source: DSI data.

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Table 3A.2. Number of Schemes and Area Transferred in DSI Pilot Regions, 1964-95

			Adana			Ar	italya				Konya				Izmir	zmir	
	Nun	nber	Are	a (ha)	Nur	nber	Area	a (ha)	Nun	iber	Are	a (ha)	Nur	nber	Are	a (ha)	
Decade	Total	IAs	Total	IAs	Total	IAs	Total	IAs	Total	IAs	Total	IAs	Total	IAs	Total	IAs	
1960s	3	1	3,820	1,370	1	1	1,200	1,200	3	0	1,850	0	0	0	0	0	
1970s	1	1	1,970	1,970	1	1	1,800	1,800	1	0	100	0	1	0	280	0	
1980s	1	0	600	0	6	4	6,350	5,550	14	0	3,296	0	2	0	295	0	
1990s	43	42	240,158	239,974	30	12	65,905	53,980	24	11	154,064	147,302	18	13	110,907	109,368	
Total	48	44	246,548	243,314	38	18	75,255	62,530	42	11	159,310	147,302	21	13	111,482	109,368	

Source: DSI data.

 Table 3A.3.
 DSI Irrrigation Units Transferred in Pilot Regions, by Organization Type, December 1995

Re	gion		To	tal	Average			Share of	Share of
Number	Name	Туре	Area (ha)	Number	area (ha)	Smallest	Largest	area (%)	units (%)
2	Izmir	Со-ор	1,133	3	378	143	680	1	14
		Village	981	5	196	16	390	1	24
		IA	109,368	13	8,413	998	16,500	9 8	62
		Total	111,482	21	5,309	n.a.	n.a.	100	100
4	Konya	Co-op	1,957	4	489	186	850	1	10
	•	Municipality	8,125	17	478	35	1,620	5	40
		Village	1,926	10	193	10	550	1	24
		IA	147,302	11	13,391	2,522	34,782	92	26
		Total	159,310	42	3,793	n.a.	n.a.	100	100
6	Adana	Municipality	1,184	2	592	184	1,000	0	4
		University	600	1	600	600	600	0	2
		Village	1,450	1	1,450	1,450	1,450	1	2
		IA	243,314	44	5,530	60	22,200	99	92
		Total	246,548	48	5,136	n.a.	n.a.	100	100
13	Antalya	Municipality	10,005	11	910	100	2,210	13	29
	•	Village	2,720	9	302	100	650	4	24
		IA	62,530	18	3,474	550	15,040	83	47
		Total	75,255	38	1,980	n.a.	n.a.	100	100
All regions		Co-op	3,090	7	44 1	143	850	1	5
total		Municipality	19,314	30	644	35	2,210	3	20
		University	600	1	600	600	600	0	1
		Village	7,077	25	283	10	1,450	1	17
		IA	562,514	86	6,541	60	34,782	95	58
		Total	592,595	149	3,977	n.a.	n.a.	100	100

n.a. Not applicable.

Note: University refers to a unit operated by a local university in Adana.

Source: DSI data.

Table 3A.4. Stages in the Transfer of DSI Irrigation Schemes, by Type of Management

Stage	IA management	Village management	Municipality management	Cooperative management
1. Initiation	Initiative generally comes from the DSI; involves meetings with muhtars, mayors, and local assemblies; agreement to continue must be given by muhtars, mayors, and their respective assemblies	Initiative generally comes from the DSI; involves meetings with the muhtar and council of elders; agreement to continue must be given by the muhtar and the council of elders	Initiative generally comes from the DSI; involves meetings with the mayor and municipal assembly; agreement to continue must be given by the mayor and municipal assembly	Initiative must come from a minimum of 15 farmers prior to construction of a groundwater or surface scheme
Legal establishment of the management agency	1) Application for the legal establishment of an irrigation association signed by muhtars and mayors with the authority of their respective local councils; 2) reviewed by the provincial governor's office; 3) reviewed by the Ministry of Interior; 4) approved by the Council of Ministers	Not necessary	Not necessary	Cooperative registered as a legal entity in accordance with cooperatives legislation adminstered by the Minstry of Agriculture and Rural Affairs
1b. Selection of chair and board	1) General assembly constituted by multars, mayors (automatic members), and two to three times as many additional members selected either by the automatic members or (less often) by irrigators; 2) the general assembly elects a chairman and four members of the management committee	Constituted by the muhtar and the council of elders	Constituted by the mayor and the municipal council	Elected annually by the general assembly made up of members and partners of the cooperative
2. Transfer agreement	1) Prepared by the DSI; 2) signed by the chairman of the IA with the approval of the IA management committee; 3) signed by the DSI regional office; 4) reviewed in Ankara by the DSI's O&M transfer section; 5) approved by minister of public works and settlement	1) Prepared by the DSI; 2) signed by muhtar with the authority given by the village council of elders; 3) signed by the DSI regional office; 4) reviewed in Ankara by the DSI O&M transfer section; 5) approved by minister of public works and settlement	1) Prepared by the DSI; 2) signed by the mayor with the authority given by the municipal council; 3) signed by the DSI regional office; 4) reviewed in Ankara by the DSI O&M transfer section; 5) approved by minister of public works and settlement	Incorporated in the regulations relating to the establishment of the cooperative
3. Transfer protocol	Prepared by the DSI; sets out the characteristics of the irrigation system	Prepared by the DSI; sets out the characteristics of the irrigation system	Prepared by the DSI; sets out the characteristics of the irrigation system	Prepared by the GDRS in accordance with the provisions of cooperative legislation
Preparation of operation and maintenance plans	Prepared by the DSI with management committee and staff appointed by the management committee	Prepared by the DSI with muhtur and other staff appointed by the muhtur	Prepared by the DSI with mayor and other staff appointed by the mayor	Prepared by operational staff employed by the cooperative under the supervision of a five-person board of directors elected annually by the general assembly; all partners and members of the cooperative constitute the general assembly
5. Implementation	Responsibility of the chairman, the management committee, and staff appointed by the chairman	Responsibility of muhtar and other staff appointed by the muhtar	Responsibility of mayor and other staff appointed by the mayor	Responsibility of the board of directors and operational staff employed by the cooperative

Source: Authors' research.

 Table 3A.5.
 DSI Schemes and Areas Transferred, by Region, as of December 1995

	To	tal		Trans	ferred			DSI op	erated	
Region	Number	Area	Number	Percent	Area	Percent	Number	Percent	Area	Percent
Bursa	23	48,148	15	65.2	24,528	50.9	8	34.8	23,620	49.1
Izmir	18	116,025	15	83.3	111,235	95.9	3	16.7	4,790	4.1
Eskisehir	42	73,260	34	81.0	36,605	50.0	8	19.0	36,655	50.0
Konya	49	164,325	47	95.9	159,385	97.0	2	4.1	4,940	3.0
Ankara	50	48,728	39	78.0	5,824	12.0	11	22.0	42,904	88.0
Adana	27	283,448	. 21	77.8	245,554	86.6	6	22.2	37,894	13.4
Samsun	35	66,790	22	62.9	48,330	72.4	13	37.1	18,460	27.6
Erzurum	18	55,650	7	38.9	12,355	22.2	11	61.1	43,295	<i>77.</i> 8
Elazig	14	60,050	0	0.0	0	0.0	14	100.0	60,050	100.0
Diyarbakir	15	29,579	11	73.3	19,589	66.2	4	26.7	9,990	33.8
Edirne	43	41,607	33	76.7	3,263	<i>7</i> .8	10	23.3	38,344	92.2
Kayseri	40	57,471	31	7 7.5	42,067	73.2	9	22.5	15,404	26.8
Antalya	30	91,390	24	80.0	80,890	88.5	6	20.0	10,500	11.5
Istanbul	1	0	1	100.0	0		0	0.0	0	0
Sanliurfa	6	58,265	5	83.3	56,185	96.4	1	16.7	2,080	3.6
Van	14	55,347	0	0.0	0	0.0	14	100.0	55,347	100.0
Isparta	36	78,526	19	52.8	20,393	26.0	17	47.2	58,133	74.0
Sivas	23	14,275	20	87.0	10,048	70.4	3	13.0	4,227	29.6
K. Maras	13	41,406	9	69.2	30,991	74.8	4	30.8	10,415	25.2
Aydin	33	131,692	20	60.6	35,467	26.9	13	39.4	96,225	73.1
Trabzon	4	595	1	25.0	205	34.5	3	75.0	390	65.5
Kastamonu	13	6,638	9	69.2	2,078	31.3	4	30.8	4,560	68.7
Kars	6	58,703	2	33.3	18,703	31.9	4	66.7	40,000	68.1
Balikesir	27	21,510	22	81.5	14,881	69.2	5	18.5	6,629	30.8
Turkey	580	1,603,428	407	70.2	978,576	61.0	173	29.8	624,852	39.0
Pilot regions	124	655,188	107	86.3	597,064	91.1	17	13.7	58,124	8.9

Note: Region 16 is a special region for Ataturk dam. Izmir, Konya, Adana, and Antalya in bold type are pilot regions. Source: DSI data.

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Irrigation Irrigation Irrigated Irrigated area/ Irrigation Irrigation Duration area (ha) association irrigator (ha) Region area (ha) *Irrigators* start date end date (days) 997 607 Gokkya Pump 16-Aug-95 500 1.21 9-Jun-95 68 **Izmir** 4,807 1,770 Gediz 10,962 2.72 31-Aug-95 **Izmir** 3-Jul-95 59 31-Aug-95 Izmir Mesir 13,679 5,820 2,800 2.08 3-Jul-95 59 13,702 8,808 4,500 57 Izmir Sarikiz 1.96 5-Jul-95 31-Aug-95 Menemen Sag Izmir 6,365 4,818 3,626 1.33 5-Jul-95 31-Aug-95 57 Menemen Sol 4,183 31-Aug-95 57 Izmir 16,500 13,018 3.11 5-Jul-95 8,000 Cumra 38,893 20,499 27-Oct-95 Konya 2.56 22-Apr-95 188 24,922 25-Aug-95 Konya Cumra Ova 24,922 3,507 7.11 21-Mar-95 157 22-Sep-95 Ivriz Sag 18,000 12,878 1,735 7.42 5-Apr-95 170 Konya Ivriz Akhuyuk Ciller 4,700 3,942 8-Sep-95 Konya 1,083 3.64 12-Apr-95 149 Ivriz Sol 9,589 8,000 30-Jul-95 11,610 1.20 28-Mar-95 Konya 124 Antalya Alara Sag 1,300 905 n.a. n.a. 1-Mar-95 12-Dec-95 286 Total 161,630 110,613 39,704 n.a. 13,469 9,218 3.12 119 Average n.a. 38,893 24,922 7.42 12-Dec-95 286 Maximum 8,000 5-Jul-95 997 Minimum 607 500 1.20 21-Mar-95 30-Jul-95 57

n.a. Not applicable. Source: DSI O&M reports.

Table 3A.6. Basic Data on Selected Irrigation Associations, December 1995

Table 3A.7. Fee Rates for Selected IAs and the DSI, 1995 (US\$/hectare)

Crop	Gokkaya Pump	DSI group 5 (pump)	Cumra	Ivriz (pump)	DSI group 2	Gediz	Sarikiz	Menemen Sag	Menemen Sol	DSI group 3
Wheat	n.a.	24.84	9.38	9.38	7.81	n.a.	n.a.	n.a.	n.a.	11.09
Sugar beets	n.a.	86.88	15.63	21.88	23.59	n.a.	n.a.	n.a.	n.a.	38.91
Cotton	31.25	86.88	n.a.	n.a.	23.59	31.25	31.25	31.25	31.25	38.91
Sesame	31.25	62.03	n.a.	n.a.	15.63	n.a.	n.a.	n.a.	n.a.	27.81
Legumes	n.a.	49.69	15.63	18.75	11.72	n.a.	n.a.	n.a.	n.a.	22.19
Fruit	46.88	99.38	23.44	31.25	23.59	31.25	31.25	31.25	31.25	44.53
Vegetables	62.50	86.88	18.75	28.13	19.69	31.25	31.25	31.25	31.25	38.91
Fodder crops	n.a.	62.03	15.63	12.50	15.63	n.a.	n.a.	n.a.	n.a.	27.81
Tobacco	31.25	62.03	n.a.	n.a.	15.63	n.a.	n.a.	n.a.	n.a.	27.81
Kitchen garden	31.25	37.19	15.63	14.06	11.72	31.25	31.25	n.a.	31.25	16.72
Onions/garlic	n.a.	62.03	15.63	17.19	15.63	n.a.	n.a.	n.a.	n.a.	27.81
Sunflower	n.a.	49.69	n.a.	12.50	11.72	n.a.	n.a.	n.a.	n.a.	22.19
Potatoes	n.a.	49.69	15.63	17.19	15.63	n.a.	n.a.	n.a.	n.a.	22.19
Vineyard	23.44	74. 53	n.a.	n.a.	15.63	31.25	31.25	31.25	31.25	33.28
Poplar	n.a.	124.22	15.63	15.63	15.63	n.a.	n.a.	n.a.	n.a.	55.63
Maize	23.44	74.53	n.a.	12.50	15.63	n.a.	n.a.	n.a.	31.25	33.28
Nursery	23.44	49.69	n.a.	7.81	15.63	15.63	15.63	15.63	n.a.	22.19
Off season	23.44	24.84	23.44	n.a.	7.81	15.63	n.a.	n.a.	15.63	11.09
Greenhouse	n.a.	99.38	n.a.	n.a.	23.59	n.a.	n.a.	n.a.	n.a.	44.53

n.a. Not applicable.

Source: DSI O&M reports and DSI rate information.

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Table 3A.8. Distribution of Capital and Operating Costs for Selected IAs, 1995 (millions of Turkish lira)

Region	Irrigation association	Personnel (1)	Travel (2)	Services (3)	Goods and materials (4)	Furniture and equipment (5)	Vehicles, machinery, and equipment (6)	Maintenance and repair (7)	Taxes (8)	Other (9)	Total
Izmir	Gokkaya Pump	329	1	512	555	27	0	0	0	0	1,425
Izmir	Gediz	2,428	2	1,341	187	336	977	0	8	105	5,384
Izmir	Mesir	450	0	1,047	20	83	4,000	2,300	0	0	<i>7,</i> 900
Izmir	Sarikiz	1,179	0	2,509	524	232	3,537	1,131	0	227	9,339
Izmir	Menemen Sag	928	8	260	193	316	21	10	10	0	1,746
Izmir	Menemen Sol	2,605	2 5	2,670	335	550	2,185	3,700	0	8,700	20,770
Konya	Cumra	1,379	0	0	382	2,322	745	0	0	0	4,828
Konya	Cumra Ova	1,845	0	160	0	750	530	0	0	0	3,285
Konya	Ivriz Sag	2,204	3	284	584	608	2,887	457	0	950	7,977
Konya	Ivriz Akhuyuk Ciller	908	1	235	336	225	323	0	116	1,183	3,327
Konya	Ivriz Sol	4,570	134	1,390	2,295	365	1,900	5,000	0	3,960	19,614
Antalya	Alara Sag	375	0	127	142	163	0	0	51	0	858
Average		19,200	174	10,536	5,554	5,977	17,105	12,598	184	15,125	86,453
Share (percent)		22.2	0.2	12.2	6.4	6.9	19.8	14.6	0.2	17.5	100

Source: DSI O&M reports.

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Table 3A.9. Allocation of O&M Expenditures for Selected IAs, 1995 (millions of Turkish lira)

Region	Irrigation association	Concrete repairs	Cleaning	Kanalet repairs	Paintwork	Underground works repair	Road repair	Building repair	Canal sealing and lining	Other	Total
Izmir	Gokkaya Pump	0	33	27	0	0	0	0	0	18	78
Izmir	Gediz	60	865	7 5	. 0	0	0	40	0	0	1,040
Izmir	Mesir	19	1,892	272	8	0	0	58	50	0	2,299
Izmir	Sarikiz	750	1,300	0	0	0	50	0	0	0	2,100
Izmir	Menemen Sag	1 7	439	822	28	0	715	0	Ö	0	2,022
Izmir	Menemen Sol	1	1,251	1,088	22	0	7 03	0	0	0	3,065
Konya	Cumra	0	0	0	0	0	0	0	0	0	0
Konya	Cumra Ova	0	0	0	0	0	0	85	0	0	85
Konya	Ivriz Sag	211	13	0	43	0	0	246	0	19	532
Konya	Ivriz Akhuyuk Ciller	0	0	0	0	0	0	85	0	14	99
Konya	Ivriz Sol	631	0	0	0	0	0	21	0	0	653
Antalya	Alara Sag	0	0	0	0	0	0	0	0	0	0
Total	· ·	1,689	5 ,79 3	2,285	101	0	1,468	535	50	51	11,973
Share (%)		14.1	48.4	19.1	0.8	0	12.3	4.5	0.4	0.4	100.0

Source: DSI O&M reports.

Table 3A.10. Total Capital and Operating Costs for Selected IAs, 1995 (millions of Turkish lira)

	Irrigation		Recurrent	Share	Capital	Share
Region	association	Total	(1,2,3,4,7,8,9)	(%)	(5,6)	(%)
Izmir	Gokkaya Pump	1,425	1,398	98.1	27	1.9
Izmir	Gediz	5,384	4,071	75.6	1,313	24.4
Izmir	Mesir	7,900	3,817	48.3	4,083	51.7
Izmir	Sarikiz	9,339	5,570	59.6	3,768	40.4
Izmir	Menemen Sag	1,746	1,410	80.7	337	19.3
Izmir	Menemen Sol	20,770	18,035	86.8	2,735	13.2
Konya	Cumra	4,828	1,761	36.5	3,067	63.5
Konya	Cumra Ová	3,285	2,005	61.0	1,280	39.0
Konya	Ivriz Sag	7,977	4,482	56.2	3,495	43.8
Konya	Ivriz Akhuyuk Ciller	3,327	2,779	83.5	548	16.5
Konya	Ivriz Sol	19,614	17,349	88.5	2,265	11.5
Antalya	Alara Sag	858	695	81.0	163	19.0
Average		7,204	5,281	71.3	1,923	28.7

 $\it Note:$ Numbers under recurrent and capital costs refer to headings in table 3A.8. $\it Source:$ DSI O&M reports.

Table 3A.11. Potential Reserves for Selected IAs, 1995

Region	Irrigation association	Irrigation area (ha)	Budgeted costs (millions of TL)	Total income (millions of TL)	Surplus (millions of TL)	Share of total income (%)	Surplus/irrigation hectare (US\$/ha)
Izmir	Gokkaya Pump	997	1,425	2,461	1,037	42	16.24
Izmir	Gediz	10,962	5,384	8,370	2,986	36	4.26
Izmir	Mesir	13,679	<i>7,</i> 900	11,000	3,100	28	3.54
Izmir	Sarikiz	13,702	9,339	15,262	5,924	39	6.75
Izmir	Menemen Sag	6,365	1,746	5,431	3,685	68	9.05
Izmir	Menemen Sol	16,500	20,770	20,770	0	0	0.00
Konya	Cumra	38,893	4,828	15,783	10,955	69	4.40
Konya	Cumra Ova	24,922	3,285	17,298	14,013	81	8.79
Konya	Ivriz Sag	18,000	7,977	8,929	952	11	0.83
Konya	Ivriz Akhuyuk Ciller	4,700	3,327	3,727	400	11	1.33
Konya	Ivriz Sol	11,610	19,614	19,250	-365	-2	(0.49)
Antalya	Alara Sag	1,300	858	1,909	1,051	55	12.63
Average		13,469	7,204	10,849	3,645	34	5.61

Note: Exchange rate used is US\$1.00 = TL 64,000. Source: DSI O&M reports.

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Year	General administration services	Technical services	Legal services	Health services	Auxiliary services	Total civil service	Contract personnel	Permanent labor	Grand total
1990	2,064	4,404	79	80	250	6,877	53	20,906	27,836
1991	2,030	4,458	<i>7</i> 9	86	248	6,901	28	20,414	27,343
1992	1,962	4,469	76	92	244	6,843	25	19,926	26, 7 94
1993	1,944	4,498	73	93	233	6,841	15	19,533	26,389
1994	2,090	4,253	64	95	207	6,709	13	18,663	25,385
1995	2,006	4,777	64	90	197	7,134	11	18,222	25,367
Average share (percent)	7.6	16.9	0.3	0.3	0.9	26.0	0.1	73.9	100.0
Percentage change 1990-95	-2.8	8.5	-19.0	12.5	-21.2	3.7	<i>-7</i> 9.3	-12.8	-8.9

Source: DSI data.

 Table 3A.12.
 DSI Staff (Headquarters and Regions), 1990–95

Table 3A.13. National O&M Staff Levels, 1990-94

Staff	1990	1991	1992	1993	1994
Engineer and senior technicians	533	522	519	516	496
Technicians	1,291	1,168	1,170	1,136	1,063
Other support staff	2,854	2,426	2,514	2,642	2,279
Skilled laborers	2,193	2,193	2,100	1,898	2,963
Unskilled laborers	3,191	3,191	3,130	3,726	2,235
Total laborers	5,384	5,384	5,230	5,624	5,198
Total	10,062	9,500	9,433	9,918	9,036

Note: Does not include headquarters O&M staff.

Source: DSI O&M department.

Table 3A.14. Index Numbers of National O&M Staff Levels, 1990–94

Staff	1990	1991	1992	1993	1994
Engineer and senior technicians	100	98	97	97	93
Technicians	100	90	91	88	82
Other support staff	100	85	88	93	80
Skilled laborers	100	100	96	87	135
Unskilled laborers	100	100	98	117	70
Total laborers	100	100	97	104	97
Total	100	94	94	99	90

Note: Does not include headquarters O&M staff.

Source: DSI O&M department.

Table 3A.15. O&M Staff Levels in ATP Pilot Regions, 1990-95

Region	Staff	1990	1991	1992	1993	1994	1995
Izmir	Engineer and senior technicians	43	34	37	35	38	36
	Technicians	83	79	77	70	68	67
	Other support staff	205	180	196	218	211	205
	Skilled laborers	65	65	82	83	82	69
	Unskilled laborers	172	172	164	240	164	151
	Total	568	530	556	646	563	528
Antalya	Engineer and senior technicians	25	26	30	26	27	27
	Technicians	62	57	59	41	41	39
	Other support staff	299	277	261	269	238	215
	Skilled laborers	83	83	75	70	146	117
	Unskilled laborers	157	157	161	410	113	38
	Total	626	600	586	816	565	436
Konya	Engineer and senior technicians	18	21	20	20	22	20
	Technicians	72	70	67	67	64	59
	Other support staff	139	145	140	133	123	123
	Skilled laborers	<i>7</i> 9	<i>7</i> 9	74	73	74	78
	Unskilled laborers	149	149	130	152	107	65
	Total	457	464	431	445	390	345
Adana	Engineer and senior technicians	102	107	98	91	96	******
	Technicians	237	242	235	231	222	
	Other support staff	670	630	610	634	584	_
	Skilled laborers	399	399	429	424	434	_
	Unskilled laborers	338	338	310	354	175	
	Total	1,746	1,716	1,682	1,734	1,511	_
Total staff pilot regions	Engineer and senior technicians	188	188	185	172	183	**********
• •	Technicians	454	448	438	409	395	
	Other support staff	1,313	1,232	1,207	1,254	1,156	
	Skilled laborers	626	626	660	650	736	
	Unskilled laborers	816	816	765	1,156	559	
	Total laborers	1,442	1,442	1,425	1,806	1,295	_
	Total	3,397	3,310	3,255	3,641	3,029	-
Index numbers pilot regions	Engineer and senior technicians	100	100	98	91	97	97
. 0	Technicians	100	99	96	90	87	76
	Other support staff	100	94	92	96	88	84
	Skilled laborers	100	100	105	104	118	116
	Unskilled laborers	100	100	94	142	69	53
	Total laborers	100	100	99	125	90	73
	Total	100	97	96	107	89	. 79

Note: Does not include headquarters O&M staff. Index numbers for 1995 exclude Adana region. Source: DSI O&M department.

4

Benefits and Second-Generation Problems of Irrigation Management Transfer in Colombia

Luis E. Quintero-Pinto

Summary

Irrigation management transfer in Colombia was unusual in that it was initiated by farmers rather than by government initiative. Since the first two schemes were transferred in 1976, 16 of the 24 medium and large schemes in the country, covering about two-thirds of the 750,000 hectares under such irrigation, have been transferred to local associations to manage. Many of the remaining schemes are expected to be difficult to transfer and the process appears to have stagnated.

In 1991 a national federation of water users' associations was formed to represent association interests. This federation has secured national recognition for itself and a seat on the top land development policymaking council in the country but has not been active in providing services to its member associations. A new law passed in 1993 gave legal status to water users' associations and outlined both their responsibilities and the supporting and monitoring obligations of the national irrigation agency, INAT.

Water users' associations enter into contractual relationships with INAT for management, but not ownership, of system facilities. One problematic feature of this relationship is the provision for ownership of assets, which specifies that even assets such as heavy equipment purchased by the association with its own funds remains the property of the government.

Results of the transfer program include more flexible irrigation plans and cropping patterns. Unit costs of maintenance are said to have dropped, and transferred systems are more likely to follow a regular maintenance schedule than are those administered directly by INAT. In terms of finances, user-managed districts receive only about one-quarter of their O&M costs as subsidies, on average, while INAT-administered districts receive subsidies covering nearly 90 percent of their costs. Association-managed districts have gained control over the form and frequency of their fee payments and have greater flexibility in dealing with defaulters. Administration of the transferred schemes requires fewer staff and has generated more local employment.

Still, a number of second-generation problems have emerged. These include several important legal deficiencies such as the rules on asset ownership and the cumbersome procedures and high fees involved in securing a legal water right.

Fee levels, now set by associations, are not keeping pace with inflation, and the result is deferred maintenance and a failure to accumulate funds for equipment replacement and rehabilitation. Financial management is a critical area for the success of the associations, but skills in this area are deficient and little or no training has been provided.

Little operational data is being collected, making performance assessment difficult, and water is seldom delivered and charged for volumetrically, although plans call for it. Accumulating deferred maintenance and inadequate mechanisms for capital fund aggregation point toward severe future operational problems.

INAT's role has changed significantly in the wake of the transfer of the management of two-thirds of its medium and large irrigation schemes to users, but the agency has not yet received a clear, new mandate nor reorganized itself to carry out its new functions, particularly its support responsibilities to the associations. Users' associations are themselves facing serious potential problems due to their underfunding and lack of dynamism. The national federation of users' associations has an extremely important potential role to play in revitalizing and supporting the associations but has yet to seize and act on this potential.

Introduction

In Colombia, the transfer of the administration of land development districts (LDDs) to water users' associations (WUAs) began as a result of an isolated initiative by a group of farmers rather than as a specific land development policy or program. In the early 1970s, the WUAs of Saldaña and Coello LDDs asked the government if they themselves could administer the LDDs, because the Colombian Institute of Agrarian Reform (INCORA), the governmental agency responsible for their administration at that time, was expensive and inefficient.¹

With a degree of maturity, organization, enthusiasm, and decisiveness that was extraordinary for those times, these WUAs exerted considerable pressure on the government to make the transfer. The government finally agreed to their petition and, in October 1976, handed over to the WUAs the administration, but not the ownership, of the irrigation infrastructure.

Since that time, the concept of transferring the LDDs has undergone several modifications, while conserving its original structure. As other LDDs were transferred in the ensuing 20 years, problems emerged and solutions were developed. The results of the solutions applied so far must now be analyzed and recommendations generated that are appropriate for different economic, institutional, and cultural conditions.

Colombia has an estimated agricultural area of 14.4 million hectares, of which 6.6 million, 45.8 percent of the total, can be equipped with irrigation and drainage infrastructure or flood protection works. Of this area, 750,473 hectares, 11.4 percent of the total adaptable area, has already been developed (DNP 1991). The private sector has participated actively in the development of irrigation in Colombia, covering 62 percent of the developed area (463,019 hectares) compared with the public sector coverage of 264,802 hectares (38 percent).

This study refers to medium-size (500 to 5,000 hectares) and large LDDs (more than 5,000 hectares). This clarification must be made, because Colombia is also implementing a program for small irrigation systems (less than 500 hectares). Although this program constructs physical facilities similar to those of medium-size and large irrigation schemes, social and economic characteristics are different. The maximum holding size of farmers in the small schemes is 2.5 hectares, and the total production volume of these schemes is insignificant at the national level, which is not the case for medium-size and large schemes.

Medium-size and large LDDs in Colombia are listed in table 4.1. Of these 24 LDDs, 16 are administered by their respective WUAs and 8 continue to be administered by the National Land Development Institute (INAT), as of 1997. General information describing each LDD and its date of transfer are also given in the table.

National Institutions and Policies

The construction of hydraulic infrastructure for irrigation and drainage began in Colombia in the late 1800s, carried out mainly by the private sector. State intervention began only in 1936 when the then Ministry of Economy began constructing irrigation and drainage systems. Since then, several entities have participated in land development but without following a consistent policy or adhering to a coherent set of investment priorities (DNP 1991).

In 1961, INCORA was created. It assumed responsibility for conducting land development programs and constructing irrigation and drainage districts. Another major function was to redistribute farmland among the rural population to reduce inequalities in holding sizes. However, while public sector involvement in land development increased as a result, that of the private sector dropped. The possibility

^{1.} Most of the acronyms for names of Colombian organizations represent the Spanish names rather than their English equivalents and thus do not correspond with the translations given. The reason for this is that the acronyms have often become words in themselves and would be unfamiliar to both Colombian and international readers if they were changed to represent the translation.

Table 4.1. Current Status of Land Development Districts

		Area (hectares)						
			Irrigation		Total	Date		
District	State	Total	and drainage	Drainage	developed	transferre		
Delegated to water users' associations								
Alto Chicamocha								
y Firabitova	Boyaca	16,722	1,373	8,321	15,235	24-Mar-95		
Samaca	Boyaca	2,947	2,934	0	2,934	15-Oct-92		
Maria La Baja	Bolivar	19,600	6,429	2,861	17,300	07-Dec-95		
La Doctrina	Cordoba	3,000	2,000	0	2,570	15-Dec-95		
Tucurinca	Magdalena	9,866	7,214	0	7,214	28-Dec-94		
Sevilla	Magdalena	8,104	5,978	0	5,978	28-Dec-94		
Aracataca	Magdalena	13,300	10,692	0	10,692	28-Dec-94		
Abrego	Norte Santander	2,000	1,200	0	1,200	27-Dec-95		
Zulia	Norte Santander	15,843	10,519	0	10,519	26-May-92		
Rio Prado	Tolima	8,500	1,286	0	5,520	28-Oct-95		
Rio Recio	Tolima	23,600	10,374	0	18,650	20-Dec-89		
Coello	Tolima	44,100	25,000	1,870	40,000	30-Sep-76		
Saldaña	Tolima	22,500	13,000	0	14,050	30-Sep-76		
Roldanillo-La-Unión-Toro						•		
(RUT)	Valle	10,750	9,500	0	9,700	14-Dec-89		
Subtotal		200,832	107,499	13,052	161,562			
Area transferred (percent)		64	90	13	61			
Administered by INAT								
Manati Candelaria	Atlantico	29,000	0	21,268	25,206	1997		
Repelon	Atlantico	3,800	2,100	250	3,400	1996		
Santa Lucia	Atlantico	3,000	1,000	0	2,400	1996		
Cerete, Lorica y Monteria	Cordoba	55,000	4,100	47,039	51,139	1997		
El Juncal	Huila	5,100	2,977	123	3,100	1996		
El Porvenir	Huila	762	241	115	357	1996		
Sibundoy	Putumayo	8,500	0	7,855	7,855	1997		
Lebrija	Santander	9,131	1,457	7,241	8,698	1997		
Subtotal		114,293	11,875	83,891	102,155			
Total all districts		315,125	119,374	96,943	263,717			
Area remaining to be		·····						
transferred (percent)		36	10	87	39			

Source: Adapted from INAT (1996).

of land expropriation by INCORA had a chilling effect on private investment in the rural sector. From 1961 onward, land development in Colombia has been carried out mainly by the government through various official entities. From 1963 to 1972, INCORA created and improved 15 irrigation or drainage districts affecting a total of 113,500 hectares. The land in these districts was distributed to landless rural inhabitants as part of the land redistribution program.

Subsequently, the government determined that it was inappropriate for INCORA to simultaneously execute two major programs considered fundamental to agriculture—land distribution and land development for irrigation and drainage. In 1976, therefore, responsibility for constructing new irrigation and drainage districts was given to a newly created organization, the Colombian Institute of Hydrology, Meteorology, and Land Development (HIMAT), while INCORA retained responsibility for land redistribution. HIMAT also assumed responsibility for administering districts previously administered by INCORA.

Between 1976 and 1994, HIMAT worked mostly to rehabilitate and complete the irrigation districts it inherited. Although a framework was created for such work, financial resources were unavailable. As a result, construction was begun in only one district (Rio Prado), and it remains unfinished. It also launched a program of small-scale irrigation development for irrigation districts of less than 500 hectares, located mainly in hilly areas.

Until 1991, this period was characterized by the absence of a clearly defined land development policy. The dynamism that had energized the program under INCORA had dissipated. To remedy this situation, in 1991 the National Council of Economic and Social Policies (CONPES) established an explicit policy, and HIMAT was divided into two entities: the Institute of Hydrology, Meteorology, and Environmental Studies (IDEAM) and the National Land Development Institute (INAT). IDEAM assumed responsibility for collecting, managing, and analyzing information on hydrology and meteorology and for executing and monitoring environmental studies, while INAT became responsible for conducting the national land development program.

National Policies

The absence of an official policy on the transfer of LDDs is somewhat understandable given the roots of the program, discussed in the introduction. Because users must approach the government, transfer begins with the WUA. However, government agencies responsible for irrigation development and management have little or no incentive to continue the process. For example, the administration of the Coello and Saldaña districts was transferred to the WUAs in 1976, but no other districts were transferred until December 1989, when the WUAs took over management of the Roldanillo-La Unión-Toro (RUT) and Rio Recio districts. During this period, HIMAT exerted little effort to initiate transfers, resisting the potential loss of power that such transfer implied. Resistance was stronger in those HIMAT regional offices where transferable LDDs were located. It was also stronger among HIMAT staff directly linked to the LDDs, who felt that their jobs were threatened.

In 1986, HIMAT signed an agreement with the World Bank related to Loan 2667-CO. In this agreement, HIMAT committed itself, among other things, to "train Water Users' Associations in administration and accounting, thus enabling them to take charge of the management of the irrigation districts included in the project area and to operate schemes of small-scale irrigation." This commitment reactivated discussion on the topic of transfers and stimulated the reinitiation of transfer activities. These became manifested with the handing over of the LDDs of Rio Recio and RUT in 1989, San Alfonso in 1990, Samacá-Zulia in 1992, and Prado de Sevilla in 1994. This last district was divided into four separate districts: Rio Frío, Tucurinca, Sevilla, and Aracataca. In 1995 the LDDs of Abrego, Upper Chicamocha, María La Baja, La Doctrina, and Rio Prado were handed over to the WUAs. Eight medium-size or large LDDs remain to be handed over to their respective WUAs (table 4.1).

In June 1991 the Department of National Planning (DNP) submitted the document Land Development Program for 1990–2000 to CONPES, proposing a long-term agricultural policy for the country (DNP 1991). The document summarized the proposed policies and outlined a restructuring of the land development subsector. It also recognized the importance of land development (particularly irrigation and drainage) and the need for investments by both the public and private sectors to modernize this sector. The proposed policy was based on an objective analysis of experiences in Colombia and in other countries and on the assessment of the main constraints hindering the development of adequate irrigation and drainage infrastructure.

The draft policy addressed the topics shown in box 4.1. It was intended to steer the land development process and establish a framework for user participation in all stages of projects, especially in

^{2.} The project included 8,500 hectares, of which only 1,286 hectares has been developed (table 4.1).

Box 4.1. Issues Addressed in 1991 Draft Land Law

- The role of the government in investment in land development
- Physical and financial goals
 - Projects for large irrigation schemes
 - Projects for medium-size and small irrigation schemes
 - Rehabilitation, completion, and expansion of LDDs
- Strategies and mechanisms
 - Irrigation and drainage (private sector initiative)
 - Irrigation and drainage (public sector initiative)
 - Institutional framework
 - Project selection and priorities
 - New resources for investment in irrigation at the regional level
 - · Recovery of investments
 - Policy on fees
 - User participation
 - Other general considerations
 - Technical issues
 - Watershed conservation and management
 - Hydrological emergencies
 - Research and technology transfer

LDD administration. Users would administer the districts, taking advantage of the experience acquired in districts transferred before 1990.³ The draft statement called for the government to provide training for the WUAs and to design financial, administrative, accounting, and engineering systems of compulsory application in the LDDs. The government would also promote the establishment of a federation of water users' associations.

Most of these measures were incorporated into Law 41 of 1993, issued by the Colombian Congress.⁴ The law gives legal recognition to the WUAs and defines the scope of their activities. It also indicates the obligation of the executing entity (for example, the agency that builds the irrigation and drainage system) to train users within the district in administration, operation and maintenance, new cropping techniques, marketing, and environmental management.

To date, the concept of transfer encompasses only handing over the administration of the districts to their WUAs. The infrastructure and assets involved continue to be government property. This situation limits the sense of ownership on the part of the WUA and inhibits the development of a strong administrative capability.

INAT's formulation of policies on the transfer of districts has been slow, even dilatory. Staff members have tried to postpone execution to maintain their power. Furthermore, directives have been absent at both the executive and intermediate levels. Budgetary restrictions delayed the execution of rehabilitation work in many districts and, in others, the completion of work already started. This is a serious drawback, because the best incentive for users is to receive a rehabilitated LDD.

^{3.} Coello, Saldaña, Rio Recio, and Roldanillo-La Unión-Toro.

^{4.} Law 41 of 1993, "By which the Land Development Subsector Is Organized and Its Functions Established."

Legal and Structural Background

Colombian legislation has always given importance to the norms that regulate the use of water and promote its conservation and quality. At first, the abundance of this resource and its easy availability made existing legislation sufficient for managing and regulating activities related to water use. However, with increasing population in recent decades, and the resulting growth in demand, new problems and issues have arisen that require legislative action.

In 1974 the National Code of Renewable Natural Resources and Environmental Protection was decreed (No. 2811). This code defines the country's environmental strategy and norms, tools for developing policy, norms of environmental preservation, and norms regarding the ownership and use of renewable natural resources and the environmental impacts of such use. The custody of Colombia's natural resources was given to the National Institute of Renewable Natural Resources and Environment (INDERENA) until December 1993, when the Ministry of Environment was created. The ministry is coordinating a study to define a national water strategy, in which all other ministries involved in water-related issues are participating.

Water Rights for Agriculture

Decree 1541 of 1978 regulates the use of nonmaritime waters. Priorities for water use as specified in the decree are shown in box 4.2. Collective water use for agriculture is accorded highest priority after domestic use.

The law mandates that, to obtain water use rights, a water concession is required in the following cases.⁵

- · Domestic supply in those cases requiring deviation
- Irrigation
- Forestry.

The law also establishes the procedures for granting permission for use or transfer of the concession and the sanctions for misuse.

When disputes arise over water use rights, the actions taken depend on whether the complainants have water concessions. Where the contending parties have water concessions, the official environmental authorities have jurisdiction to handle the dispute until a settlement is reached.

When an environmental authority grants a concession for water use, the authority is guaranteeing the use of the conferred right and, where that right is impeded, the authority will ensure the enforcement of

Box 4.2. Priorities for Water Use (from Decree 1541)

- Collective human consumption, rural or urban
- Individual domestic needs
- Community use for agricultural activities
- Individual use for agricultural activities
- Generation of hydroelectric energy
- Industry
- Mining
- Community recreation and sports
- Individual recreation and sports

^{5.} A water concession is a license by which the environmental authority grants an individual or legal entity the right to use water for a specified purpose. In the case of irrigation, water use must be in a land development district.

this right. For unresolved cases, the parties may resort to litigation for a final settlement of the dispute. Where one or more of the parties in the dispute does not have a water concession, the problem is resolved by civil law, because, in Colombia, no specific jurisdiction exists for water issues.

Governmental Organizations

The land development subsector comprises the following organizations:

- · The Ministry of Agriculture, as the agency regulating land development policies
- The Superior Council of Land Development (CONSUAT), as the entity guiding and coordinating these policies
- INAT and other public and private entities, as executing agencies
- The National Land Development Fund (FONAT), as the administrative unit that finances irrigation, drainage, and flood prevention projects.

CONSUAT is an advisory and coordinating organ of the Ministry of Agriculture and is in charge of guiding and recommending the application of subsector policies. Participants in CONSUAT are:

- The Minister of Agriculture, who presides over the council
- The head of the DNP
- The minister of environment
- The president of the Fund for Agricultural Financing (FINAGRO)
- The director general of the Agustín Codazzi Geographical Institute (IGAC)
- A representative of the indigenous communities in whose territories land development is being conducted
- The president of the Farmers' Association of Colombia (SAC)
- The president of the Federation of the Water Users' Associations of Irrigation Districts (FEDERRIEGO)
- The director of INCORA
- A representative of the National Association of Rural Users (ANUC)

The technical secretariat of CONSUAT is provided by INAT. INAT is a government agency that promotes, finances, or cofinances land development; designs studies; executes infrastructure projects; provides community and technical services; and offers technical assistance in irrigation-related issues. It aims to intensify soil and water use, ensure high productivity, and advise public and private sectors in the design of studies and in the construction of land development infrastructure, while safeguarding and conserving soil and water resources in the watersheds circumscribed by the LDDs and preventing, controlling, and protecting against floods in district areas.⁶

INAT is responsible for formulating the country's land development policy. However, it may and does authorize other public entities to construct infrastructure. These entities are called public executing agencies. An analogous situation occurs in the private sector, where INAT may authorize engineering firms who demonstrate expertise and who fulfill certain requisites previously established by CONSUAT to act as private executing agencies.

Local Organizations

As part of the program of agrarian reform, INCORA began to organize communities in sites where it was implementing its programs. Part of that organization consisted of forming a general committee of

^{6.} Ministry of Agriculture Decree No. 1278 of 1994 modifies the organizational structure and functions of the National Land Development Institute (INAT), formerly the Colombian Institute of Hydrology, Meteorology, and Land Development (HIMAT).

users, an executive committee that represented the community before external organizations, in particular INCORA.

When the committees of users in Saldaña and Coello requested that they assume administration of these LDDs, these committees were transformed into WUAs and the Ministry of Agriculture granted them legal status. Their organization and operation obeyed the norms that the ministry had established for agricultural organizations.⁷

Law 41 of 1993 refers specifically to the WUAs of the LDDs, delegating the control and monitoring of these associations to INAT. To perform these functions, CONSUAT issued Resolution No. 019 of 1995, "by which the course of action and the basic organizational principles of water users' associations in land development districts are indicated." This resolution is the regulation currently in force for monitoring and controlling the activities of the WUAs. All administrative statutes issued to implement this resolution are clear in recognizing the principle consecrated by law of community participation in the land development process, from project design through to construction.⁸

The reality, however, is different. Participation is only on paper, and the mechanisms and procedures for community participation are yet to be established. This gap is used to justify INAT's activities in which the WUAs have been absent, for example, preinvestment studies and contracting and follow-up work. The participation of the WUAs in these activities is mandated in Article 22 of Law 41, which defines their roles. Colombia is undoubtedly adjusting, and, once this process is complete, the WUAs presumably will be involved actively in all stages of the development process. But to date, little genuine desire has been shown to provide the WUAs with the participation granted to them by law. At the same time, neither the WUAs nor FEDERRIEGO have made energetic claims to secure the participation to which they are entitled. Despite the foregoing, the WUAs have generally played their roles well. In particular, they have generated feelings and attitudes of "ownership" of their respective LDDs, and they have worked to obtain needed resources and to increase the participation of users and the government.

Previously, associations worked independently of each other and, despite proximity, exchanged little of their experience or their analyses of common problems. To address the need for greater interaction, the WUAs created FEDERRIEGO, a second-level organization that was recognized by the Ministry of Agriculture and granted legal capacity.⁹

This federation played an important role in writing Law 41 of 1993, participating in discussions and making observations on the different drafts of the law as they were produced. As the organization with the greatest collective experience in transferring the LDDs, FEDERRIEGO also took the initiative to make its own contributions. Law 41 of 1993 recognizes the federation as the official voice for all WUAs. The president of the federation has the right to speak and vote in the CONSUAT, the highest policymaking agency on land development issues. A federation representative also serves on INAT's board of trustees, with the right to speak and vote.

Beyond its involvement in the development of Law 41, however, the output of FEDERRIEGO's activities has been exceedingly modest. The leadership displayed during its creation has not been constant, and only 10 of the existing 24 WUAs that manage medium-size and large districts have joined the federation. Despite the fact that FEDERRIEGO has contributed to the creation of a favorable atmosphere within decisionmaking circles, for example, CONSUAT and INAT's board of trustees, it has not developed a clearly defined role to benefit the WUAs. In a recent workshop organized by external consultants for the FEDERRIEGO board of trustees, a number of weaknesses were identified relating to (a) social issues, (b) institutional presence and leadership, (c) administration, and (d) finances and budgets. The following potentialities were also identified: (a) legal disposition, back-

^{7.} Ministry of Agriculture Decree No. 829 of 1974.

Law 41 of 1993, Chapter VI, Articles 20 to 24.

^{9.} Ministry of Agriculture Legal Capacity No. 964, November 13, 1991.

ground, and acquired experience; (b) assertiveness and group approach; and (c) growth potential (Arellano and Bernal 1996).

FEDERRIEGO is now reorganizing to provide associated LDDs with services and information produced by other entities, for example, results of research carried out by public entities or trade unions such as the National Federation of Rice Growers or the National Federation of Cereal Growers. This new structure should prove the foundation for strengthening both the WUAs and FEDERRIEGO itself.

Contractual Agreements

The first contractual agreements were made with the WUAs of Saldaña and Coello districts through which the government delegated functions to a delegated administration. That is, the delegating entity (the government as represented by HIMAT) transferred to the receiving entity (the LDDs of Saldaña and Coello) the responsibility for administration of a public good and authorized the receiving entity (the LDDs) to carry out, in its (HIMAT's) name, all the activities deemed necessary in this regard. HIMAT considered "that the degree of development of the user community in the Districts of Saldaña and Coello indicates that they are capable of assuming responsibility for the administration, conservation, and maintenance of the corresponding districts." An agreement was signed with each WUA, whose objective was "to administer, operate, complete, and rehabilitate the irrigation and drainage district of Rio Saldaña (Rio Coello)."

Agreements of this nature were made until 1993 when "Agreements of Delegation of Functions" (for transferring the administration of LDDs) were changed to "Contracts" to conform with a recently issued law of administrative contracting. These contracts state that "the Water Users' Association assumes the administration, operation, and conservation of the Land Development District." Comparison of the two models of transferring administration to the WUAs shows that the new agreement maintains the essential structure of the old one, along with basic aspects of surveillance and monitoring by INAT. Key features are shown in box 4.3.

The transfer of administrative responsibilities to the WUAs is a step forward in the participative process. However, because of restrictions placed on decisionmaking and property ownership in the contract with the government, the WUAs' sense of ownership and autonomy is distinctly limited. The WUAs regard the relationship with the government as paternalistic. Because the hydraulic infrastructure continues to be governmental property, the WUAs expect the government to assume the costs of operation, maintenance, and replacement of heavy machinery and other equipment.

Box 4.3. Key Features of Contracts between the WUAs and INAT

- The WUA is responsible for administration.
- The general comptroller of the republic provides fiscal surveillance.
- The goods are given in administration and use but not in property.
- All goods and equipment acquired during the administration become property of INAT.
- The budget prepared by the WUA should be approved by INAT and may be modified by the latter when deemed necessary.
- Fees are to be approved by CONSUAT.

^{10.} Agreements No. 212 and 213 of Delegated Administration, subscribed between HIMAT and the Water Users' Associations of the LDDs of Coello and Saldaña, respectively.

^{11.} Agreements No. 212 and 213 of Delegated Administration, subscribed between HIMAT and the Water Users' Associations of the LDDs of Coello and Saldaña, respectively.

^{12.} Law 80 of 1993.

In addition to the administration contract between INAT and each association, regulatory rules are contained in Law 41 of 1993, Decree 1881 of 1994,¹³ and the Administrative Regulations for Land Development Districts (RADAT).¹⁴ These define the norms and criteria that the WUAs should follow to administer a LDD. The main responsibilities of both the WUA and INAT are shown in box 4.4.

Promotional Activities

Activities to promote the transfer of a district to its users are carried out intermittently and do not follow an established protocol. As Arévalo and others (1994) say:

The number of users is unknown and participatory processes are slow and unarticulated because of the lack of institutional planning. Administrative disarticulation is attributable to the lack of guidelines and strategically defined transfer policies, not only generating misinformation within the institution itself and among users, but also reducing the reliability of INAT's management.

Promoting Participatory Management of Irrigation

Table 4.1 indicates three distinct periods of transfer: (a) 1976, when, by request of users, Coello and Saldaña districts were transferred; (b) 1989 and 1993, when, in compliance with the commitments made to the World Bank, the LDDs of Rio Recio, RUT, Samacá, and San Alfonso were transferred; and (c) 1994 and 1995, when the largest number of districts were transferred to fulfill a goal of the administration at that time. Transfer of the eight districts remaining will not be easy because their budgets are heavily subsidized (table 4.2). In

Box 4.4. Responsibilities of WUAs and INAT

Water Users' Association

- Carrying out activities that lead to an optimal administration, operation, and conservation of the infrastructure and other assets of the district
- Ensuring that tasks are correctly executed
- · Ensuring that water resources are efficiently used
- Formulating policies and establishing guidelines for executing cropping and irrigation schedules
- Conducting those activities required to protect, conserve, and manage the water basin feeding the
 district
- Preparing a budget proposal for approval by INAT and a schedule of user fees for approval by CONSUAT
- · Reporting its management activities to INAT regularly

INAT

- · Providing the WUAs with legal advice and technical assistance in organization and development
- Training the WUAs in the administration, operation, and conservation of the LDDs
- Ensuring that the WUAs apply the norms issued for the correct administration of the LDDs
- Approving the budget presented by the WUAs and defining the percentage of subsidy assigned to each; handling the formalities with CONSUAT for approving proposed fees
- Imposing, through law enforcement authorities, those coercive measures required to administer the
 district and to sanction infringers of the norms of operation and management of the LDDs
- Approving those projects to be conducted by the WUAs to complete, expand, and rehabilitate the LDDs

^{13.} Issued by the Ministry of Agriculture, Decree 1881 of 1994 partially implements Law 41 of 1993.

^{14.} Document to be submitted to CONSUAT for approval.

8

Table 4.2. Budgeted Costs and Subsidies for Land Development Districts, 1993–96 (thousands of pesos)

		1993		1994			1995			1996		
Districts	Budgeted costs	Fee income	Subsidy (%)	Budgeted costs	Fee income	Subsidy (%)	Budgeted costs	Fee income	Subsidy (%)	Budgeted costs	Fee income	Subsidy (%)
Administered by INAT											*	
Repelón	593,978	63,000	89	623,000	83,000	87	766,257	99,000	87	975,944	80,000	92
Manatí	345,897	24,000	93	390,000	73,000	81	480,157	87,000	82	787,132	0	100
Santa Lucía	382,535	23,000	94	418,000	34,000	92	514,510	38,000	93	858,303	46,800	95
Montería-Moc.	787,59 6	285,000	64	638,897	378,000	41	1,010,874	467,000	54	1,424,760	208,000	85
El Porvenir	44,081	5,000	89	65,946	7,000	89	156,332	9,000	94	192,049	15,964	92
El Juncal	986,639	263,000	73	1,086,522	282,000	74	1,540,709	384,000	7 5	1,719,451	582,990	66
Sibundoy	615,925	0	100	531,920	0	100	640,400	0	100	908,404	0	100
Lebrija	326,500	29,000	91	407,495	35,000	91	552,942	39,000	93	617,235	70,800	89
Average	n.a.	n.a.	87	n.a.	n.a.	82	n.a.	n.a.	85	n.a.	n.a.	90
Delegated to the WUAs							,				•	
María la Baja	419,934	123,400	7 1	689,243	131,000	81	<i>772,9</i> 00	177,500	<i>7</i> 7	908,100	144,900	84
Samaca	74,282	74,282	0	87,130	87,130	0	88,250	88,250	0	113,054	113,054	0
A. Chicamocha	314,687	314,687	0	340,194	340,194	0	359,794	0	100	467,257	250,248	46
La Doctrina	153,255	40,600	74	207,435	52,700	7 5	309,097	76,300	7 5	412,032	70,000	83
San Alfonso	_	<u>.</u>	_	107,318	107,318	0	134,718	134,718	0	161,428	161,428	0
Rio Frío			_					-	_	503,400	270,480	46
Tucurinca		_					_			627,552	316,501	50
Aracataca	******	_								346,649	330,500	5
Sevilla								_		615,066	268,000	56
Abrego	46,773	19,000	59	43,474	30,000	31	57,339	0	100	64,092	51,092	20
Zulia	361,708	361,708	0	520,114	520,114	0	673,503	673,503	0	724,030	724,030	0
Coello	1,127,171	1,127,121	0	1,298,750	1,298,750	0	1,675,225	1,675,225	0	1,714,126	1,714,126	0
Saldaña	826,889	826,889	0	1,138,000	1,138,000	0	1,289,001	1,289,001	0	1,559,500	1,559,500	
Rio Recio	435,002	435,002	0	448,823	448,823	0	553,795	553,795	0	683,006	683,006	
Rio Prado	257,313	81,300	68	175,704	89,500	49	225,300	140,500	38	280,010	1 77, 210	
RUT	662,930	662,930	0	823,734	823,734	0	1,026,665	1,026,685	0	1,257,320	1,257,320	
Average	n.a.	n.a.	25	n.a.	n.a.	20	n.a.	n.a.	32	n.a.	n.a.	27

[—] Not available. n.a. Not applicable. Source: INAT (1996).

addition, the land development subsector has not yet adopted programs oriented to motivate users to endorse the transfer. The lack of even a design for a strategy to reach users indicates that the transfer of these districts is not a priority with the current administration.

A World Bank loan (Loan 2667-CO) was requested mainly to rehabilitate the LDDs, and the commitment made by the government was that the districts would be transferred to a participatory management mode. These rehabilitation programs further served as an incentive for transfer, because one of their components involved the purchase of heavy machinery and other equipment to replace existing equipment. This possibility delighted the WUAs. But, in most cases, rehabilitation programs have not been completed because of the lack of governmental resources, leading to skepticism among users.

Until Law 41 of 1993 was promulgated, the government had no clear reasons for establishing the transfer of the LDDs as a key program, except on request of users or commitments made to the World Bank. Law 41 reiterates past recommendations and decrees in a clear statement that districts should be transferred to the users for their administration and that, once the value of the public investment is recovered, the infrastructure and other assets at the service of the district become the patrimony of the respective WUAs. However, the provisions of this law apply only to systems constructed after its promulgation. Thus, the impediment of transferring system assets to future LDDs is solved, but the barrier remains for those districts constructed before the law was issued.

Forming Water Users' Associations

The WUAs had their origin in INCORA's program for community organization, an experience that yielded excellent results. The results were first applied by HIMAT (now INAT) to organize the WUAs in districts built after 1976, the year in which HIMAT was created. Subsequently, the results were used by INAT, especially in its program for small-scale irrigation development. The initial organization of the associations was not difficult, but several problems emerged when the WUAs attempted to exercise their rights. For example, the creation of the WUAs generally tended to reduce INAT's scope of action, which was usually interpreted by INAT staff as reduced power and decreased job security. However, these difficulties have diminished, because the Law 41 of 1993 expressly mandated the transfer of LDDs.

Once the LDDs were transferred to the WUAs, users were to be trained as required. Because this training was not part of an overall strategic program, various guidelines and training programs were established. The administration contracts obligate INAT to carry out these training plans, which were not to be limited to courses for users but were to include activities carried out jointly with other entities to increase the users' level of awareness of their responsibility toward the LDDs.

A model plan for training was designed by the District Management Group of the Subdirectorate of Land Development (SAT) that addressed training at three levels:

- · The board of trustees of the association
- Employees of the LDD
- General users.

For each level, the training objective, the activities to be performed and their duration, the training procedures to be used, and the specific topics are given (INAT 1996).

Results of Management Transfer

The results of transferring management from INAT to the WUAs are presented here under the following categories: water distribution, maintenance, agricultural production, finances, and institutions.

Water Distribution

Before users participated in irrigation management, water distribution was planned and carried out by governmental entities (INCORA, HIMAT, and now INAT) responsible for the LDDs. The staff of these institutions was not involved in agriculture, the main activity of these districts, nor were they interested or committed to the district's development because they were usually not residents.

Cropping and irrigation plans were prepared by these administrative entities without the participation of users and without considering their agricultural needs. The rigidity of these plans made their application difficult but brought discipline and order to users' behavior. Water delivery, especially in the larger LDDs, was measured so that each user knew how much water was received. This work was carried out by appraisal commissions equipped with the necessary measuring instruments. This system worked, but, because of the importance of the water measurements, both for water deliveries and for billing purposes, it led to fraud.

Following transfer of management responsibility to the WUAs, cropping and irrigation plans are more realistic and more responsive to market influences. The preparation of these plans generally complies with the following procedure:16

- Users inform the operations office of each LDD in advance of the crop, area to be planted, and possible planting date.¹⁷
- The operations office then analyzes the requests, calculates water requirements, and compares them with the availability of water.18
- Conclusions are drawn from these comparisons, and plantings are authorized, with their respective dates, following a preferential order established in RADAT.¹⁹

RADAT also establishes the procedures and priorities to follow in case of water shortage. It defines the status of water distribution for irrigation according to water availability.20 These status levels are:

- Free flow, when all water supplies are able to meet demand
- Rotation, when water availability is deficient and delivery must be by turns
- Emergency, when water availability is highly restricted and demand cannot be adequately met, thus requiring more drastic changes in the irrigation scheme operations
- Drought, the nonexistence of water, which makes water distribution impossible.

The foregoing is complemented with decisions made by the board of trustees of each WUA on restricted planting, crop priority, and water supply according to established priorities. The predominant distribution model is volumetric delivery of water, which defines a volume of water per unit of area (cubic meter/hectare). It is based on previously defined parameters that correspond to the physical characteristics of the soil to be irrigated and the crop. Water thus assigned and delivered is quantified, and that volume is the basis for charging the volumetric rate.

Although this is the theoretical model for irrigation management, it is not necessarily carried out exactly in this manner by the WUAs. The practices outlined require a regular system of water measurement to implement. However, computing the amount of water delivered is imperfect, given the infrequent use of water gauges, even though they exist in most LDDs (INAT 1996). Actual practices are thus most likely variations on this model.

^{16.} Administration Regulations of Land Development Districts, Chapter X, Articles 73 to 86.

^{17.} The time limit is established by each LDD in its regulations.

^{18.} Water availability is generally established according to the experience of the most veteran employees of the LDD; a standard methodology for estimating water availability has not yet been established.

^{19.} Administration Regulations for Land Development Districts, Article 63.

^{20.} Administration Regulations of Land Development Districts, Chapter X (District Services).

Before the participatory approach to irrigation management was applied, the AA (administrative agency) was a public entity with a government-assigned budget and could therefore rely on a technical department to carry out engineering tasks. When users assumed primary responsibility for administering the LDDs, they sought to reduce costs, often by eliminating or downsizing the technical section. Technicians working in O&M sections were persuaded to carry out the functions of technical assistants. This void is now evident in transferred LDDs and, even though INAT (and previously HIMAT) is committed to provide that assistance, it has been limited and is often no more than a commitment.

When the administration of the LDDs was carried out by a public entity, information was rigorously collected, recorded, analyzed, and examined. However, with the initiation of participatory management, both parties lost interest in the efficient collection and management of information, resulting in an ongoing lack of adequate data. Several voices have been insisting on the need to establish a methodology and procedure to evaluate the LDDs that are still under INAT's responsibility. But, to date, no action has been taken, despite reiterated offers made by the International Irrigation Management Institute (IIMI), who has experience in this area, to participate in such efforts.

A most important achievement of the participatory approach to irrigation management is that people within the district make decisions affecting the district. Before the change of management, administrative decisions were made by HIMAT (now INAT), who was uninformed of events at the district level. The participation of the WUAs in decisionmaking has yielded an administration that is more committed, not only to local farmers, but also to providing services that are timely and equitable.

Cropping systems are also more realistic, seeking to better fulfill market requirements. All the LDDs in Colombia enjoy the freedom of planting whatever they wish, except in the Coello district, where rice planting is restricted because of limited water (Vermillion and Garcés-Restrepo 1996).

Maintenance

The WUAs are obliged to prepare and submit to INAT a budget proposal based on an operational plan for the year. The administrative agency of each LDD thus prepares in advance the annual maintenance plan, which specifies planned activities, their duration and costs, required machinery, and dates of maintenance according to a methodology established by INAT in 1996. With the participation of users in district irrigation management, much has been gained in refining these plans, for example, reduced unit costs and more timely execution of tasks.

As mentioned earlier, many LDDs receive government subsidies (17 of 24). On the whole, the maintenance programs of unsubsidized LDDs follow their maintenance plans, and tasks are usually not postponed. The entire program is paid for by the O&M fees collected. The opposite occurs in the subsidized group, where little of what is planned is executed, and, because INAT frequently fails to transfer subsidy funds on time, maintenance is usually deferred because of the lack of either resources or liquidity (INAT 1996).

Another problem observed in the WUAs' administration of the LDDs is that all districts prefer to have their own heavy machinery and other equipment, leading to low use of the equipment. Most also have their own workshops for repairs and maintenance with permanent workers, leading to high repair and maintenance costs. The districts have not yet analyzed the possibility of renting or leasing machinery.

Agricultural Production

As a result of the changes, first in HIMAT and now in INAT, data collection has been notably neglected, and information required to analyze agricultural production in the LDDs under different management modes is unavailable. Over the last 20 years, production in the LDDs has increased significantly, but this increase is attributable not only to participatory irrigation management but also to concurrent factors, such as the availability of improved seeds, new cultural practices, and higher agricultural input use. Determining the impact of the change in management alone is thus not possible.

As in the case of production, the change in area planted has depended not only on user administration, but also on other factors such as farm credit. Overall, the area planted has increased, but the same difficulties in interpretation apply.

Users are more practical in planning cropping calendars and, consequently, in scheduling irrigation. In tropical environments where crops can be grown throughout the year, rural wisdom refrains from concentrating certain activities, such as planting, thus optimizing the use of available machinery and labor. Water delivery is staggered in accordance with the staggered planting schedule, as is, of course, harvesting, to avoid plunges in purchase prices caused by abundant supply.

Finances

The WUAs carry out numerous activities, among which is the administration of the respective LDDs. INAT, as the entity responsible for the control and surveillance of the WUAs, demands that these associations, when acting as the administrative agency of an LDD, handle the two organizations, association and district, separately so that accounting, finances, and all other activities are separate and independent. This should continue, inasmuch as the users pay only the part of expenses that correspond to the LDD infrastructure and assets for which they are responsible, as established by Law 41 of 1993. Financial information on the LDDs in shown in table 4.2.

Managing Association Funds. Billing users for services provided by the LDD is an important administrative activity. The collection of water fees is the best indicator of the quality of administration. An efficient process generates confidence and credibility in the user, promoting payment of service fees.

To administer the LDD adequately, the WUAs have an administrative section in addition to those for operations and maintenance. This administrative section has a treasury to handle funds and an accounting unit. Funds are managed through the banking system and are controlled by both the treasury and accounting units. Currently, almost all the transferred districts use systematized accounting practices and are connected to the operations section. This allows them to consult the updated account of each user in the district.

In Colombia, whoever administers governmental assets is obliged to give accounts to the General Comptroller of the Republic. The comptroller audits the books and determines whether they are in accordance with procedures established by law. Based on this examination of accounts, the comptroller draws conclusions and may or may not approve the accounts. If accounts are not approved, then the executives of the association, the members of the board of trustees, or the administrator must be responsible, depending on who ordered the disallowed expenditures.

Colombian legislation also establishes that an association must have an internal auditor that is selected by the general assembly of the WUA. The auditor should be a certified public accountant. The functions of the accountant, among others, are to ensure the correct financial management of the association. Penalties are severe for auditors who fail in this task.

WATER FEES. One advantage of users' involvement in management is that they have more control over an important variable production cost. When WUAs participate in the establishment of water fees, they can define the form and frequency of their payment obligations.

Water costs have had an interesting evolution, as in the cases of Coello and Saldaña where water fees (both fixed and volumetric) increased the first year, but then stabilized. The increase in total output per hectare and per unit of water was significant in these districts (Vermillion and Garcés-Restrepo 1996).

To recover administration, operation, and maintenance costs, two types of fees have been established by decree.²¹

^{21.} Ministry of Agriculture, Decree 1881 of 1994, Article 2.

- A basic or fixed fee, which is the cost per hectare subject to irrigation or drainage, flood control, roads, and other infrastructure that should be paid by users.
- A usage or volumetric fee, which corresponds to the cost per volumetric unit that should be paid by
 users for the water supplied to their properties.

The LDD also bills users for costs incurred for other services provided, such as the lease of machinery or topographic surveys.

Table 4.2, which shows the degree of cost recovery of the LDD budgets, also shows the worryingly low level of collection of water fees, which is taken to the extreme in the Manatí and Sibundoy districts, where collection is nonexistent. Of the 24 districts listed in table 4.2, only 7 are self-sufficient. All other districts receive subsidies, ranging from 5 to 100 percent of their budgets.

Despite these subsidies, budgets are usually insufficient, causing notable deficiencies in maintenance programs. To determine the level of subsidy received by the WUAs, INAT bases the degree of expected fee collection on previous collections and assigns subsidies accordingly. This approach obviously discourages payment and collection of O&M assessments.

It should be noted that the highest levels of fee collection for O&M costs are reached in those districts, such as Coello and Saldaña, where users have contributed the investment costs of the system. In contrast, the lowest levels of collection correspond to those districts involved mainly in drainage and for which the government has been the only investor. A study of accounts receivable, "Analysis, Design, and Implementation to Recover Accounts Receivable," was carried out by a consulting firm for INAT. This study pointed out the following limitations to fee collection (INAT 1996).

- · Inaccuracies in the boundaries of the LDDs
- Outdated General Registry of Users
- · Inconvenient billing dates
- Deficient communication between the district and users
- Inability of INAT to renegotiate debts
- Lack of documentation enabling INAT to initiate coercive collection
- User expectations of possible forgiveness of interest obligations, based on similar actions taken by other entities in the sector
- Indifference of users to the LDDs
- Ineffective strategies used by INAT to recover debts.

Perhaps collection would be more effective if the WUAs were made responsible for collecting accounts receivable, with the money collected reinvested in the infrastructure of the respective LDD.

Water measurement is deficient in all the LDDs (INAT 1996). In Saldaña, calibrated measuring devices were built at the water's entrance to each property larger than 10 hectares. However, their use has been minimal, because neither the users nor the LDD executives consider measuring the amount of water delivered important.²² Most of the time, water is delivered without measuring the flow at the entrance. The employee who delivers the water estimates (guesses at) the flow and records the period during which that flow has been received. The total volume received is calculated on the basis of these data. The amount is accumulated throughout the harvest and totaled at the end of the season, thus establishing the volume to be billed under the volumetric fee system.

Associations are nonprofit entities and therefore cannot distribute profits among their members. If a surplus occurs at the end of the fiscal year, this may be assigned to the budget of the following year or allocated to funds reserved for such activities as the replacement of machinery, the protection and conservation of the watershed, or other objectives previously established by the association.

^{22.} Personal experience of the author when working as general manager of the Saldaña LDD.

Table 4.2 presents the budgeted costs and funds collected by the LDDs during 1993-96 and the subsidy required by each LDD to complement the annual budget. This table also indicates the subsidy granted by INAT to each LDD. Subsidies are about three times greater in those LDDs administered by INAT than in those transferred to the WUAs. However the INAT-administered group includes a number of problem LDDs. Subsidies in both groups have increased slightly between 1993 and 1996. Under a plan proposed by INAT, subsidies for most transferred districts will end next year.

BILLS PAST DUE. The concept of bills past due corresponds to the accumulation of debts users have with their respective LDD. Principal causes are mismanagement of fee collection by the AA; deficient delivery of services, and consequent user refusal to pay; and inability of users to pay when the debt has grown or when interest charged for unpaid debts is high.

The magnitude of the problem of unpaid bills varies from one LDD to another. It depends, in part, on whether the LDD is administered by a WUA or by a public entity. In the first case, administration is more flexible. Because it is a private corporation, relationships between the LDD and users are governed by standards established to regulate the relationships between private parties.

In the second case, the matter is more complicated, because billing becomes routine over time and is done without analyzing past collection performance or correcting errors. Inaccurate service fee invoices are thus produced. When the user wishes to pay but does not agree with the amounts on the invoice, problems arise because of the difficulty of modifying or correcting the invoice. Users have also learned that if they lodge a protest, whether justified or not, fee collection is suspended and water service continues while the dispute is being resolved. A never-ending cycle is thus formed.

INVESTMENTS. The annual budgets, developed by the WUAs and approved by INAT, also specify future investments. The investment program for either heavy machinery and other equipment or infrastructure is executed by joint decision of the LDD manager and the board of trustees. In those districts where assets are still the property of the nation, the respective WUAs must take out insurance to protect themselves against all risks.

Institutions

The participation of users in irrigation management has generated local changes and has made various organizations redefine their roles in view of revised circumstances. Thus, governmental entities in charge of the public administration of irrigation have changed their focus from operational activities to planning land development programs. From being administrators of the LDDs, they have become controllers and monitors of the new administrators, the WUAs.

Major additional changes are foreseen in the immediate future, because Law 41 of 1993 grants the private sector a growing participation. The most important functions of INAT will then be to direct the land development subsector and to grant and manage subsidies and incentives. This financial role will remove INAT increasingly from operational tasks in the rural sector, leaving this field to users' associations, their federation, and commodity associations.

The change in the role of users is, perhaps, of the greatest importance. From passive spectators, they have become protagonists of their own work plans and can now exercise their expertise on irrigation and management of districts, an opportunity that they had not previously had. Users have begun managing their own resources and to play an important role in changing management of the districts and national agricultural policy.

ADMINISTRATIVE MODE. The AA of an LDD can be (a) the executing agency (EA), in other words, the agency that built the LDD, for example, INAT; (b) the WUA of the LDD, which has first priority to be the prospective AA; or (c) a third party to whom the district's EA contracts the administration when the WUA cannot assume the administrative responsibility, a highly improbable case. The AA is responsible for the LDD's operation, its obligation extending from harnessing the water to delivering it to the entrance of each property, from whence water distribution is the responsibility of each user. The AAs have therefore paid little attention to the application of irrigation water within each property, thus leading to very low on-farm water-use efficiencies (INAT 1996).

When a WUA administers an LDD, participation in irrigation management normally follows, because the association is an administrative organization in which users are represented. The board of trustees of a WUA is the executive component that represents the interests of the members. Experience has shown that when users participate in the planning of water distribution, they are more committed to achieving realistic and efficient water use.

LABOR AND EMPLOYMENT. Significant changes have occurred in district administration with respect to labor use. Administration is carried out by fewer people, compared with that operation by the governmental agency (Garcés-Restrepo and Vermillion 1994). Local people have also more opportunities for temporary employment, exert greater control over the district and its activities, and have rationalized procedures and contracts.

Labor issues have been handled inadequately in the Saldaña and Coello districts because of the relative inexperience in this field and the lack of understanding of the goals pursued by official entities. After the transfer, the WUAs reemployed workers who previously were working in the districts for the government. This led, years later, to the decision that the WUAs had to recognize and pay for retroactive fringe benefits for these employees, which significantly affected their finances. In other districts, this experience was taken into account and problems were avoided, presumably by not hiring previous employees. Within the restructuring that first led to HIMAT and its subsequent transformation into INAT, programs were created to facilitate the retirement and relocation of redundant personnel.

There are other problems with WUA personnel practices. The WUAs hire personnel according to employment policies and procedures that are frequently less than objective. For example, friends and relatives are hired or political favors are paid back. As a result, the quality of personnel is sacrificed.

LIMITS ON PARTICIPATION. The degree of participation of both users and associations is comprehensive, except in two areas. The first is the handling of debts, especially bills past due, which can be revised and modified by the district's administration, but can never be written off. Writing off debts, or condonation, is restricted in Colombia and can be carried out only through passage of a specific law by the Congress of the Republic. The second issue involves the contracting of work in the transferred districts, whether financed with resources from the national budget or from other sources. One function of the WUAs, granted by Law 41 of 1993, is to "participate in land development projects, presenting recommendations to the executing agency on project design and investment budget, and in the selection of proposals for work on infrastructure, through the Technical Committee of the Users' Association of the respective District."23 However INAT directly contracts work without user participation and has delayed issuing a regulation that defines the procedures for that participation.

ROLE OF FEDERATION OF THE WATER USERS' ASSOCIATIONS. FEDERRIEGO has at times played an important role at the national level. Since it was created in November 1991, it has participated in the gestation of the Land Development Law and in the elimination of the tax on added value (IVA) for some LDD activities.

As a result of Law 41 of 1993, FEDERRIEGO began to participate in CONSUAT and on INAT's board of trustees. This participation, however, has diminished to attendance at meetings. The federation has not presented, on its own initiative, projects or programs that would favor user associations. Additionally, its interaction with other organizations such as SAC, an entity that encompasses almost

^{23.} Article 22, "Functions of Water Users' Associations."

all the organizations of the agriculture sector and is distinguished by its aggressive advocacy for the sector, has also been extremely limited. Its activity has been more adjustment to the ambiance than action. With reorganization and strengthening, the federation can surely improve its performance.

Internally, FEDERRIEGO's role has also been deficient, and its ineffectiveness seems to stem from the lack of clear and specific objectives and of a set of services to offer to member districts. Member districts have a clear need for such services. By participating in irrigation management, the WUAs have had to confront issues such as the management of sediments, deterioration of watersheds, efficient application of irrigation water, drainage, salinization, and machinery selection and purchase. INAT is committed by contract to provide technical assistance on such matters, but frequently such assistance goes only as far as good intentions. INAT personnel have been reduced because of reengineering and continuous downsizing, and new employees tend to be relatively inexperienced. As a result, the WUAs have expressed the need for FEDERRIEGO to assume the responsibility of providing the WUAs with technical assistance, not necessarily directly, but by coordinating this service and identifying possible sources of assistance (universities, consultant firms, and trade associations such as those for coffee, rice, and cereal growers).

Marketing problems represent another area in which FEDERRIEGO could assist its member WUAs. Because the collection of market information and prices can be difficult and expensive for each district to handle individually, FEDERRIEGO could offer market information to all member districts as another service.

So far, the federation's work has been based on the individual efforts of members of the board of trustees, people who are extremely busy with other activities and cannot dedicate the time required to managing the federation on a day-to-day basis. FEDERRIEGO urgently needs to hire a small, motivated, full-time staff to prepare projects and provide technical assistance to the WUAs.

INAT recently contracted with a consulting firm to help support the creation or strengthening of a federation of users of land development districts, thus seriously questioning the representation of FEDERRIEGO and its organization. At present, participation within FEDERRIEGO is restricted to a selected group that does not permit democratic intervention by ordinary members (Arellano and Bernal 1996). The consultants pointed out that "the essence of a trade association organization abides in the following factors:

- That it can provide effective services to its members
- That it can defend its interests
- That it is strong and exerts social presence
- That it has the capacity to be a valid speaker before the nuclei of political and economic power."

The report assessing FEDERRIEGO finished by stating that "FEDERRIEGO still has a long way to go before it becomes the trade association needed by the users of land development districts" (Arellano and Bernal 1996).

Training Programs

Training efforts to date by HIMAT (now INAT) have been intermittent and have aimed more to fulfill commitments and utilize external assistance funds than to establish a solid program with previously defined objectives and purposes. At present, only a general training plan, covering common issues of the districts, can be prepared, because a diagnosis and inventory of district needs required for preparing a plan with specific objectives is lacking. Training programs were conducted before some of the districts were handed over to the WUAs. Although well intentioned, they have been short and wanting in relevance, thus frustrating rather than satisfying the users.

Training for Water Users' Associations

Training programs for board members of the different associations have involved study trips to Chile and Mexico. Several technicians from the districts have, through World Bank Loan 2667-CO, attended

training programs abroad. No formal training programs were created for administrative personnel such as treasurers and secretaries.

Some associations, by their own initiative and using their own resources, have conducted training programs for their employees. But these efforts have been sporadic and did not follow an overall plan or strategy. The District Management Group (a support group of the LDDs belonging to SAT) has identified some target groups for training and a general set of topics for the WUAs as follows (District Management Group 1996):

- · Extended board of trustees
 - Organization of the LDDs
 - Planning
 - Organization of the WUAs
- District administration
 - Administrative personnel
 - Finance personnel
 - Technicians
 - Operation
 - Conservation
 - Environmental management and development
 - Legal issues
- General users
 - Information on the LDD, its operation, and organization
 - Users' duties and rights.

Training for INAT

INAT has used some of the credit from the World Bank for institutional development, training staff, and purchasing basic equipment, mainly computers. The institution, however, is undergoing structural changes and renewal of personnel. Resources from the Inter-American Development Bank (IDB) will be used to contract with a consulting firm to advise and support INAT in the process of institutional strengthening during the next three years. A defined training program is planned for personnel at all levels and in the specialized areas required by the institution.

A program of continued education for most INAT personnel is included in the plan for institutional strengthening. This program will include personnel at headquarters and at regional offices and will be carried out with resources from the IDB loan. No program of continued education exists for the personnel working in the districts, whether paid by INAT or by the associations. However, if the employees of the WUAs are to maintain a level of knowledge that will enhance their performance, they must receive continued education.

Second-Generation Problems

During and following the transfers of the LDDs to WUA management, a number of problems have arisen in their administration. These are listed below in order of priority to Colombia.

Legal Issues

Legal questions arise at every stage of the transfer process. Before transfer, legal obstacles must be addressed, and following transfer legal issues need to be resolved. Major categories of legal concerns are the following:

- LDD property rights—The major legal issue affecting the transfer of an LDD to its WUA is the
 ownership of the infrastructure and assets already constructed and in operation for the LDD. These
 continue to belong to the state; only the administration is transferred to the users.
- National water code—The absence of a national water code results in confused and sometimes
 conflicting legal interpretations. Such a compilation would collect and organize the entire body of
 existing legislation on water. It would also deal with water rights, administrative procedures, and
 legal proceedings in lawsuits concerning water.
- Water rights—Water rights must be procured to use water. Autonomous regional corporations
 belonging to the Ministry of Environment are the agencies in charge of granting water rights.
 Because existing procedures are complicated and difficult to apply, most LDDs lack formal water rights.
- Water fees at the watershed level—The autonomous regional corporations responsible for managing water at the regional level are authorized to collect fees for the use, control, and monitoring of the resource. These fees were established without in-depth analysis, and their payment has been onerous for the LDDs, so much so that they are requesting revision of the fees. This cost is additional to the fees collected by the LDDs for system operation and maintenance.

Finances

Inadequate financial resources to administer, operate, and maintain the LDDs constitute a major problem. Budgets are unable to cover all required costs, and the LDDs do not derive sufficient income from the sale of services.

- Resources for administering, operating, and maintaining the LDDs—According to INAT, with a
 few exceptions the LDDs have low levels of fee collection because the General Registry of Users is
 not kept up to date, users have difficulty in paying, the water supply service is deficient, and the
 role and benefits of the LDDs are not widely known. If the collection of O&M fees is low, then
 budgets show deficits and the administration of these districts becomes deficient.
- Resources to rehabilitate the LDDs—Seven of the 16 transferred LDDs do not receive O&M subsidies from the government. In all the LDDs, however, users generally increase fees at a rate lower than that required. This causes some maintenance tasks to be put off, generating an accumulation of postponed tasks that lead to major rehabilitation programs. The LDDs are truly self-sufficient only when the needs of rehabilitation and maintenance of the infrastructure can be executed with the funds collected. But, when a major job is required or heavy machinery or other equipment has to be replaced, finances record a deficit. The case is similar for those LDDs that are subsidized. A time will come when the government will not subsidize or will not contribute resources to rehabilitate the LDDs. In view of the indifference shown by users to these looming problems, serious social impacts will surely result.
- Equipment replacement funds—The reserve funds currently held by the LDDs are insufficient to
 replace the heavy machinery, vehicles, and other equipment that INAT has handed over to them
 and that the LDDs need to operate normally.
- Bills past due—The increasing accumulation of users' debts with the LDDs is a cause of concern.
 This problem has not been resolved, because of INAT's complex bureaucratic procedure and because users have learned how to manipulate these difficulties to their advantage, delaying payments while retaining irrigation service.
- Training in financial management—The budgets handled by the LDDs, even the smallest, constitute sums of money that merit sensible financial management. But of all the aspects involved in the LDD transfer, this has received the least attention. Employees of the WUAs and members of the boards of trustees desperately need training in this area.

Operation and Maintenance

Transferred LDDs have applied a risky approach to reduce administrative costs: they have downsized their technical staff or have dismissed qualified personnel and replaced them with inexperienced, but less expensive, personnel. Maintenance is also being postponed, generating an accumulation of deferred maintenance that, when finally addressed, will involve high costs.

- Operating the LDDs—Existing infrastructure is underused and undergoing progressive deterioration because of inadequate maintenance. Crop and irrigation improvement programs are also lacking. These factors affect the LDD operation, which shows a low efficiency of soil and water use. Water supply programs are inadequate because no functional system exists to measure water, and water gauges are not used. None of the LDDs have an updated general register of users, so operational tasks and fee collection become increasingly inefficient.
- Maintaining the LDDs—Inadequate budgets lead to lagging maintenance programs, even in the best-administered LDDs. Plans are being made to solve these problems through state-funded rehabilitation programs, but this will only reinforce the culture of deferred maintenance. The heavy machinery and other equipment the LDDs received from INAT need replacing, funds for which will have to be generated. However, here also, in the absence of clear guidelines on ownership and cost sharing, LDDs will continue to set aside insufficient replacement funds while the WUAs perceive the possibility that INAT will make the replacements.
- Information generated by the LDDs—The recording, classification, analysis, study, and use of information generated by the LDDs have been totally neglected. INAT is not processing this information and, as a result, the LDDs have stopped recording data. This has a number of negative consequences, including the inability to analyze LDD performance.

Role of INAT

The role played by INAT, the main governmental land development agency, should be redefined and clearly specified. The definition should address the following points.

- Responsibilities of the parties involved, both during and after transfer—Attention should be given to the role that INAT should play after an LDD has been handed over to its WUA.
- Prompt payment of INAT's existing subsidy and financial support commitments for administration and training programs and a clear policy on cost sharing with the WUAs for rehabilitation and heavy machinery and equipment replacement programs.
- An operational plan that coordinates the activities of various INAT sections so that the institute works in an integrated fashion, thus avoiding scattered and inefficient actions—Additionally, staff members should be sufficiently motivated to act as fundamental promoters of transfer.
- INAT should conduct or commission research on operation and maintenance of the LDDs and establish programs to develop and validate new technologies and approaches.

Water Users' Associations

Legal instruments are necessary for conducting and maintaining a transfer program, but enormous efforts will be required to ensure the effectiveness and sustainability of the WUAs if they are to administer the LDDs and participate, along with the government, in the management of Colombia's water resources.

- User participation—The participation of users in important matters is decreasing (INAT 1996). The number of attendees at general assemblies is less than 50 percent of those qualified to attend. Such apathy leaves decisionmaking in the hands of a small self-perpetuating group.
- Activities that benefit users—WUA activities are routine, and new services are rarely developed for the water users, accounting in part for their limited participation.

 A weak federation—The weaknesses identified in the WUAs are transmitted to their higher level organization, the federation. As a result, FEDERRIEGO also needs to be strengthened. The WUAs should organize themselves in such a way that they have sufficient authority and prestige to dialogue directly with the government on policy issues regarding water resources or agriculture. The WUAs should strengthen themselves through training programs to prepare their representatives to speak for their interests with the government and for soliciting needed public services.

Environmental Issues

While environmental problems may be less immediately obvious than financial or legal problems, the importance of the environment to the sustainability of the transferred irrigation systems will only increase. Both individual WUAs and their national representatives (FEDERRIEGO) and agency partners (INAT) will need to monitor the following:

- Degradation of the watershed—When programs to protect watersheds are limited or inadequate, programs for watershed recovery become necessary. Otherwise, water volume decreases and sediments increase.
- Degradation of water quality—The careless use of agrochemicals in farming has decreased water quality to such an extent that it is perhaps the greatest challenge faced by the WUAs. Communities must be educated to minimize negative impact.
- Industrial pollution—Industries contaminate water sources, affecting not only their use for irrigation but for all other purposes. This problem must be solved.

Problem Solving: What Is Being Done

To solve the problems summarized in the preceding section, the following efforts (among others) have been carried out.

- Asking the Council of Ministers, the highest legal tribunal of the country, to remove the legal impediment to transferring governmental assets to private parties. As yet, there has been no response.
- Compiling existing jurisprudence on water-related issues and preparing a decree. However, a national water strategy is required for a more comprehensive approach. The strategy would cover water concessions, user fees, and surveillance and control of water in watersheds.
- Rehabilitating the LDDs and replacing heavy machinery and other equipment using loans from multilateral banking. This is under way.
- Scheduling training programs in O&M for users, using resources from both the national budget and external sources.
- Transfering and validating technology through agreements with other official entities, such as the National Learning Services (SENA), the Colombian Agricultural Institute (ICA), and the Colombian Corporation for Agricultural Research (CORPOICA). So far, results have been discouraging.
- Offering training programs by the WUAs in organizational development to strengthen the associations and motivate users, but results have been disappointing.

What Is Not Being Done

No solutions have been adopted for legal problems, even though the intention exists. Financial problems have been solved over the short run by rehabilitation loans from the World Bank. No concrete solutions were developed for the problems of O&M of the LDDs. Operational plans for the LDDs recommended by different consulting firms have not been applied, and the WUAs have not received training. Maintenance plans and programs of the LDDs reflect inertia, and work conducted in each district usually follows routine patterns and is not actively planned and assessed. Activities such as research on technology transfer, validation of new technologies, application of solutions to environmental problems, and the assessment and improvement of the performance of the WUAs are at a standstill. Such stagnation reflects lack of leadership, inadequate service plans for users, and the absence of programs to motivate users. The search for solutions to environmental problems has been nil, and this area requires immediate attention.

Recommendations: What Needs to Be Done

The following points summarize several steps that need to be taken in order to ensure the sustainable transfer of Colombia's irrigations systems.

- Develop a comprehensive program for transferring districts. In doing this, defining the concepts of WUA property, infrastructure, and assets must be a top priority. Simple, well-defined procedures for obtaining water concessions are needed, and arrangements should be made for the autonomous regional corporations overseeing the water resource to establish equitable fees for water use, control, and surveillance.
- Establish comprehensive rehabilitation programs for those LDDs still administered by INAT to encourage their transfer. Replacing heavy machinery and other equipment that are obsolete would also serve as an incentive.
- Implement training programs for the O&M staff of the LDDs aimed at solving specific problems in each district. The program should be based on individual diagnoses of district needs.
- Gain the full support of all INAT staff members by making them familiar with the transfer process. Obtain and communicate a clear commitment to the process from top management.
- Conduct research programs on irrigation management and on the transfer and validation of technology.
- Conduct research and educational programs on environmental problems to promote correct use of agrochemicals and pesticides and preserve water quality.
- Support the WUAs through activities that strengthen organizations and generate leadership skills and attitudes of self-reliance. They do not need paternalism.

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Participatory Irrigation Management in the Philippines: National Irrigation Systems

Namika Raby

Summary

The Philippines was a pioneer in involving farmers in irrigation planning and management. Building on a centuriesold tradition of local communities developing and managing small irrigation systems, in the mid-1970s the Philippines began to systematically adapt and apply community management principles, first to government-assisted communal irrigation systems and then, beginning in 1984, to larger national schemes. This incremental process was termed "the learning process approach."

The approach used community organizers who lived in rural communities and helped farmers organize themselves into small irrigation associations (IAs). These associations then entered into contracts with the National Irrigation Administration (NIA) to perform various management functions, such as system maintenance and fee collection, within their portion of the larger system. A driving incentive for the program was the need to increase cost recovery by the government, and, in particular, NIA's need to fulfill its mandate to be financially self-reliant. It tackled this task by attempting to both increase revenues through improved fee collections and trim costs, particularly staff costs. Organizing farmers was key to both efforts.

NIA has a special department, the Institutional Development Division (IDD), that deals with irrigator associations—its budget is about 8 to 10 percent of the agency construction budget. The IDD is responsible for organizing irrigators and for supporting the associations with ongoing training programs. The program has gradually expanded over the past 12 years until about 90 percent of the area under large irrigation schemes in the country is covered by some form of contract between NIA and local associations. The costs of forming and developing an irrigator association are estimated to be about US\$28 per hectare.

The results of the program are difficult to assess. Some studies show increases in area served, cropping intensity, and fee collection efficiency. However, assessment is complicated by the fact that transfer of functional responsibilities was usually accompanied by rehabilitation, making it difficult to attribute the observed effects. Collection efficiencies are still low compared with other countries. Agency operation and maintenance (O&M) staff levels have declined somewhat in the last 10 years. Interestingly, one study shows that collection efficiencies improve best in areas where the most responsibility is transferred.

A number of problems that emerged over the course of this program now seem to mandate a fresh look at the entire participatory program. One is that membership in an IA is voluntary, and the tools available to the IA to compel compliance with rules and payment obligations are limited. A second is the dependency relationships that have arisen between some associations and NIA organizers, and, more generally, between the IAs and NIA. Finances are another important problem area. Specific problems include continued nonpayment of fees, poor financial management by associations, especially where subsidiary enterprises are involved, and inadequate auditing and accountability.

Many individuals from within NIA and outside generously took time from their schedules to share their experience with the writer regarding the history and implementation of participatory irrigation management in the Philippines. However, the author is alone responsible for the interpretations and conclusions drawn, as well as any omissions and errors.

The management model that has emerged in the Philippines is one where clear distinctions between NIA's role and that of the IAs are often lacking. The two roles mingle at low system levels, forming a complicated pattern of joint management arrangements. As a consequence, NIA is unable to make a clean break from lower level management functions, and the IAs fail to achieve true autonomy. A new model now emerging involves a three-way relationship among local village administration, IAs, and NIA. The assignment of a central role to local government agencies is an important innovation that should characterize future management models.

Introduction

Current approaches to participatory irrigation management (PIM) in the Philippines are synonymous with what is known as the "learning process approach." This approach results from a history of community participation in the management of irrigation activities and the systematic implementation of participatory processes in small (less than 100 hectares) communal irrigation systems (CISs), and is characterized as gradual, progressive, small scale, and intensive.¹

The Philippines has a total of 3.1 million hectares of irrigable area, of which 49 percent is managed-under two broad types of PIM arrangements. In recent times, legally constituted irrigators' associations (IAs) were established in smaller government-constructed communal irrigation systems (box 5.1). Under a national policy legislated with the passage of the Irrigation Act of 1912, first under the Bureau of Public Works and subsequently the National Irrigation Administration (NIA), the government funded the construction of communal irrigation systems covering an average of about 100 hectares. It established the irrigators' association as a legal body eligible for government assistance in constructing an irrigation system. This association was subsequently assigned to manage the system and collect from its members the costs of managing it in proportion to benefits received.

In 1975 the NIA charter was amended to authorize recovery from irrigation users of the full cost of construction or a portion thereof, as well as operation and maintenance costs. Furthermore, it stipulated that the IA could make a contribution to construction, in cash, labor, or kind and, upon the completion of the project, operate, maintain, and manage the completed irrigation system. Presently 245,829 hectares of a total of 268,971 hectares under NIA-assisted communal irrigation systems are covered by this arrangement.

By 1984 this policy of PIM was extended to national irrigation systems. The IAs were formed as an organized medium for communication with NIA, the agency that constructed and operated the systems from the tertiary level turnout and up.

Box 5.1. Terms and Conditions of IAs in Communal Irrigation Systems

- IAs organized to assist and fund part of the costs of construction of an irrigation system.
- IAs identified their needs before construction and participated in the construction.
- Ten percent of cost was government subsidized, 20 percent had to be repaid by the IA at 6 percent interest, the remaining 70 percent was amortized over 25 years.
- If the IAs could pay 30 percent of cost during construction, the system was turned over to them with no further payment due.
- NIA remained responsible for giving technical support and undertaking rehabilitation.
- Fifteen percent of amortization payments were set aside by NIA in a trust fund to undertake emergency work.

^{1.} The historical legacy of PIM in the Philippines dates back to the rice terraces of northern Luzon some 2,000 years ago, and subsequently the traditional community-constructed and -managed irrigation systems known as the *zanjeras*. State construction of irrigation systems began during colonial Spanish rule and continued under the Americans. The concept of PIM through formally organized irrigators' associations dates back to 1912 under the American regime.

The IAs in national irrigation systems were organized following the same approach used in the communal systems. In the national irrigation system (NIS), this process is characterized by the formation of the IAs to manage irrigation-related activities jointly with NIA and, in the long term, the secondary levels of the systems. The approach had as its anchor the institutional development officer (IDO) who had a dual role, as a catalyst helping mobilize farmers and organize the IAs, and as liaison between the IA and NIA in carrying out joint management. The IDO's role was expected to conclude with the formation of viable IAs.

At present there are 165 national systems serving 652,264 hectares. NIA, established in 1964 as a government-owned corporation, is responsible for irrigation development by constructing, operating, and maintaining national systems. Three of these, Angat-Maasim, Magat, and Upper Pampanga River Integrated Irrigation System (UPRIIS), are reservoir-backed multipurpose systems serving about 230,000 hectares. The remaining 162 irrigation systems are of the run-of-the-river diversion type and pump irrigation systems. On the average, each serves 2,000 hectares and is generally characterized by highly variable and generally low dry-season water supplies; poor system design for flood control and drainage; deteriorating canal structure and silted and defective diversion works; and inadequate drainage and on-farm facilities. The damage and deterioration of these systems are further compounded by such natural disasters as periodic typhoons, floods, and volcanic explosions. Resulting from this is the need for periodic rehabilitation and the frequent need for major and minor physical improvement of irrigation systems.

Background

The Republic of the Philippines is an island nation composed of an archipelago of islands in the western Pacific off the coast of mainland Southeast Asia. A total land area of 300,000 square kilometers is divided among three island groups: Luzon in the north, the Visayas in the center, and Mindanao in the south. The climate of the islands consists of a dry summer from November to May and a rainy season from June to October. The economy is agriculture based. In addition to irrigated small farms, there are coconut plantations. Mining, fishing, and manufacturing are other major industries.

Of the population of 70 million, 90 percent speak English. Filipino, or Tagalog, is the national language. In addition, there are 87 other languages and 111 dialects in the archipelago. Separated by geography, distinct ethnic groupings have emerged with a common set of values. These characteristics define the Filipino social system and influence the nature of participation in any community activity, including those related to irrigation. Ethnic communities are identified with provinces and popular beliefs attached to ethnic groups. For example, the thrifty, hard-working Ilocanos from the north are said to make better irrigation managers.

The common set of Filipino values is a blend of different cultures brought by immigrants and rulers over the centuries. The value placed on family ties, helping each other and respecting elders, is said to be inherited from the Chinese. Family values are reflected in ties to land ownership and residence in the barangay (a village or barrio). This is also the smallest unit of political representation in the Philippines. Maintaining smooth, interpersonal relations, pakikisama, is a cultural value relevant in community interactions. It connotes consideration, fairness, and camaraderie. People may go to considerable lengths to prove that they have pakikisama and are therefore worthy members of the group.

Considered a Malay legacy is the spirit of helping one another, *bayanihan*. In agrarian communities this spirit is reflected during planting and harvesting when family members and neighbors give their help freely.

Piety is the legacy of three centuries of Spanish rule. In response to a question about what makes a good IDO, a well-known authority on the subject of farmer participation responded that such a person must have missionary zeal in approaching the work. To a further question about why a majority of IDOs are women, the same authority stated that they were better at the job because they were religious.

Historically, these and other values have mobilized the community into action groups for irrigated agriculture. Such values become social capital, institutionalized for the achievement of instrumental goals in the interests of self and the community.

The Farming Community

Over two-thirds of all poor households live in rural areas where persistent and widespread poverty is the norm. More than half of all rural households fall below the 1995 official rural poverty line of P8,000 (US\$310) per capita. A continuing high population growth rate (2.3 percent annually), increasing landlessness and scarcity of land, and inadequate growth of the agricultural sector call for an improved strategy for managing this economic sector of society.

Some 75 percent of households cultivate 1 hectare or less, which, at full development, would only provide annual incomes ranging from US\$393 to US\$785. Some 40 percent of farms are cultivated by leaseholders. The size of landholding and the issue of landlessness are determined by institutional factors such as rules of inheritance, where family property is equally divided among all siblings, and the Philippine Civil Code, whereby property is jointly owned by the conjugal unit.

Women are active in household decisionmaking about farming and finance (box 5.2). Formal membership in the IAs is limited to the tiller of the soil. However, it was perceived in field visits that both married partners share de facto membership in an IA. In addition to participating in transplanting, weeding, and harvesting activities, a married woman will use her proxy membership to actively participate as a fee collector. The IA leadership transmits O&M information through women, as they are more readily available. Women are disproportionately represented in IA management roles as secretaries and treasurers. Women also participate more actively in IA training sessions.

Mandate of the National Irrigation Administration

NIA was established in 1964 as a part of the nation's goal of achieving national self-sufficiency in rice production. In 1974, NIA embarked on an ambitious program to reach the minimum and normal rice requirement of the nation through irrigation alone (NIA 1990, p. 63). NIA's charter was amended in 1974 through Presidential Decree 552, which made the following changes.

- NIA was granted broader powers to undertake comprehensive water resource projects such as flood control, drainage, land reclamation, domestic water supply, hydropower development, construction of roads and highways, and reforestation.
- The capitalization of NIA was increased from P300 million to P2 billion. The government provided an explicit subsidy to NIA for general administration, operation and maintenance of national irrigation systems, and studies of new irrigation projects. NIA did not have to repay the government's advance funding and could keep its irrigation fee collection, funds from equipment rental, and administrative charges from administering construction loans. Although not stated in the charter, an unwritten agreement called for the subsidy for system O&M to be gradually phased out over a five-year period at which time NIA would depend directly on collections from farmers for its O&M expenses.
- NIA was authorized to delegate the partial or full management of the NIS to duly organized cooperatives or associations.

Box 5.2. Women's Roles in the IAs

- Proxy members of the IA
- · Collectors of service fees
- IA secretaries and treasurers
- IA leaders
- Active participants in training sessions

• To cover the increasing costs of operation, the flat rate irrigation service fee (ISF) was differentiated into reservoir, pump, and diversion irrigation system categories.

NIA was to undertake the organization of viable and responsible irrigators' associations that would assist in the construction of irrigation projects and undertake the management, operation, and maintenance of the completed irrigation projects. In selecting irrigation systems to be constructed, the following criteria were to be evaluated: crop to be grown (projects with rice over other crops), benefit-to-cost ratios, average size of landholding, incidence of tenancy, farmers' commitment to build part of the project, and environmental impact. Before a project was constructed, the following had to be accomplished:

- Feasibility study showing cost-benefit ratio, internal rate of return, and returns on farmer's investment (done by NIA)
- Organization and registration of beneficiary association with NIA initiative and assistance
- Water rights application
- · Plans and estimates of construction
- Agreement between NIA and the IA regarding the sharing of costs and management responsibilities in the national systems and the amortization of communal systems
- Program of work.

As spelled out in its amended charter, NIA was authorized to recover

from the beneficiaries of all irrigation systems, the full cost of construction (at appraisal) or portion thereof within a reasonable time and to the extent consistent with government policy, in addition to the collection of irrigation fees covering insurance and expenses for the operation and maintenance of the system by NIA or irrigation charges for management and administration.

IAs were to contribute to construction in cash, labor, materials, or right-of-way, and upon the completion of the project it would be turned over to duly organized IAs to operate, maintain, and manage. NIA was to make all efforts to strengthen and develop the capability of the IAs, monitor and evaluate their performance to meet standards, assist them technically, and turn over the irrigation system to them only after they were fully trained to manage it.

Water Rights and Cost Recovery

The irrigation service fee is a charge levied on the farmer for water delivered and the cost of delivery. The basic principles and framework for the appropriation, control, and conservation of water resources are embodied in the Water Code of the Philippines, 1976.

Under Article 3 of this code, all waters belong to the state.² The state may allow the use or development of waters by administrative concession. The control and regulatory functions of the government with reference to the objectives of the Water Code are exercised through the National Water Resources Council and the National Water Resources Board. Under Article 10, the purposes of water appropriation are as follows: domestic, municipal, irrigation, power generation, fisheries, livestock raising, industrial, recreational, and other.

Water cannot be appropriated without a water right acquired through a water permit. This water right is a privilege granted by the government. An individual, a group such as an IA, or a corporation (NIA) can secure a permit. For agricultural purposes, a permit must be supported by documents of ownership or possession of land to be developed, such as a certificate of title, a tax declaration, and a certificate of land transfer or contract of lease (if applicant is a lessee). Documents must also show the

^{2.} This definition of water refers to water under the ground, above the ground, water in the atmosphere, and waters of the sea.

location plan of the area, including point of diversion, nature of diversion works, and area for which water will be used.

For national irrigation systems, NIA is the water permit holder.³ This permit can be transferred subsequently to others, with the approval of the National Water Resources Board. The right to use water is made appurtenant to the grantee rather than to the land (as was the case previously under the Irrigation Law, 1912). However, the land within the irrigation system is used as lien against the amount of irrigation service fees to be recovered. This is based on the size of landholding irrigated, type of irrigation system, and wet and dry seasons. The irrigation service fee itself is calculated through a combined charge for volume of water delivered, in this case, to NIA by the National Water Resources Board and a standard charge levied by NIA for the delivery of water, although in practice only the NIA charge is assessed. Fee rates are shown in table 5.1.

Since 1975, irrigation service fees are denominated in paddy, and farmers may pay either in cash or kind based on the government paddy support price (the 1996 rate is P8 per kilogram for clean dry paddy). The denomination in paddy provides a degree of indexation against inflation. About 50 percent of farmers pay in cash. NIA loses about 10 to 15 percent of its gross receipts in collecting, storing, and selling paddy. Farmers harvesting less than two tons of paddy per ha are exempted from the fee. Other crops cultivated with irrigation were subject to payment of service fees at varying rates, but payment must be in cash.

Unpaid ISFs become liens, first on the land benefited and then on the crops raised on it. Such a lien has preference over all other liens, except for taxes on the land. If the charges are not paid, the property may be sold by NIA. Judicial action for the collection of unpaid fees is governed by the Rules of Court of the Philippines for similar actions. Such actions, however, are rare.

In this context, NIA's immediate objective in forming irrigators' associations in the national irrigation systems was cost recovery through collection of irrigation service fees.

From 1983 to 1987, O&M costs were approximately US\$13.10 per hectare (covering mainly salary of NIA staff) plus another US\$3.30 per hectare for maintenance work (desilting, minor restorations, repairs, and so on) totaling US\$16.40 per hectare. O&M costs increased by 50 percent in 1987, and this level was maintained in 1992 at US\$30 per hectare. Of this amount, according to the World Bank approximately US\$25 supported salaries (recurrent O&M), and US\$5 was spent on repairs (incremental O&M).

The NIA board of directors, through its memorandum circular on National Policy on Repayment of Construction Cost of Irrigation Facilities (approved by the president of the Philippines as National Economic Development Authority Resolution 20, S.1978), decided that in order "not to discourage participation of farmer beneficiaries in the development and operation of irrigation facilities," the government (NIA) will bear the capital cost of national irrigation systems and was authorized to recover from beneficiaries the cost of operating and maintaining them.

It was anticipated that improved communication between NIA and the cultivators through the formally organized IA would result in a planned cropping calendar and better sharing of water among

	Cavan of paddy/ha	(one cavan = 50kg)
Type of system	Wet season	Dry season
Diversion	2.0	3.0
Pump	3.0	5.0
Reservoir	2.5	3.5

Table 5.1. Irrigation Service Fee Rates

Note: Annual ISF for diversion systems: US\$67 per hectare. Source: NIA files.

^{3.} A random selection of three water permits filed indicates that while NIA secured permits for a pump irrigation system and a river diversion system, an IA secured a permit for diverting water by means of an intake from a creek for a CIS.

farmers, increased area irrigated, and increased cropping intensity, all of which would then increase the willingness of irrigators to pay irrigation service fees. Increased contact and communication between NIA and IA would lead to better system maintenance at the tertiary level, subsequently, to better IA performance of maintenance at the secondary level under contract, and, finally, to the federating of the IAs that would lead, in turn, to system turnover at the secondary system.

The Participation Process

The process of implementing PIM in national irrigation systems has involved capacity building within NIA, organizing the IAs, and negotiating contracts delineating the mutual roles and responsibilities of NIA and the IAs.

The Role of NIA

At the national level, overall responsibility for managing the Institutional Development Program is vested in the NIA administrator, supported by the NIA board of directors. The program is carried out through the office of the Assistant Administrator for Systems Operation and Equipment Management. Under this assistant administrator, the institutional development activities associated with the formation and development of the IAs in the NIS come under the Institutional Development Division (IDD).

At the regional level, the Institutional Development Program is the responsibility of the regional irrigation manager through the Institutional Development Division. Program management at the irrigation system level is vested in the superintendent of the concerned irrigation system and the provincial irrigation officer for communal irrigation systems. At the field level, the program is implemented by the watermasters, the water resources facilities technician, and the IDO.

The Institutional Development Division at NIA headquarters operates under two units, Irrigators Organization and Irrigators Assistance, each under an assistant manager. The Organization unit is responsible for IA formation and training while Irrigator Assistance provides skills development training for the IAs to become economically viable.

The total staff of the IDD at NIA headquarters is 25. At the regional level, the IDD staff normally comprise a regional IDD manager and the IDOs who are appointed two per region. The NIA *Annual Report* (NIA 1994) gives the IDO personnel number at 68 for national irrigation systems and 94 for communal irrigation systems, a total of 162. It is estimated that the IDD budget is 8 to 10 percent of the NIA construction budget.

The IA

A formally organized IA is a nonprofit, nonstock association registered under the Securities and Exchange Commission (SEC). IA membership is voluntary. The membership fee is nominal (P5 to P15). According to the bylaws of the IA, membership is for the "tiller of the soil"—traditionally the position is filled by the male head of household. An organized and registered IA becomes the forum for mobilizing irrigation service fee collection and transmitting information from the agency.

The Catalyst Approach to IA Organization

The IA formation is based on the catalytic role of the institutional development officer.⁴ College graduates in the social sciences, experienced in working with the rural and urban poor, were oriented in the policies and procedures of NIA, exposed to operating irrigation systems, and hired on a temporary basis

^{4.} At various times, this catalyst role has been identified by other designations, for example, community organizer (CO), institutional community organizer (ICO), and irrigator development officer (IDO). However, the basic role has remained the same.

as community organizers.⁵ They lived in farming communities and participated in community activities to gain rapport and acceptance. Over time, they acted as facilitators among the farmers, helping them vocalize their needs, problems, and ideas regarding the irrigation system expansion, maintenance, and operation, while informing them of the kind of assistance they could obtain from NIA. In this process the needs that were identified, as well as types of assistance to be provided, were tailored to the local farmers and the irrigation system. The need for sufficient lead time to analyze local requirements before construction has been pointed out as critical (Bagadion 1994). In one case such preconstruction activity in a project of 600 hectares lasted 10 months.

More intensive organization in a single IA is provided by a farmer irrigator organizer (FIO), an irrigator resident in the community who is recruited by NIA for 12 months for a stipend of P500 per month. Beyond this point it is up to the IA to retain the organizer on its payroll as a member of its board of advisers.

Farmers form groups to prepare a map of the proposed irrigation service area and the location of canals. They discuss these matters with NIA engineers and accompany them during the surveys for the planning and design of the system. They then negotiate the right-of-way with relevant landowners and prepare the documents needed for the registration of their association with the Securities and Exchange Commission.

Before construction, the association meets with NIA to discuss the type of diversion structure, the construction schedule, extent of farmer involvement in construction work (through contract as well as association counterpart contribution), and to estimate the costs that the farmers will repay. In older national irrigation systems that were constructed before the formation of the IAs, this process took place during rehabilitation. The IA contributes 25 percent of costs in labor and materials. During construction or rehabilitation, farmer committees are encouraged to monitor the use of equipment, fuel consumption, and costs. Upon completion, the IA and NIA undertake the shared management of the system. This process of enhancing participation and recovering costs was tried on a pilot basis in the 1980s and was implemented nationally by 1987.

Contracts and Incentives

PIM under the shared management strategy is implemented through a sequence of contracts between the IAs and NIA and through incentives given to the IAs.

MAINTENANCE CONTRACTS. An organized and registered IA signs a maintenance contract with NIA; the contract specifies mutual obligations of both parties.

IA Obligations

- Undertake grasscutting and clearing on the inside and outside slopes of the supply canals.
- Fill up potholes along canal embankments and drain accumulated water from depressed portions of canal embankment.
- Remove debris from canals and conveyance structures.
- Undertake minor repairs of facilities that will not require equipment or construction materials.
- Undertake greasing of steel gates including turnout gates at least once a month.
- Undertake with NIA the painting of regulatory and control structures.
- Protect and safeguard all irrigation structures.
- Prevent people from constructing illegal turnouts.

^{5.} Today, not all are from the social sciences, in fact a good many are agriculture graduates and some civil engineers.

- Maintain all farm-level facilities within the IA area, including desilting, removal of debris, and grasscutting.
- Prepare monthly maintenance reports to be submitted to NIA.
- Participate in regular meetings, trainings, and seminars.
- Coordinate with other institutions (*barangays*, and so on) and promote programs for the welfare of the association.
- Participate in the identification of structures needing repair or restoration and undertake such activities with NIA.
- Allocate and deliver in a timely fashion adequate amounts of water from the lateral headgate to individual farms programmed for irrigation during a cropping season.

NIA Obligations

- Undertake rehabilitation of facilities jointly with the IA.
- Provide the IA with supplies for maintenance activities.
- Provide the IA with water delivery and planting schedules one month before cultivation begins
 and notify the IA of any unavoidable delays or changes.
- Deliver in a timely manner adequate water to the headgate of the lateral of the IA.
- Develop and implement training programs to develop the IA capacity to undertake its activities.
- Regularly inspect and monitor the IA activities regarding fulfillment of its contract.
- Assist the IA in conflict resolution beyond its capacity to resolve.

The IA is currently remunerated at the rate of P1,400 per 3.5 kilometers of canal per month for satisfactorily performing its obligations. The IA replaced the agency ditchtender who had previously discharged activities now performed by the IA.

Collection Contracts. Simultaneously with a maintenance contract or independently, an IA can sign an ISF collection contract that also specifies mutual obligations of NIA and the IA.

IA Obligations

- Monitor irrigated planted area weekly and report this information to NIA.
- · Distribute water within the IA area.
- Gather water discharge data and submit to NIA.
- Deliver irrigation fee bills to farmers.
- Collect payments and remit them to NIA every Friday or when the amount collected reaches P5,000.
- Assist NIA in verifying farmlots to be exempted from the irrigation service fee.
- Gather yield data from randomly selected farmer beneficiaries.
- Monitor changes in land ownership and tenure.

NIA Obligations

- Inform the IA of water delivery and planting schedules.
- Train the IA to gather and report water discharge data.
- Prepare and deliver irrigation bills to the IAs.
- Issue official receipts on remitted fee payments.
- Assess farmlots requesting exemption of payments.
- Train IA members in gathering yield data.
- Ensure timely payment of the IA share from fee collection.

The IA receives a portion of the fee collected as incentive and compensation for its effort. Rebates are given on a sliding scale, ranging from 2 percent of fees collected above the first 60 percent, up to a maximum of 15 percent for collection of 100 percent of the fees due.

System Turnover Contract. Turnover can be either full or partial. Under full turnover, the irrigation system is turned over to the IA under the following agreement.

- The irrigation system is amortized as in the case of the CIS.
- Operation and maintenance tasks over the entire irrigation system are the responsibility of the IA.
- NIA continues to be responsible for major repair and rehabilitation of the irrigation system.
- NIA provides technical and managerial training for the IA.
- NIA assists the IA in developing a system operation plan.

Under partial turnover, NIA retains a share of the O&M tasks. The IA performs the following:

- Maintaining the entire length of the main canal
- · Undertaking all technical repair works considered to be minor
- Implementing a jointly agreed water delivery plan for the entire system
- Collecting irrigation service fees from farmers per the collection contract.

Under partial turnover, NIA is responsible for the following:

- Undertaking rehabilitation and major repairs to the irrigation system
- · Providing the IA with managerial and technical training to enhance its capacity for self-management
- · Providing the IA with necessary tools and equipment, funds permitting
- Giving preference to the IA in carrying out rehabilitation of the system
- · Operating the main canal and, where relevant, the reservoir.

Assistance and Training

Assistance given to registered IAs is categorized as internal and external. Internally, the assistance unit of the Institutional Development Division of NIA has prepared a monitoring system, called the Irrigator Association Management Information System. Instruments developed for this purpose are used by the IAs to record information on farming activities, water delivery and distribution, harvesting, and ISF collections. The IAs will be trained to use this cumulative information for planning their future cultivation agenda.

Externally, the Institutional Development Division mediates and facilitates links between the IAs and other agencies, as follows:

- Cooperative Development Authority—The IAs typically receive production loans from the Land
 Bank during the first year of their existence. Beyond this period, the IA must convert to a cooperative in order to continue to receive lending from the Land Bank. The Cooperative Development Authority relies on NIA to provide the IAs with skills and training that allow them to convert into cooperatives.
- Department of Agriculture—The Institutional Development Division facilitates the implementation of the Livestock Project, the Enhancement of Agriculture Project, and the Rice Production Cluster Project, among others, aimed at improving farm output.
- National Food Authority—The Institutional Development Division acts as liaison between the IAs and the National Food Authority in marketing and technology transfer.
- Technology and Livelihood Resource Center—The Institutional Development Division mediates with nongovernmental organizations such as the center and assists IAs to procure loans from them.

A contracted IA, over a period of two or three years, is targeted to receive at least one round of the following types of training from NIA's Institutional Development Division:

- Basic leadership development course encouraging leadership skills
- Systems management training including water distribution, implementation of cropping calendar, in-season maintenance, ISF collection, and conflict management
- · Financial management training including bookkeeping and money management.

A second round of training is given at the request of the IA, with the latter bearing 50 percent of the cost of the training.

Finally, the PIM program in the Philippines supports the integration of the IAs with the community through IA participation in activities such as fiestas, parades, and harvest festivals. NIA also has an annual competition for outstanding IA in the irrigation system and the region.⁶ These IAs in turn compete for the position of outstanding IA in the nation. The first-place IA receives a cash award of P20,000 and the second- and third-place IAs receive certificates.

Results of the PIM Program

The impact of PIM in the national irrigation systems of the Philippines is reviewed here from the following perspectives: (a) the irrigated area under contract for shared management and realization of goals of the program for irrigated agriculture; (b) the reduction of government costs through the reduction of NIA O&M staff as the IAs assume such activities; and (c) the trend in cost recovery through the collection of irrigation service fees.

Irrigated Area under Shared Management

Table 5.2 and box 5.3 show the status of IA organization, contracting, and transfer as of December 1995. Table 5.3 presents several indicators of program coverage and impact for two points in time, 1987 and 1990. The two years shown in the table can be associated with periods before and after the program was introduced. However, because the organizing program is progressive and ongoing, it is difficult to associate a particular year with a "before" situation and another with the "after." Moreover, it is risky to use agricultural data from a single year to represent "typical" conditions because of the many possible variations associated with weather and other factors. The data suggest increases in all five of the target variables, but more information is needed to evaluate these suggested changes.

Reduction in NIA Personnel

Because more than three-quarters of NIA's operating budget in the late 1970s was devoted to operational costs, of which personnel expenses were the largest share, reduction in staff was a major concern. Voluntary reductions in staff were carried out in the 1970s and 1980s, reducing the personnel share of the budget from about 80 percent in 1976 to 74 percent in 1986. From 1992 to 1996, staffing levels remained constant in the central, regional, and provincial offices of NIA, while staffing totals in national irrigation systems for the same period dropped from 5,660 to the present 4,785, a 15 percent reduction. NIA payroll includes the irrigation superintendent, watermasters, and ditchtenders. The reduction in staff has resulted primarily from the replacement of ditchtenders upon retirement with contract labor arranged through the IAs. Staff attrition was also caused by an increase in the command area serviced by an individual watermaster, from 500 hectares to 1,000 hectares.

^{7.} NIA also recognizes the outstanding irrigation superintendent and outstanding regional irrigation manager.

Table 5.2. IA Organization, Registration, and Contracting for National Irrigation Systems as of December 1995

Particulars	Status
IA organization	
Number of IAs organized	1,861
Area covered (ha)	586,990
Number of farmers	388,606
Number of IAs registered with SEC	1,826
Area covered (ha)	577,005
Number of farmers	391,410
IA contracts	
Total (as of September 1995)	
Number of IAs	1,552
Area covered (ha)	478,877
Number of farmers	344,030
Maintenance: number of IAs	419
Area covered (ha)	144,926
Number of farmers	97,393
Collection: number of IAs	398
Area covered (ha)	112,926
Number of farmers	96,620
Maintenance and collection: number of IAs	680
Area covered (ha)	236,088
Number of farmers	171,855
Turnover: number of IAs	45
Area covered (ha)	13,929
Number of farmers	10,680

Box 5.3. Status of Management Transfer to IAs (1995)

- Area turned over completely: 11,202 ha
- Area under maintenance contracts: 144,926 ha
- Area under collection contracts: 81,141 ha
- Area under combined contracts: 236,088 ha
- Area under organized IAs: 108,103 ha
- NIA staff declined between 1986 and 1996 by 31 percent
- NIA O&M salary costs declined from 80 to 56 percent of operating expenses
- Dry season benefited area increased by 20 percent
- ISF collection increased by 17 percent
- Repair and maintenance costs declined by P160 per hectare

A ten-year trend in NIA staffing is given in table 5.4. NIA permanent staffing has declined over this period, which covers the nationwide implementation of the participatory program in national irrigation systems, from 10,255 in 1986 to 7,077 in 1996, a decline of 31 percent. Temporary staff hired under foreign-funded projects declined also from a high of 9,098 in 1986 to a low of 3,291 in 1996. The institutional development program has relied primarily on project funds to hire institutional development officers.

In 1995 the government introduced a five-year O&M subsidy in national irrigation systems of P220 per hectare. This was to be supported by system rehabilitation and an intensified effort at collecting

Table 5.3. Status of Irrigation before and after the Introduction of PIM in National Irrigation Systems, 1987 and 1990 (thousands of hectares)

	Outo	comes
Program goal	1987	1990
Service area	600,500	621,000
Area wet season	436,400	478,500
Area dry season	370,100	382,800
Cropping intensity (percent)	134	139
ISF collection (percent)	51	54

Table 5.4. NIA Personnel Trends, 1986–96

Personnel		Mo	nthly			
Year	category	Permanent	Temporary	Daily	Total NIA/project	Total overall
1986	NIA Project	6,696 0	419 2,857	3,140 6,241	10,255 9,098	19,353
1987	NIA Project	7,795 0	611 2,867	2,917 4,631	11,323 7,498	18,821
1988	NIA Project	7,529 0	583 2,955	3,734 5,970	11,846 8,925	20,771
1989	NIA Project	7,656 0	416 2,912	3,576 5,466	11,648 8,378	20,026
1990	NIA Project	<i>7,7</i> 21 0	0 0	1,591 8,887	9,312 8,887	18,199
1991	NIA Project	7,555 0	34 0	5,301 3,891	12,890 3,891	16,781
1992	NIA Project	7,281 0	25 0	878 4,712	8,184 4,712	12,896
1993	NIA Project	6,931 0	25 0	1,202 4,019	8,158 4,019	12,177
1994	NIA Project	6,633 0	11 0	1,855 4,704	8,499 4,704	13,203
1995	NIA Project	6,310 0	1,205 0	0 4,716	7,515 4,716	12,231
1996	NIA Project	6,183 0	. 0	894 3,291	7,077 3,291	10,368

Source: NIA files.

irrigation service fees. To motivate NIA staff to pursue fee collections, national irrigation systems were carved into groups of responsibility centers. Financial incentives totaling 10 percent of the fee revenue collected above actual operating costs (an amount sufficient to recover narrowly defined O&M costs) were given as bonuses to NIA staff at the regional and system levels.

NIA's operating expenses during the period covered by the nationwide implementation of PIM are given in nominal terms in table 5.5. At 1996 levels, operating expenses per hectare in NIS were P1,360.

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Table 5.5. Annual Operating Income and Expenses, 1986–95 (millions of pesos)

Category	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total (%)
Income											
Irrigation fees	179.9	174.0	181.8	213.8	278.7	342.3	328.0	336.1	373.4	345.9	46
Equipment rentals	36.6	<i>75.7</i>	79.7	76.1	68.5	89.6	72.0	82.2	113.0	162.9	14
Pump amortization	5.6	4.5	3.6	3.2	2.5	2.3	1.9	1.4	3.8	0.6	0
Interest	64.2	74.8	67.3	39.0	49.5	28.6	13.6	26.8	54.1	47.1	8
Management fees	58.4	77.9	73.0	64.6	102.7	99.2	65.1	125.9	66.1	109.8	14
CIS amortization	8.2	31.5	43.4	47.2	104.0	53.7	44.2	50.8	51.5	76.7	9
Others	24.3	21.5	16.4	24.9	30.4	<i>7</i> 9.5	120.7	67.4	88.6	49.5	9
Total	377.2	459.8	465.3	468.9	636.3	695.2	645.5	690.7	750.4	792.5	100
Expenses											
Personnel services	250.0	283.0	313.3	326.0	508.1	498.4	581.6	535.6	599.7	671.8	<i>7</i> 4
Overhead	100.3	133.1	148.8	139.8	155.3	181.9	175.2	161.5	189.5	201.4	26
Total	350.3	416.0	462.2	465.8	663.4	680.3	756.8	697.1	789.2	873.2	100

Of this, salaries accounted for 56 percent, civil works for 30 percent, and other operational expenses for 14 percent.

Table 5.6 shows that the total cost of organizing an IA in 1991, as given by NIA, is P47,816 (US\$1,771). Combined with the cost per hectare of developing IA management capacity for turnover at the secondary system (table 5.7) at P572.4 per hectare, an approximate cost of forming and developing an IA for a 250hectare area is estimated to be P190,906 (US\$7,070), or about US\$28 per hectare.

NIA-Consult, Inc. studied national irrigation systems with and without the IAs in 1993 using the criteria of collection efficiency, repair and maintenance costs, personnel costs, and change in dry season benefitted area (table 5.8) and found that on all accounts the former fared better than the latter.

The sample IAs in this study were drawn from irrigation systems that received on-farm improvements through project funds for system rehabilitation as well as those organized through the community organizer approach. Thus results cannot be attributed entirely to the community organizing approach.

By the year 2001 an additional 19 national systems covering a total of 25,426 hectares are expected to be added to the turnover program.

Cost Recovery through Irrigation Service Fee Collection

According to a study by NIA-Consult (1993, p. 18), the role of IAs in service fee collection becomes a stabilizer once such collections reach a certain level. The study argues that the greater participation of IAs in negotiating the level of ISF collection sharing between 1987 and 1991 resulted in the increase of

Table 5.6. Annualized Costs per IA Formed, 1991

Type of costs	Amount (pesos)
Farmer irrigation organizer salary	6,000
Farmer irrigation organizer supervision	6,000
Institutional development officer	8,096
Institutional development officer allowance	720
Basic leadership development course for IA leaders	9,000
Systems management training	9,000
Farmer management training	9,000
Total cost (at 1991 exchange rate of US\$1 = P27)	47,816 (US\$1,771)

Source: NIA files.

 Table 5.7.
 Summary of Costs of IA Development and Management for Turnover Program, Nationwide

Category	Number of NISs	Service area (hectares)	Area with IAs (hectares)	Area without IAs (hectares)	Development cost/ha with IAs (pesos)	Development cost/ha without IAs (pesos)	Total development cost with IAs (pesos)	Total development cost without IAs (pesos)
Irrigation Operations								
Support Project II	10	04.600		10.104	FFO 41	FCO 41	40.040.400	10 005 000
(World Bank)	18	94,689	75, 555	19,134	572.41	569.41	43,248,438	10,895,090
Water Resources								
Development Project								
(World Bank)	19	214,566	186,966	27,600	572.41	569.41	107,021,208	15,715,716
Irrigation Systems								
Improvement Project								
(Asian Development								
Bank)	5	26,674	19,678	6,996	572.41	569.41	11,263,884	3,983,592
Other NIS		291,561	235,561	56,121	572.41	569.41	134,837,472	31,955,859
Total		627,611	517,760	109,851	572.41	569.41	296,371,002	62,550,258

Table 5.8. Performance of National Irrigation Systems with and without Irrigators' Associations

Category	Collection efficiency (%)	Repair and maintenance costs (pesos/ha)	Personnel costs (pesos/ha)	Dry season benefited area (%)
With IA	60	380	340	40 and greater
Without IA	43	540	450	20 and greater

Source: NIA-Consult Inc., (1993).

collection efficiency from 52 to 65 percent. The study also concludes that IAs with more O&M responsibilities are more efficient in collecting irrigation fees (table 5.9).

Some conclusions emerge from this discussion of irrigation service fee collections. First, fee collections have leveled off. Second, about 70 percent of this income goes to support activities other than physical works. Third, a reduction in personnel costs can be achieved through the IA contracting for activities previously performed by NIA ditchtenders and watermasters. However, these personnel are currently replaced only upon their retirement. Fourth, there is a greater willingness to pay service fees among the IAs involved in system operation and maintenance.

A somewhat more critical view is presented in the World Bank report *The Philippines Water Resources Development Project* (World Bank 1996, annex 7). This report states that income from national irrigation systems declined from 84 percent of costs in 1989 to 63 percent in 1993. This decrease is attributed to increases in salaries of civil service personnel while irrigation service fee collections have remained at the level of about 60 percent of collectibles. It states further that NIA system level staff spend 10 to 40 percent of their time collecting service fees from farmers and that the ratio of staff salaries to the amount collected was almost 100 percent.

Problems Identified in PIM Strategy

The Institutional Development Division conducted an evaluation of the IAs in the national irrigation systems in 1996. The objectives of this survey were to (a) assess the current status of the IAs, (b) identify functional and nonfunctional aspects of the IAs, (c) provide a basis for establishing development programs for the IAs, and (d) serve as one basis for the selection of the outstanding irrigators' association. The

Table 5.9. IA Irrigation Fee Collection Efficiency, by Contract Type

	Collection efficiency (%)					
Contractual arrangement	On-contract effectiveness	Two years after contract	1991			
Canal maintenance and water distribution contract	41	58	60			
Irrigation fee collection and water distribution contract	65	58	83			
Canal maintenance, water distribution, and irrigation fee collection contracts						
Collections sharing between NIA and IAs fixed by NIA	52		93			
Collections sharing negotiated between IAs and NIA	65	58	110			
Full turnover contract to the IA	77	103	143			

Source: NIA-Consult, Inc. (1993).

findings of the survey reflect the organizational capacity of the IAs to carry out activities mandated by their contracts and to undertake progressively greater responsibilities. This in turn is a reflection of the PIM strategy adopted by NIA for its national irrigation systems and the adequacy of its training programs.

The IAs were evaluated under the criteria and weightings shown in table 5.10. The evaluations were based on the functionality index shown in table 5.11. This survey evaluated 54 percent of all the IAs in national irrigation systems and found that 14 percent were very functional, 52 percent moderately functional, and 34 percent not functional. Problems are summarized in the following list:

- Voluntary membership made it hard to obtain compliance on contract obligations.
- NIA cannot enforce compliance of contracts with the IAs except through long and cumbersome litigation.
- NIA had financial difficulties and failed to pay incentives on time.
- NIA was unable to make repairs to systems on time.
- Funds for IA development were inadequate and were not released on schedule, leading to a lack of synchronicity between construction or rehabilitation activities and IA development.
- NIA is unable to withdraw field staff even when the IAs are interested in maintenance contracts.
- IA leaders are elected annually, resulting in rapid IA management turnover and heavy but unmet demand for leadership training programs.

Table 5.10. Evaluation Criteria for 1996 IDD Study (percent)

Criteria	Weight
Operation and maintenance	. 68
Planning	8
Implementation	48
Performance outputs	12
Organization	20
Membership	4
Board of directors meetings	4
General assembly meetings	4
Record files	8
Financial performance	6
Net worth	3
Income versus expenses	3
Organizational discipline	6
Holding of regular meetings	2
Imposition of discipline and sanctions	2
Attendance at meetings	2
Total	100

Source: NIA files.

Table 5.11. IA Functionality Criteria Used by NIA/IDD (percent)

Criteria	Score
Very functional	100-80
Moderately functional	79–60
Not functional	59 and below

Source: NIA files.

- Inadequate training in financial management and lack of transparency in financial management processes has resulted in the insolvency of many promising IAs.
- The organization stage of IAs lacked sufficient emphasis, and training was needed during the organization process rather than after the contracts are let.
- The conversion of IAs into multipurpose cooperatives has not succeeded in generating additional income for the IAs.
- Institutional development officers hired as temporary catalysts have fostered dependence of the IA on them.
- The agency goal of cost recovery conflicts with its long-term goal of strengthening the IAs; NIA field personnel are given bonuses based on their success in collecting service fees, while little emphasis is placed on strengthening IAs.
- The IAs have poor internal agency management, unclear position descriptions, absence of management controls, little training of systems-level technical staff in managerial skills, and failure to support institution building is common.
- A continuing NIA presence in areas where the IAs are performing O&M activities under contract leads to confusion and delay in IA capacity development.

Conclusions

The following conclusions are related to problems in implementing the current organizational, training, and monitoring and evaluation strategy of PIM in the Philippines.

Voluntary Membership

IA membership is voluntary, and full membership is seldom achieved. In the 19 systems scheduled for turnover in the coming years, full membership has been achieved in only 5. The consequences are twofold: first, the IA is unable to obtain cooperation to implement its contractual obligations and seasonal cultivation program from nonmembers. Second, the voluntary nature of the IA limits its ability to enforce its policies even on its members, for example in the nonpayment of irrigation service fees. The IA bylaws rely on consensus and social pressure, not on legal sanctions.

For nonpayment of fees, NIA must take delinquent farmers to court. One such case was reported from Region V, where the land was seized by the regional office. Beyond this, NIA has authorized the irrigation superintendent or district manager to send out letters of demand to nonpaying farmers. The UPRIIS-District III reported that, usually upon the receipt of one or two such letters, a farmer will come to the district office and pay the fees due because the consequence of nonpayment beyond the third letter of demand is repossession of the land. The social embarrassment of such action is said to be a sufficient deterrent for a farmer to pay any outstanding service fees. As of July 1996, however, the fee collection efficiency in District III is only 59 percent, about average for national irrigation systems.

The inability of NIA and the associations to collect fees through current methods affects not only current levels of fee collection but what are known as new back accounts, amounts owed by individual IA members since the date of the IA contracting for fee collection and old back accounts incurred before the signing of such a contract. (While the incentive for collecting old back accounts is as high as 25 percent, for accounting purposes all back accounts fall under one category.) The magnitude of these back accounts is seen in table 5.9. The importance of their collection for the financial solvency of NIA as well as the sustainability of irrigation systems cannot be overemphasized.

^{7.} UPRIIS reports there are farmers who have not paid ISFs in 20 years. The District Irrigation Office has a target of apprehending at least 1,000 defaulters per year, with a staff of five billing clerks performing this task. Cases involving less than P 50,000 will be arraigned in the municipal court, while amounts up to P200,000 will be brought to the trial court.

Accelerated Organization Schedules

Under project funding, the focus of monitoring efforts has been on IA creation within the project area and not the sustainability of the IAs created. Thus little is known about long-term effectiveness. On the one hand, the success of the learning process approach, as documented by Bagadion (1994), has been attributed to intensive organizing efforts focusing on a limited number of systems and extending over at least one year. In contrast, IAs organized in the latter half of the 1980s were organized in a hurry with limited staff and budget. Thus, from 1980 to 1987, a total of 1,233 IAs were organized, while over a one-year period in 1989–90, a total of 876 IAs were organized. It would be important to assess the impact that these different approaches to IA organization has had on IA performance and sustainability.

Catalyst Dependence

The use of a catalyst to organize IAs is the centerpiece of the learning process approach in the Philippines. Over time this catalyst has been known as the institutional community organizer, the institutional development officer, and recently the irrigator development officer. The educational background of catalysts has varied over time from the social sciences to agriculture and engineering. Following "the farmer's way," a different kind of catalyst was created with the introduction of the farmer irrigator organizer. By all accounts, the primary responsibility for organizing sustainable IAs is now the domain of the watermaster, with the support of the IDO and FIO. Thus, the catalyst has evolved from a single person to a triumvirate of individuals with different backgrounds and capacities. In this case, accountability and responsibility need to be spelled out clearly.

The institutional development officers were originally hired as casual or contractual employees whose employment was terminated at the end of foreign-funded programs. The first officers were hired and trained for work in communal irrigation systems under Ford Foundation funding and were moved to national irrigation systems under other foreign-funded projects. Institutional development officers have expected over time to become permanent employees of NIA. But NIA currently has a limited number of permanent positions for these officers, whose functions should end with the formation of the IAs. At least some institutional development officers appear to have cultivated a dependency relationship with the IAs.

This situation is also true of the farmer irrigator organizers, who were hired for 12 months to help establish an IA and whose services were terminated by NIA at the end of this period. In many cases IAs have demanded that NIA keep the farmer organizers on its payroll beyond this period even though the IA itself is unable or unwilling to pay for their services. In contrast, watermasters are part of the NIA's cadre of civil service positions and can only be moved to newly irrigated areas or be allowed to retire.

Multifunctional Associations

A number of IAs, particularly in reservoir and pump systems, have accumulated capital through their O&M contracts, obtained loans from the Philippines Land Bank, bought tractors, established rice mills, and undertaken the trading of rice. The conversion of the IA into a vehicle for channeling private and government-based enterprise for the development of the rural sector was envisaged by NIA as the next phase in the IA development.

However, this has posed a dilemma in that IAs, as presently constituted, are registered as nonprofit, nonstock, nonsectarian organizations. To perform these new functions, IAs must be converted into for-profit organizations. However, in order to qualify for loans from the Land Bank, the IA must be constituted as a cooperative. NIA fears that, in their enthusiasm for business-related activities, the IAs might forget their original O&M functions. The recent history of IAs converting to cooperatives has not been positive.

The irrigators' association for a pump irrigation system covering 831 hectares in Region III is a case in point. Organized as an IA in 1984 with 700 members, it was turned over in 1986. The IA board of directors had converted the IA into a cooperative without approval from the membership at large (15 members are

required to form a cooperative and this number was met by the members of the board). In 1991, using IA funds as collateral, they then borrowed P6 million from the Land Bank and diversified into other activities including a rice mill, a warehouse for rice storage, and a fisheries project. Two years later, after repaying part of this loan, they obtained a further loan. In the following year, two new members were elected to the IA board of directors who demanded to see the association's financial records, because the IA was unable to make its loan payments to the Land Bank. The Land Bank appropriated IA funds of P600,000 and foreclosed on properties that, according to IA members, were worth at least P3 million. The membership voted the board of directors out of office (and ostracized them in the community), separated the IA from the co-op, and reorganized the IA under a new leadership. The IA is currently reorganizing and refers to its experience as "the sad history of the co-op." As mentioned by some members, "we should have enforced the yearly election of the board as mandated by the IA bylaws. We trusted them (the board) and did not demand to see accounts. The IA should not be converted into a co-op unless all members are willing and able to become shareholders in the co-op."8

Given this incident, NIA policy regarding the diversification of the IAs into other activities is one of gradually building up capital internally and undertaking lending and income-generating ventures using this capital. According to the manager of the IDD, "No IA should convert into a cooperative unless all its members are willing and capable of buying a share."

Impact of Land Tenure

During the course of this study, it was uniformly reported that the difficulty in collecting at least 50 percent of back accounts from farmers is because such payments are disputed by the farmer. This is directly linked to patterns of land tenure.9

In the irrigation systems in the Philippines there can be three types of cultivators: owners, lessees, and farmers of amortized lands. In District III of UPRIIS, from a total of 14,656 farms, the land tenure pattern is shown in table 5.12. The average size of landholding was given at 1.7 hectares. 11

Most nonpayments of irrigation service fees are attributed to disagreements over who should be responsible for the fees in the amortized lands when such payments are interrupted or stopped because the cultivator is unable to make payments. The high level of leasing (50 to 70 percent), where landowner and lessee may each deny responsibility for paying fees for certain years, compounds this problem. Land ownership itself may also change without NIA's awareness, and the new owner may disclaim any outstanding dues after the previous owner (notwithstanding the lien on the land) had sold the land. Finally, land fragmentation and intrafamilial conflicts may also result in the nonpayment of irrigation service fees.

^{8.} Another case of financial mismanagement in a pump system (Stage III) in this region resulted in an IA (covering 1,350 ha with 1,200 members) owing NIA the operations cost of pump. Such costs are advanced by NIA up to the maximum allowed at P800,000 and then repaid by the IA. At this point, NIA sent a letter of demand to the IA, and the members of the IA became aware that even though they had paid their share of the costs for operation (as well as amortization), the leaders had not remitted payments to NIA and had misappropriated its funds. This IA board too has been replaced. As reported by the regional irrigation manager, this IA has now paid the entire dry season bill of P278,964.30 and paid an advance of P400,00.00 for the upcoming season. However, a P6 million back account is still

^{9.} The Agricultural Land Reform Code, 1963, abolished share tenancy and established a system of leasehold until such time that lessees could become full owners. It stipulated that repayment for the lease should not amount to more than 25 percent of the average normal harvest in the three years immediately preceding the date of leasehold after deducting the costs of seed, harvesting, processing, and other related activities. Over time, lessees would become owner-cultivators. (Estrella 1969, p. 17).

^{10.} The size of landholding was given as 2.8 ha in 1975 and this current size indicates the extent of fragmentation. Other figures reported from different regions have varied from 1.5 ha to 0.5 ha. Although abolished under the Land Reform Act, there are some cases of share tenancy as well.

Table 5.12. Land Tenure Pattern in District III of UPRIIS (percent)

Cultivator	Tenure
Landowner	28
Lessee	29
Farmer of amortized land	43

Source: Author's research.

IA Contracts

PIM as implemented in the Philippines pioneered the strategy of contracts and incentives for IAs. It was based on the premise that a gradual transfer of responsibilities to IAs, backed up by a training program for them, would build their capacity to undertake complete responsibility for system operation and maintenance. However, in order for the contract mechanism to work smoothly, there must be a third-party arbiter and a set arbitration process to which both parties can appeal. This, in the current case, is absent. When terms of contracts are changed, as in 1987 when negotiated collection contracts were replaced by standardized ones, NIA was the party that unilaterally enforced these terms through its memorandum circular of 1990. NIA acted on behalf of the government of the Philippines, which was implementing the World Bank-financed Irrigation Operations Support Project I. However, the perception of the farmers was that it was an unfair change. Collection of irrigation service fees dropped with the implementation of standardized lower collection incentives introduced in 1987 and uniformly adopted by 1990.

The explanation for this debacle is linked to confusion in defining terms of the contracts. Thus the "collection" (or Stage II) contracts written before 1987 were incorrectly named, because they were not contracts given to IAs to collect irrigation service fees. They were really contracts recognizing the fact that the IAs were progressively undertaking greater O&M responsibilities and therefore were being compensated with a greater share of the fees. This incentive was generally ploughed back into system O&M, hitherto performed by NIA and now by the IA. Identifying these arrangements as collection contracts and making policy changes as if they were collection contracts have delayed the PIM program on its path toward system turnover.11

Training

Training is a key ingredient in the overall implementation of the PIM program. Training is critical to equip farmers and IA staff to carry out their new management functions. But training is also important to help NIA staff adjust to their new roles.

Associations. In the past IA training was focused on the leadership. As the IA bylaws stipulated annual election of leaders, the impact of this training was limited due to rapid turnover of leadership. The

^{11.} The reason for replacing the existing contracts was that the individually negotiated contracts were "too complicated." The change was also based on a policy emphasizing cost recovery through collection that, due to the mislabeled contract, overlooked the benefits of cost recovery through the IAs undertaking O&M. Furthermore, a closer examination of the terms of the collection and maintenance contracts reveals other problems, for example, tasks that are really in the realm of system operations are under both types of contracts. The IAs contracting under the post-1987 collection contracts were reluctant to take over these responsibilities that they perceived should be under the maintenance contract (O&M), while the IAs contracting under the latter type of contract felt that they were not being compensated for operations activities.

training given to IAs is of the classroom variety. Training fatigue also set in when, to cut costs, two or three training sessions are held in a single day. Perhaps due to limited resources and shortage of qualified personnel, not all IAs receive all types of training in the NIA repertory. This is particularly true of financial management training.

IAs that have gone beyond the initial water management activities and have formed cooperatives have often succumbed to misappropriated funds. Lack of accountability and transparency of activities is a primary culprit here. However, lack of know-how in bookkeeping and money management may constitute other reasons for this outcome. Some IAs with contracts have reported spending income derived from contract work "on fiestas." If capital buildup is the path to the IA viability, then providing relevant financial management training becomes critical. Simplified financial management training was given to IA leaders in some schemes in preparation for joint management. This training included single-entry bookkeeping, strategies and procedures for collecting service fees, preparation of annual budgets, internal auditing methods, and preparation of simple financial reports (Bagadion 1994, p. 10). The lack of adequate funding to carry out such training on a nationwide basis rather than lack of expertise is the reason for the sporadic training given to the IAs in this respect.

IRRIGATION SUPERINTENDENTS. Irrigation superintendents as civil engineers are called on to be managers capable of motivating their staff and the IA to jointly bring the irrigation system to maximum productivity. Also, the implementation of the agricultural program for the system requires that they secure the cooperation of related agencies. Training programs to reorient the technical staff, currently implemented on a pilot basis, will need to be expanded and implemented systematically nationwide.

Monitoring and Evaluation of NIA O&M Staff

Current performance evaluation systems of NIA field staff do not sufficiently emphasize IA development as a component for promotions or salary increases. Following a point system, a watermaster, for example, is given a maximum of 42 points for operations, 25 for maintenance, 25 for fee collection, and the remaining 8 for farmer organization and administration.

Building the capacity of IAs depends on the interest of individuals. This is particularly critical, because PIM through contracts is implemented jointly by IA and NIA system staff in overlapping roles and responsibilities. Then, there must be sufficient incentive for NIA staff to train IAs to take over these shared roles, which would make NIA's role redundant.

Status of NIA as a Public Corporation

The status of NIA as a public corporation clearly gives it a number of mandates difficult to fulfill simultaneously. First, it is one government agency, albeit a major one, managing the diversified control of water, in this case by undertaking integrated irrigation development on behalf of the state. Second, for this purpose, substantial government funds were invested, the goals of which were to increase agricultural production, and in particular, to achieve self-sufficiency in rice. Third, it was anticipated that this, in turn, would lead to rural development and the financial uplift of the farming population, which would then enable the latter to comply with their obligations and responsibilities, such as paying service fees and undertaking O&M of systems. The irrigators may be perceived as clients in some contexts, but concern for their welfare overrides their status as dues-paying customers, hence the change from the original intention to recover all costs to a policy of recovering only O&M costs from farmers.

^{12.} A plan to inaugurate a national water summit bringing together some 32 water agencies under the auspices of President Ramos and the appointment of a water czar to coordinate the activities of these agencies was reported (Mejia, personal communication) in October 1996.

Because irrigation service fee collections are insufficient to meet O&M expenses, NIA must rely on its other income sources such as management fees and equipment rental to cover part of its O&M budget. The shortage of government funds and the inability of NIA to access its resources in a timely manner tend to delay programs that encourage farmer participation, for example, the IA organization before rehabilitation or construction, which is often carried out under government counterpart funding. These problems also delay the payment of incentives and bonuses to IAs, undermining the irrigators' faith in the program.

Finally, the lack of funds to give a "golden handshake" to ditchtenders and watermasters means that NIA must keep such personnel on the payroll even when an IA is willing to take over more responsibilities in managing the irrigation system.

Recommendations

PIM in the Philippines in government-constructed national irrigation systems is implemented through IAs. The strategy for its implementation was transferred from the original design for communal irrigation systems based on multistranded preexisting social patterns to a model of formal organization for IAs. This strategy works best in situations where the social and hydrological units are coterminous and where the social unit is homogeneous and small. Fifty-hectare systems work best; systems should perhaps be no more than 200 hectares. Strong leadership and the ability to mobilize social groups to undertake construction, operation and maintenance, and conflict management are factors leading to success in communal systems. Thus, the IA selected by NIA as the outstanding IA in 1996 has a total of 500 hectares of service area and 171 members.¹³ It comprises one village and one ethnic group. This is not a typical profile of the IA in the national irrigation systems. In more typical cases, the average landholding size would be closer to one hectare, and there would be greater ethnic heterogeneity.

In transferring this social design to the larger national irrigation systems, it was assumed that it would work best in smaller units over a long period of nurturing. This entailed a long-term capacity building of IAs, primarily through training, for self-management. However, the technical program and the institution-building programs have generally been out of step: in the original blueprint the institution-building program was to begin first and precede the technical program. During the period under evaluation, this schedule was hardly ever implemented because of shortage of or the late arrival of funds for institutional development.

Moreover, as joint management rather than complete system turnover was the goal of the national program, it needed a strong monitoring system for evaluating the performance of the NIA staff, particularly at the system level, in building IA capacity. While the Institutional Development Division has recently begun monitoring the progress of the institutional capacity of the IAs, there is no clear responsibility and accountability placed on the irrigation superintendent. Thus, the technical and institutional development programs are not adequately integrated for successful PIM.

The strategy of PIM adopted in the Philippines for its national irrigation systems is at an impasse today because of this direct transfer of the communal PIM model without taking into account the social, technical, and managerial requirements of national systems. A new strategy for organizing and developing IAs is needed. Such a strategy should consider the conditions already in place to respond to the weaknesses in the current program.

Toward a Socially Based Strategy

The barangay, also known as the barrio, is the traditional Filipino village. Typically settled by ethnically homogenous populations as well as groups of related people, it is today the smallest local government unit in the Philippines. Under the Local Government Code, 1991, its financial as well as power base

^{13.} The selection is based on the same or similar criteria used for evaluating IA functionality.

have been strengthened. Twenty percent of taxes collected by the Philippines Internal Revenue Department is returned to the *barangay*. The *barangay* has also benefited from the Countrywide Development Fund allocated to congressmen and senators as well as the program known as "Clean and Green" inaugurated by Madame Ramos, the wife of the Philippine president.

An irrigation system superimposed on legal and social units may cut across a number of boundaries. It may be located in one province (occasionally more than one), cover wholly or in part one or more municipalities (in the 19 systems scheduled for turnover, the number of municipalities involved ranges from one to five), and a number of *barangays*.

Unlike the province or municipality, the *barangay* is both a legal and social unit. As reported by one regional irrigation manager, "The *barangay* captain (leader) is responsible for the *barangay* and IA members are part of this responsibility. I tell people that the *barangay* is the third leg of a three-legged stool. Without this third leg (NIA and the IA are the other two), it will be a wobbly stool." Two irrigation superintendents reported that when a farmer brings a grievance to them they typically ask the individual to go first to the IA, then the *barangay*, and only then to NIA.

Taking the Balanac irrigation system as an example, the 1,040 hectares actually covered by the system is within the jurisdiction and territory of 17 *barangays*. Andanan system, covering a design area of 5,500 hectares, lies within 16 *barangays*. Even a tertiary canal may cut across two or more *barangays*.

Currently the links between the *barangay* and NIA and the IAs are largely informal and based on reciprocity. Thus, in return for cooperating with an IA, the latter may agree to share a percentage of its remuneration from irrigation service fee collection; or NIA may offer the use of vehicles to transport gravel and other supplies during road construction in a *barangay*. Cooperation of the *barangay* is officially sealed in meetings convened to implement the cultivation schedule and the O&M plan for the system under *barangay* ordinance.

In the context of implementing PIM through the IA, the *barangay* represents social capital. Within its boundaries, farmers relate to one another and to the IA leaders, particularly at the level of tertiary units in a multifaceted relationship based on ethnicity, kinship, and neighborhood ties. This multifaceted relationship can then be used in the service of irrigated agriculture.

Recommendations

The tertiary level of current IAs is an arbitrary unit from the social perspective. It may work better as a less formal unit, loosely linked to the *barangay*.

The focus of IA attention should be on secondary and system levels, which are currently organized as federations of the IAs, and training emphasis for IA leaders should be placed on system management, financial management, and leadership skills.

A new strategy for PIM in the national irrigation systems of the Philippines should be built on this social base. Instead of creating the IA as a social unit as done currently, the new strategy should build the IA on the existing social unit. The legal structure of the IA with reference to water rights, water wholesaling, and securing payments needs to be reviewed to rationalize the notion of shared management. The terms and conditions of IA contracts need to be streamlined and enforced. NIA must relinquish authority and control to the IA in order to gain compliance with contracts. Then, the IA at the secondary system can function as part of the village community without its authority being usurped by the politicians of the barangay, as is feared by some. IAs are recognized for their social and community activism during fiestas

^{14.} The concept of shared management is somewhat ambiguous. While in many cases it connotes the simultaneous involvement of NIA and the IA in sometimes overlapping activities, NIA uses this term to refer to the systems turned over to the IAs, where NIA may have control over the reservoir, the diversion structure, and perhaps the first 1.3 kilometers of main canal. It also uses the term to cover irrigation systems completely turned over to the IAs in which NIA has oversight, training and emergency assistance responsibilities.

and similar events. Successful networking between them and other community associations as well as the *quid pro quo* relationships between them will decentralize the implementation of the cultivation program as NIA itself has decentralized its own operations. Good management is, after all, a set of social technologies (Esman 1991).

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A Synthesis of Benefits and Second-Generation Problems

Mark Svendsen, Jose Trava, and Sam H. Johnson III

Editor's note

This chapter presents the major outcomes of the International Workshop on Participatory Irrigation Management: Benefits and Second-Generation Problems sponsored by the World Bank Institute (WBI) and the International Irrigation Management Institute (IIMI). The workshop was held in Cali, Colombia, in February 1997 on the campus of the Centro Internacional de Agricultura Tropical (CIAT) and attended by more than 35 irrigation professionals experienced in various aspects of participatory irrigation management. A field trip was made to discuss benefits and second-generation problems in the Roldanillo-La Unión-Toro Irrigation District in the Cauca Valley.

The workshop was based on a set of eight case studies, five of which (Argentina, Colombia, Mexico, the Philippines, and Turkey) were of countries currently shifting management responsibility from national or state governments to local organizations. The other three cases (Italy, Japan, and Taiwan, China) were of more developed economies with considerable experience in this form of irrigation system management and could thus serve as practical examples to countries now implementing irrigation management transfer programs. Their experience can provide early warning of changes and problems that might occur in this transfer of responsibility.

This chapter synthesizes lessons from the case studies presented in the workshop, captures ideas expressed during workshop discussions, and documents the conclusions reached during small group and plenary sessions. The authors base their discussion on these sources but also draw on their own thinking and experience in fleshing out concepts and ideas.

Introduction

Participation in irrigation management by water users can take a wide variety of forms. Farmers can be involved in various system management functions, including planning, design, operations, maintenance, rehabilitation, resource mobilization, and conflict resolution. Moreover, they can be involved in these functions at various system levels, from the field channel to the entire system.

Almost all irrigation systems have some involvement by water users in system management. When people speak of introducing participatory irrigation management (PIM), they are usually referring to a change in the level, mode, or intensity of user participation that would increase farmer responsibility and authority in management processes.

Irrigation management transfer (IMT) is a more specialized term that refers to a process of shifting basic irrigation management functions from a public agency to a private sector entity, a nongovernmental organization (NGO), a local government, or a local organization with farmers at its base. The most common form of IMT moves management responsibility from a centralized government irrigation agency to a financially autonomous local nonprofit organization in which water users have a substantial voice in the control process or control the irrigation system altogether.

^{1.} Although nonfarmers may be users of water from an irrigation system (a rural industrial plant, for example), it is assumed here that water users are farmers practicing irrigated agriculture.

The changes in management reported in the five primary case studies on which this chapter is based can all be considered forms of the IMT. However, there is an important difference between the organizational form of the recipient organization employed in the Philippines as compared with the form employed in the other four cases (Argentina, Colombia, Mexico, and Turkey). In the Philippines, the primary management unit employed is community based and results from an intensive grassroots organizational campaign involving hired community organizers. This primary management unit is fairly small (less than 100 hectares) and relies primarily on voluntary labor in carrying out its functions. The most important relationships among members of the unit are social. In the other four cases, the organizational form of the irrigation systems can be termed an irrigation district (ID). Irrigation districts are typically larger (several thousand hectares), rely principally on paid employees to perform its functions, and link farmer-members together mainly through ties of economic self-interest. This and other key features of the five primary cases are shown in table 6.1.

Issues are analyzed in this chapter using a set of three basic categories: the processes used to introduce programs of the IMT, the initial effects of an IMT program, and second-generation problems and possible solutions. The remainder of the chapter is structured around these three categories.

The term second-generation requires some explanation. Transferring substantial management authority to a locally based organization is a complicated undertaking. It may involve changes in national policy, regulations, and organizational structures; creation of new organizations at the local level; transference of equipment ownership; and changes in personnel, in addition to the shifting of management functions to the new managers. Any undertaking this complex, in addition to solving problems, will almost certainly create new problems that did not exist before or were not previously evident. An example might be inadequate technical capability of new irrigation field personnel. These problems are here termed second-generation problems. In addition, there may be situations, such as low agricultural productivity, that were present before the transfer but that were not acute problems when irrigation fees were low or nonexistent. For our purposes, these are also included in the category of second-generation problems. Some second-generation problems may be a result of faulty processes used to introduce the new management system. Some may be a result of conscious choices during implementation to defer consideration of certain potential problems in the interests of accelerating program coverage. Others may be virtually unavoidable, although the ability to anticipate major problems in advance should allow corrective measures to be put into place earlier than would be otherwise possible.

In this chapter problems are analyzed from several different perspectives: that of the water user, the irrigation association, the irrigation agency, and the government. In terms of these perspectives, a change, such as increased irrigation service fees, may constitute a problem for water users, but a benefit for the irrigation association and perhaps the government, if it reduces government subsidies.

The term impacts also requires some explanation. In general, impacts can be either positive or negative. When they are positive, they are benefits, or positive benefits. When they are negative, they are similar to what are called second-generation problems here. In the chapter, negative impacts will be noted in the discussion of impacts but will be discussed in more detail in the following section on second-generation problems.

Process of Introducing New Forms of PIM

Considering the case studies as well as PIM programs in other countries, key background conditions leading to the turnover process include:

- National budgetary crisis
- Top-level political will to place irrigated agriculture on a sound economic footing
- Progressive deterioration of irrigation infrastructure due to deferred maintenance.

^{2.} This distinction is similar to the one drawn by Ruth Meinzen-Dick of IFPRI and Ashok Subramanian of the World Bank between Asian and U.S. models.

 Table 6.1.
 Features of PIM Case Studies

Feature	Argentina	Colombia	Mexico	Philippines	Turkey
Type of first-level management unit	District	District	District	Community based	District
Beginning year of program	1984	1976	1989	1976ª, 1980 ^b	1993
Implementing agency	DGI	INAT and IAs	CNA	NIA	DSI
Special law on transfer	No	No	Yes (1992/1994)	Yes (1974)	No
Total area of government irrigation systems	360,000	315,125	3,300,000	652,000	1,467,000
Share of area covered by program (percent)	100 (1997)	64 (1996)	90 (1997)	90	61 (1995)
Number of levels of local management:	3	1	2	2	1
Average size of first level local management unit (ha)	3,000	12,500	7,900	40	6,500
Average size of second level local management unit (ha)	20,000	_	107,000	275	
Average size of third level local management unit (ha)	90,000	_		_	
Number of staff per 100 ha (IA)	0.19	0.8	0.2	1.8 (vol), 1.1 (paid)	n.a.
Average irrigation service fee (\$/ha/yr)	70 (1997)	52 (1996)	40 (1996)	77 (1997)	25 (1995)
Fee base	Area	Area/crop ^c	Area/crop	Area/crop/source	Area/crop
Share of fee assessment recovery (percent)	70 ^d (1997)	76 (1996)	92 (1997)	58 (1995)	+72 (1995)
Share of O&M cost supported by fee income (percent)	12 (1997)	52 (1996)	85% (1997)	46 (1995)	Most
Facilities ownership	Government	Government	Government	Government	Government
Maintenance equipment transferred to IA	Yes	Yes	Yes	No	No
Transition phase of shared responsibility	Yes	No	Yes	Yes	Yes
National Association of IAs	No	Yes	Yes	No	No
Farmers can refuse transfer	No	No	Yes	Yes	No

[—] Not available.

n.a. Not applicable.
a. Communal irrigation systems.
b. National irrigation systems.
c. Fixed plus volumetric fee schedule in pump schemes.
d. Recovered by DGI.

Source: Authors.

Only in one case of those reported at the workshop (Colombia) did the farmers themselves initiate the process. At the irrigation systems level, another set of conditions that must be taken into consideration include:

- Physical condition of hydraulic network
- The country social, political, and economic conditions
- · Water availability.

Political will at the highest level of the government was a main component in Mexico's IMT program. In 1989, with a new administration in office, comprehensive water management was recognized as a top priority issue. The National Water Commission (CNA) was created and a national policy on privatization took off. In Colombia it was the National Planning Department who in 1991 submitted the Land Reclamation Program 1991–2000. In Turkey, a budgetary crisis that led to a squeeze on financial allocations to the state water resources agency (DSI) provided the initial impetus. In Argentina, a program to modernize the entire economy, which began in 1990 with the privatization of large electricity utilities, led to the turnover of water management to the provinces. In the Philippines, the National Irrigation Administration (NIA) embarked on an ambitious program in 1974 to increase rice production. A provision of this policy was for subsidies for the operation and maintenance (O&M) of systems to be gradually phased out over a five-year period at which time NIA would depend directly on collections from farmers for its O&M expenses.

The hydraulic infrastructure should be in fair condition, and an affordable and reliable water supply should be available most of the time. Being in fair condition means the hydraulic infrastructure can deliver water to farms in sufficient amounts to satisfy crop needs and in a timely manner. Surface drainage of surplus water and salinity should not be limiting factors. If these basic conditions are not satisfied, then a rehabilitation plan should be considered.

In Mexico, although the irrigation districts had suffered considerable deferred maintenance, the IMT program took off quickly, because all of the systems were performing satisfactorily at the outset—with water conveyance efficiencies at main and secondary canal levels on the order of 60 percent.

The readiness of users to assume management responsibilities has to do with political and social factors. For example, it seems clear water users from Saldaña and Coello in Colombia were ready in 1976 when they asked their government to turn over the administration of their districts to them. Due to its political background and social context, it is apparent that Argentinean farmers were also ready for the change. In Turkey, farmers were used to a traditionally strong central government, and many, especially the early adopters, were market-oriented producers. This made them somewhat receptive to government declarations of the necessity of the transfer of managerial and financial responsibility.

In most districts of Mexico, however, this was not the case. In the first place there was the land tenure issue. After the 1910 revolution, land was divided between two types of small farmers, *ejidatarios*, who worked small plots of land held communally, and small landowners, some of whom belonged to the *hacendados* or landlords' elite. Second, there were numerous outspoken *ejido* leaders who, when consulted about the coming change, voted against it, suspecting that the change would reduce their present status. Active promotion of the IMT in Mexico was vital in order to overcome these obstacles.

National Policies

National policies for IMT implementation vary both in regard to objectives and scope. Under the Philippines Water Code of 1976, the appropriation of waters by an irrigation association has priority over requests of individuals. The government then helped farmers organize themselves into irrigation associations that enter into various types of contracts with NIA to handle O&M of the system.

In Turkey the DSI is the main executive agency of the government for the country's overall water resources planning, execution, and operation. It was established in 1954 and is part of the Ministry of Energy and Natural Resources. Since the early 1960s, the DSI has had a program to transfer O&M responsibility for secondary and tertiary distribution networks to irrigation associations (IAs). Under the program the IAs

entered into contracts with the DSI to take administrative responsibility for tasks such as collecting and submitting farmer water demand application forms to the DSI, managing water distribution below the secondary canal, and cleaning and minor repair of canals and other small hydraulic structures. Although existing municipality law appears to be providing a workable initial basis for the formation of the IAs, their further development and evolution may require a law specifically for the IAs.

Argentina is a federal entity divided into 23 provinces, which are autonomous in all aspects related to water (rights, granting, duration, taxation, and so on). IMT programs began in 1990 as a response to pressure from the national government to reduce bureaucracy and render public administration more efficient.

In Mexico the 1989 presidential decree that created the CNA also granted the agency the responsibility to define the country's water policies and allocate water to users through licenses and permits. The new policy created autonomous and self-financing water utilities to provide water services in cities and in irrigation districts, encouraged water reuse and water quality conservation, and promoted a new water culture based on the efficient use of the resource.

In Colombia the policy of the IMT is part of a larger shift in agricultural policy toward minimizing state subsidies and regulation. However, the state continues to play a major role in land reclamation and in rehabilitation and expansion of irrigation areas.

IRRIGATION SERVICE FEES. In Mexico, the IMT program was part of a series of changes in the economy including reductions in subsidies for agricultural credit and inputs, elimination of guaranteed support prices for the major agricultural crops, and increases in energy and fuel prices. Transfer of O&M responsibility for the irrigation districts, leading to users paying the real cost of irrigation water, was seen as just another step in the liberalization of the economy.

In a similar fashion, in the Philippines, a 1974 presidential decree authorized NIA to delegate partial or full management of irrigation systems to duly organized associations. Under this decree, NIA was allowed to keep all irrigation service fees, with government subsidies for O&M expenses to be gradually phased out over five years. Thus, at the end of this period NIA was to depend directly on irrigation service fee (ISF) collections from farmers for O&M expenses.

The financial aspects of the IMT in Turkey are similar to Mexico in that the policy is designed to shift the burden of O&M costs from the government to the users. However, the government continues to subsidize maintenance, which is not the case in Mexico and the Philippines. Colombia has also shifted the financial burden of O&M to the users, while irrigation schemes in Argentina are under joint management with fee collection by both the government and the IAs.

WATER LAWS. National water laws that clearly specify the rights of the IAs and the individual users appear to be an important factor in successful management transfer. Without such rights, the IAs are extremely vulnerable to increased demands from other more powerful users, such as industry and municipalities.

Beginning in 1976, the Philippines attempted to develop a water rights register of all water rights in the country, including specifying in volumetric form the water rights of the national and communal irrigation systems. As part of the registration process all IAs must register their water rights. Once legally registered, water rights cannot be withdrawn except for failure to use them as stipulated in the law.

This system can be contrasted to that of Mexico. Here the IAs are given a limited concession to use the irrigation infrastructure and the associated water supply but do not have a clearly specified legal right to a volumetric supply. With the domestic supply given priority, the IAs are not ensured a constant water supply over time. The concessions are also for a fixed time frame (20 to 30 years) after which they can theoretically be reassigned to another user. Because none of the concessions have expired to date, it is unclear exactly what process will be used to grant a second concession.

The country where IAs appear to be most vulnerable to changing water demands is Turkey, where water is controlled by the DSI, and the individual associations have no water rights. This system works in areas where there is little competition for water but leaves the associations extremely vulnerable in areas

where municipal and industrial use is expanding rapidly. Colombia is somewhere in between these two situations but still is highly dependent upon the national irrigation agency, because the country has yet to establish a legal water rights system.

The Mode of Implementing PIM

The process of changing to a more participatory management system varies widely from the bottom-up approach used in the Philippines to the more top-down approach used in Turkey and Mexico.

In promoting the PIM process, Colombia invested much less time and effort than the other countries. As a consequence, the process of transfer was quick, but there have been second-generation problems. Users were less well informed and have been uncertain about their rights with respect to ownership and changes in management practices. As a number of the irrigation systems in Colombia are based on river pumping, some of the more recent cases of transfer have involved additional negotiations with respect to energy subsidies.

Argentina used information meetings and word of mouth to transition rapidly to PIM, while Mexico and Turkey used more structured informational meetings with users. These two countries also invested heavily in training their own staff. In Mexico, audiovisual materials prepared by the Mexican Institute of Water Technology (IMTA) and outside firms were used to persuade users that the IMT was a positive change.

The Philippines has used the slowest process with intensive use of institutional development officers and farmer organizers (FOs) to serve as catalysts. These organizers lived in the villages and organized exchanges between NIA and the users. However, NIA realized that too much dependence upon FOs slowed the process and has now reduced significantly the number of FOs.

In terms of transferring responsibility, most of the Colombian IAs appear to have had very little say in the process. However, this has changed somewhat, because more recently the IAs have been negotiating energy subsidies and insisting upon rehabilitation before transfer. In the Philippines there has been more dialogue through the organizers but, given that only limited transfer of responsibility has taken place, this approach has not achieved rapid transfer of responsibility to the users. In contrast, both in Turkey and in Mexico there have been very active negotiations concerning transfer terms. As a result the IAs have been able to exert some power and develop a partnership with the agency based on a meeting of equals. In a number of cases they have also been able to ensure that critical investments were made before transfer.

As a key stage of the transfer process, Colombia, Mexico, and Turkey adopted a phase of shared management between the agency and the IAs during the transition. The duration of this shared management varies by country and by district but is usually between 6 and 12 months. In contrast, in Argentina the systems were transferred much more quickly, while in the Philippines the shift in responsibility has been very gradual, in some cases over a period of many years.

Type and Nature of IAs

The type and nature of the IAs are directly related to the structure of the economy as well as the type of irrigation found in the countries. In Argentina, Colombia, Japan, Mexico, Taiwan(China), and Turkey, the IAs are larger (2,000 to 50,000 hectares) and are organized more along the lines of commercial entities, reflecting the more commercial nature of the irrigated sector. Agriculture is developed on a cash basis, and many of the staff are hired professionals paid in cash from the ISF. Given their large size, the IAs can afford to purchase and maintain their own transport and maintenance equipment.

In contrast, the IAs in the Philippines are small (100 to 300 hectares) and are often organized based on the village structure. Most of the labor is voluntary labor provided by the users, and very few, if any, of the irrigation staff are hired professionals. Given the small size of the IAs, there are diseconomies of scale, and hence the organizations cannot afford to own specialized maintenance equipment. In the Philippines, irrigation service fees are usually paid in grain. Fees therefore are awkward to store and transport and typically result in 10 to 15 percent losses due to damage during storage and transport.

In Argentina, the IAs are public nongovernmental organizations with full legal authority, including the power to tax. The IAs in the other countries have a limited power to establish and collect ISFs but do not have local taxation powers; therefore the majority of their income is from ISFs.

Impacts and Benefits of Transfer

Implementing a program of management transfer is a complicated undertaking that involves incurring costs and affects the lives and livelihoods of many people. It is thus not desirable to enter into such a program unless the benefits of the changes are positive and significant. Impacts, of course, may be either positive or negative, and they can be either qualitative or quantitative. And because the change in management patterns will usually occur simultaneously with other changes in physical, economic, and social conditions, it may be difficult to separate the effects caused by management changes from those caused by other factors.

As a starting point, a number of potential positive and negative impacts of a program of IMT are shown in table 6.2. Generally only some of these will be present in a given case. Note that some impacts are shown in both positive and negative columns, indicating that an overall evaluation is far from simple.

The nature of the impacts that occur will be shaped by the social, political, and economic characteristics of the countries involved. Impacts are also conditioned by the perspective from which they are viewed. Important perspectives in this case include those of water users, the associations they have already created, the irrigation agency, and the national or state government under whose overall control these systems operate. What is positive from one perspective might be negative from another. Judgment is thus required in evaluating the overall impact of a program and the tradeoffs in positive and negative benefits among the various groups affected.

The following sections discuss impacts in terms of legal and organizational factors and operational procedures.

Table 6.2. Potential Impacts of the IMT

Positive impacts	Negative impacts	
Farmer perspective		
Sense of ownership	Higher costs	
Increased transparency of processes	More time and effort required to manage	
Greater accessibility to system personnel	Less disaster assistance	
Improved maintenance	No assured rehabilitation assistance	
Improved irrigation service	Less secure water right	
Reduced conflicts among users	Decreased agricultural productivity	
Increased agricultural productivity	,	
Government perspective		
Reduced costs to government	Less direct control over cropping patterns	
Greater farmer satisfaction	Need to reduce staff levels, sometimes over union	
Reduced civil service staffing levels	opposition	
Reduced costs to the economy	Reduced ability to implement new agricultural policies	
(greater economic efficiency)	through the irrigation agency	
Irrigation agency perspective		
Fewer conflicts to deal with	Reduced bureaucratic and political influence	
Reduced operational involvement	Uncertainty over agency role	
New responsibilities	Reduced opportunity for rent seeking	
Reduced opportunity for rent seeking	Reduced control over water resources	
Reduced political interference		
Reduced O&M staff levels		

Source: Authors.

Legal and Organizational Impacts

Some of the countries first build a new national water law before moving into a transfer program (Colombia, Mexico, and the Philippines). Others move into transfer supported only by old national laws (Turkey) or local laws (Argentina). There has been considerable discussion on the issue of water rights from the perspective of ownership versus concession. In most of the countries, all water belongs to the governments, either at federal or provincial levels. Irrigation districts were usually created based on constitutional mandates that clearly defined the system's physical limits and thus the water right implicit to it. In some countries such as Argentina, however, the right of individual appropriation takes legal precedence.

After turnover, IAs in some countries receive the concessions that give them access to collective water rights. This does not change the existing system of water rights and priorities. In other countries, systems of water rights allocation and protection are virtually nonexistent, which can lead to serious second-generation problems. In most of the case study countries, agricultural uses are subordinate to municipal uses, which include domestic and industrial use (see table 6.2).

Sense of Ownership. The formation of IAs generally creates a stronger sense of ownership of the system on the part of users. This has been the case in Argentina, Colombia, Japan, and the Philippines for many years. In Mexico and Turkey this change has taken place more recently and has been an exhilarating source of pride for some users, even though legal ownership of system facilities remains with the government. In Colombia some consideration is being given to transferring actual facilities ownership to IAs, an idea supported by some National Land Development Institute (INAT) staff and IA officers. This idea has also been discussed in the Philippines. There are a number of problems with this step, including loss of the right of eminent domain. Such a move may also weaken an IA's claim on public assistance for rehabilitation and emergency repairs.

A sense of ownership is also enhanced, because users now have a greater voice in selecting the governance of their system, normally by electing boards of directors through the IA general assembly. With leaders elected in a democratic manner, needs can be expressed more readily. The opposite situation is presently occurring in Taiwan, China, where the users are turning systems back to the government. This is a result of the declining importance of agriculture in the Taiwanese economy and the high costs of system O&M that cannot be sustained by many IAs.

Transparency. All of the countries report that their transferred irrigation districts are now managed with more transparency, meaning that major decisions are exposed to the association's members or their representatives through board of directors' and general assembly meetings. In Mexico, a representative assembly, formed by delegates selected by the general assembly, makes routine decisions without summoning the general assembly, which may be composed of hundreds or thousands of users. In Turkey a similar body made up of 30 to 70 local government officials and farmers also serves as a general assembly.

Transparency may be even more important in financial accounting than in organizational politics. Before transfer, the government collected fees and was generally supposed to invest the fees back into the system where they had been collected. However, due to bureaucratic procedures, collected fees were not necessarily applied in the same systems where they originated. This resulted in complaints by users, and the agency was seldom forthcoming with information on financial accounts relative to particular systems. With associations collecting and managing funds, and with money accounted for on the basis of the unit managed by the IA, users better understand how their money is being used. However, strict supervision and auditing of water fee collection and expenditures by an outside party are still necessary to counter the possibility of money being diverted for unauthorized purposes.

Where the transferred units do not include an entire hydrologic unit, it may be more difficult for users to see how the fees collected from them are allocated because of the subdivision of responsibilities among a number of IAs. In this case, accounts should identify the portion of fee collections that are earmarked for O&M within the IA unit and the portion allocated to higher level O&M. An alternative

might be for the IAs to merge into a larger unit. However, a number of other factors must be considered before taking such a step.

WATER FEES INCREASE. Usually one of the immediate effects of the IMT is an increase in water fees at the irrigation district level. In some countries the increase can be dramatic, on the order of 100 to 200 percent or greater (Mexico, Turkey). However to be valid, fee rates must be put in constant value terms before being compared. Irrigation service costs are generally considered appropriate if they constitute 5 to 8 percent of total production costs. Even after transfer, they tend to fall into this range in most countries. In the case of small holding sizes and lower value crops, however, the gross margin retained by farm households is also a relevant factor. Where this is already small, a doubling or tripling of the ISF can create hardships for small farmers and their households.

A proposed increment in the ISF may also have a negative psychological impact on water users who have come to expect a heavily subsidized irrigation service. This kind of attitude may be gradually changed with promotion activities before transfer takes place and, of course, with efficient financial management and better service once the association is formed.

As can be seen in table 6.1, ISF collection rates are above 50 percent in all five countries currently implementing IMT activities and are above 70 percent in four of the five. However, in looking at the share of O&M costs covered by ISF collections, the picture is a bit different. For example, before transfer in Mexico, the ISF collection rate was around 100 percent, but this amount covered only 25 percent of O&M costs. After transfer, the ISF collection rate is still 100 percent in transferred districts, but fees now cover close to 90 percent of O&M expenses. In order for transfer schemes to be financially self-reliant, they must achieve high rates of fee collection as well as have an ISF that covers O&M costs.

Substities. From the government's perspective, an increase in O&M cost recovery normally means a reduction of subsidies. By subsidy we mean here any kind of costs associated with the provision of irrigation services that the farmers should be paying instead of the government. Expenditures within an irrigation district (ID) are usually related to:

- O&M costs plus overhead
- Acquisition of premises
- Purchasing machinery and equipment
- Rehabilitation and modernization
- Technical assistance and training
- Emergencies.

O&M plus overhead constitute expenses related to the daily administration of the system from the headworks down through the tertiaries. These expenses have to be paid in full, either by the government, the users, or a combination of both, if a system is to be sustainable. The sharing of costs between the government and the IAs ranges from 40/60 to nearly 0/100, as is the case with Mexico.

Acquisition of premises refers to the land and buildings IAs use as they provide service to farmers. In Mexico, the CNA initially provided premises to the IAs as part of the concessions. However, after six years of turnover, some associations have purchased their own offices, to which they often refer with pride.

Providing machinery and equipment to the IAs has been a key component of transfer programs in Colombia and Mexico. In other countries, such as the Philippines and Turkey, machines are still under the control of the irrigation agency. In Mexico, equipment provision was heavily subsidized by the government to encourage farmers to participate in the IMT program. Many of the machines given in concession to the IAs were old, and the government had to subsidize repairs. Other machines were purchased under a World Bank loan. As reduction of maintenance costs was of concern to both government and users, emphasis was put on the purchase of light machines to replace the heavy construction equipment that traditionally was used in the ID by the CNA.

Rehabilitation and modernization of hydraulic infrastructure are also key issues for all countries involved in IMT programs. Although farmers usually ask for investments of this kind to be made before turnover takes place, governments are often unwilling to supply the necessary resources to fulfill these requests. Turkey is an exception to this rule, where rehabilitation was not an integral part of the IMT program. In some cases, countries use international loan funds for this purpose, enabling the government to negotiate with farmers the amount of needed investment and the financial share that users will need to contribute. Costs are often shared between the government and the IAs on a 50/50 basis (for example, Mexico).

Support for technical assistance and training may also be subsidized through the IMT programs. In Mexico, technical training for both IA and government irrigation district staff has been provided by the CNA with assistance from the IMTA. More recently, starting in 1995, some IAs have signed private agreements with the IMTA in which technical assistance is being provided on specific projects with a limited subsidy from the CNA. In the Philippines, promotional and technical support to farmers is regularly provided by the government through various types of community organizers. In Turkey, extensive training for agency field staff and farmer leaders was provided by the irrigation agency. Yet, in all countries the training needs for PIM programs by far exceeds current investments in training.

Subsidies are also normally available in the case of emergency situations. Although little specific information on this is available, all of the countries recognize the need of governmental intervention when such cases do arise, for example, hurricanes in Mexico or typhoons in the Philippines. Water scarcity also creates emergency situations for transferred IDs. For example, during the 1995–96 irrigation season, an extraordinary drought took place in northern Mexico. Due to the lack of water, the IAs did not have water to deliver to farmers; consequently, collection of fees dropped nearly to zero. For many of the IAs, the government had to step in with 100 percent subsidy programs to avoid a collapse of the associations. A few IAs that were only partially affected by the drought tackled the problem by hastily imposing a compensation fee on their farmers to implement a water reuse program.

Impacts on Operational Procedures

It is expected that a shift to participatory local management will improve the effectiveness and efficiency of water delivery as well as the quality of maintenance. The case studies provided some details to document these impacts, but better information about the operational impacts of the IMT is still needed.

IMPROVED MAINTENANCE PROGRAMS. One of the immediate consequences of the IMT programs is that irrigation systems have improved maintenance programs. (Colombia, as recently reported, seems to be an exception.) A recent study carried out in 1994 in Mexico by the Colegio de Posgraduados reported that 84 percent of the sample users believed maintenance had improved substantially since the IAs have been in charge of O&M. In some areas not only have the IAs completely eliminated the problem of deferred maintenance, but also are now putting surplus money from O&M activities into programs for the modernization of hydraulic infrastructure.

IMPROVED SERVICES. Although few studies specifically on the quality of services after the IMT exist, the general impression is that, after turnover, services have substantially improved in regard to timeliness, reliability, and equity of water distribution. There are many reasons to believe this. In the first place, after turnover, users usually have better access to the irrigation service provider. Compared to the earlier relationship with the agency, the farmer-association relationship is much better in terms of distance, personal contact, and feedback on complaints. Water conflicts among farmers also tend to be minimized, because farmers usually search for solutions to their problems at the IA level that is physically closer to them. There is also a degree of self-control prevalent, because the users know each other very well and are therefore able to regulate behavior among themselves.

In a 1994 study of IAs in Mexico, 84 percent of the users indicated that water distribution had improved since turnover, 79 percent said they were receiving enough water, 79 percent were also receiving water in

time, and 64 percent indicated water was being allocated in the appropriate amount. However, water conflicts do arise between the IDs and the IAs, especially when water is scarce. Recent lessons from the Mexican drought indicate that, under extreme competition for water, the IAs were overwhelmed by operational problems. This required prompt government intervention to keep the conflicts from getting out of control and becoming an explosive political issue.

AGENCY REORGANIZATION. IMT programs can have a significant impact on agency organization. A sharp reduction in field personnel and O&M staff usually takes place. A change in the role of the agency with regard to water management in the systems also follows.

Once the government's employees perceive the possibility of losing their jobs as a consequence of IMT implementation, they may attempt to block the turnover process. Clear legal arrangements between the parties are needed in order to overcome difficulties. Unfortunately, the number of people involved in the process may be quite large. In Mexico, 5,000 out of 7,000 government personnel were to be released from the IDs because of turnover, while the Philippines reduced government agency staff from 19,353 to 10,368.

Changing the role of the government irrigation agency is a natural outgrowth of IMT. The change requires not only willingness on the part of high level officials to make the change but also training them on specific issues. One issue is simply convincing government officials that there have been substantial changes in the way the irrigation sector is structured. For instance, in some countries the agency keeps asking the IAs to report the same types of information as if management had never been transferred. In Mexico, after six years of turnover, changes in the governmental sector are still incomplete.

Once the turnover thoroughly takes place in a system, the agency's new role should be more oriented toward supervision, guidance, monitoring, and regulation of water rights, plus selected technical assistance support to IAs. Management responsibilities of the system should be in the hands of the users, with the possible exception of headworks that, when considered of strategic importance or technically sophisticated, should remain under the agency's direct control and administration.

Second-Generation Problems and Solutions

As noted in the introduction, problems and solutions in a particular location will differ, depending on the perspective of the observer. The following discussion addresses problems from the perspectives of the irrigation associations, the irrigation agencies, the farmers, and the government. Solving these problems can involve a variety of steps including revision of laws or implementing regulations and changes in organizational structure, organizational rules and processes, and funding mechanisms.

In addition, associations will require supporting services. Support services are services that come from outside the association itself but that are necessary for it to carry out its mission. They include such things as financing for equipment purchases, legal advice, computer programming assistance, and financial auditing services. Such services may be difficult for an association to generate internally (for example, financing for heavy equipment) or may be used only infrequently (for example, specialized maintenance equipment) and hence be too expensive for an association to maintain full-time.

Support services can be procured by associations from a variety of sources—private firms, public agencies, universities and institutes, nongovernmental organizations, and regional or national federations of associations. In the past, it has usually been assumed that any such services must come from government agencies. Today it is recognized that higher quality and less expensive services may often be obtained from other sources and that the government should generally serve as only one of several alternatives, rather than the sole source.

Irrigation Associations

Insecurity of water rights was identified as the most serious second-generation problem affecting irrigation associations in the five case study countries (box 6.1). Water rights that are often absent, poorly defined, or insecure can (a) inhibit investment in new system facilities or rehabilitation, (b) encourage

Box 6.1. Major Second-Generation Problems for Associations

- Insecure water rights
- · Financial shortfalls
- Rehabilitation
- Lack of financial and administrative management expertise

short-term thinking and behavior on the part of association managers and farmers, (c) result in heavy expenditures in legal costs to defend a poorly defined water right, and, ultimately, (d) lead to a reduction in water supply and even system collapse.

An effective water right should provide security to the association but must, at the same time, be adaptable so that water can be diverted to other more productive or higher priority uses as economic and demographic conditions change. In this event, appropriate compensation must be provided to those who are giving up the water right by those who gain it. In Mexico, for example, an association's irrigation water right is always subservient to present and future municipal demands. This creates considerable insecurity for associations that share water sources with growing municipalities and violates both the principles of security and that of just compensation.

An effective water right should be specified in both quantitative and qualitative terms. Water quality degradation by upstream effluent discharges, as from a factory or an inadequate municipal sewage treatment plant, can render the water unusable by downstream irrigators. It can also make the water suitable only for lower value crops, because biologically or chemically contaminated water may not be permitted for production of higher value fresh fruits and vegetables. This will become an increasingly serious problem as water reuse increases in response to growing demand from all sectors.

Establishing a water rights system where it is lacking, as in Turkey, or clarifying water rights where they are weak, ineffective, or inequitable, as in Mexico, will usually require action from the national legislative body or from top-level executive leadership, or both. It is thus extremely important for water users' associations to have adequate representation of their interests when these issues are taken up.

Two different types of support services are identified as crucial to associations attempting to establish or clarify their water rights. The first of these is legal advice and representation when the association faces challenges to its rights. Such representation is best secured from private law firms, if available, because services secured from government sources may be of lower quality and may be subject to political pressures that would compromise their objectivity. Legal representation is also important during the formative stage of an association, when negotiations with the government irrigation agency will establish the contract or concession that will control the relationship of the association and the government. Unfortunately, associations that are just forming may be unaware of the importance of high quality legal advice at this stage or may be unable to afford it. A national federation of associations can play a valuable role as a source of legal advice and assistance to newly forming associations.

The other type of support service required by associations is lobbying on their behalf in government policymaking councils. Because other interests, such as municipalities and industrial water users, are usually larger than individual associations and likely to be more powerful politically, it is important for associations to establish regional or national federations representing many associations and a large number of farmers. This will give them political influence with which to counter competing interests. A federation can also represent irrigation associations on the board of directors of the national irrigation agency as is currently the case in Colombia.

Financial shortfalls comprise another high priority second-generation problem affecting associations (box 6.2). A central feature of the PIM programs undertaken in all of the case study countries is financial autonomy. Financial autonomy exists when an organization generates all of the revenue it

Box 6.2. Financial Problems in American Irrigation Districts

Irrigation associations in developing countries are not the only ones to experience financial problems. According to *US Water News* (February 1997) the Maricopa-Stanfield Irrigation and Drainage District in Arizona (equivalent to an irrigation association) recently restructured US\$89.2 million in debt to end a 22-month effort to stave off bankruptcy. Two other Arizona irrigation districts filed for U.S. bankruptcy court protection in 1994. Both subsequently negotiated agreements with their bondholders.

The Maricopa-Stanfield district was formed in 1962. In 1984, it sold bonds and took out an interest-free loan from the U.S. Bureau of Reclamation to pay its share of the costs of building pumps, wells, and canals to deliver Central Arizona Project water from the Tucson Aqueduct to individual farms. However, reduced prices and yields on cotton, tight credit, and plunging land values hurt farmers and impeded their ability to make repayments. The settlement reached will extend the repayment period of the debts.

needs to support itself and to perform its primary functions. It implies that the association is not directly subsidized by the government, or if it is subsidized, that the subsidy is a fixed amount that does not vary according to the condition of the association's balance sheet. The principal source of revenue for most associations is ISF collections. Financial shortfalls affecting a number of associations in Argentina and Colombia have been a concern in Mexico since the 1995 economic crisis.

Financial shortfalls are a function of several factors, including ISF rates, ISF collection effectiveness, the contribution of other sources of revenue, and expenditure patterns. One important factor is the structure of the ISF. Fees can be levied on flat rate or volumetric bases. A recommended structure for fees has two parts comprising both fixed and volumetric components. The flat portion constitutes a connection charge, a charge for simply being within the boundaries of the system's service area whether or not water is actually taken from the system. This charge reimburses the association for expenses incurred in maintaining the physical and administrative capacity to deliver water to the farm. The absence of this component in the fee structure of Mexican associations has created severe problems during years when drought greatly reduced the available water supply to the system's water users. The other portion of the fee is based on the volume of water actually delivered during a cropping season, or some proxy for this amount, such as area irrigated and number of irrigations given. This charge relates directly to the amount of water delivered and serves to limit excessive demand for water.

Revenue from ISFs also depends on the percentage of the fees assessed that are actually collected, although associations in many countries do a reasonably good job in this regard. An exception is the Philippines where low collection rates have been a persistent problem for NIA.

Solving problems of revenue shortfalls that relate to fee levels and collection efficiency is largely an internal association responsibility. Outside assistance may be useful, in some cases, in estimating the farmers' ability to pay particular ISF levels and in analyzing management systems set up for collecting revenue. This is discussed further in a following section.

In many cases, underlying difficulty in generating sufficient ISF revenue to sustain system operations is the low productivity of irrigated agriculture in system command areas. Low productivity can result from a large number of factors but is often associated with small farm size, a subsistence orientation, production of low-value crops such as grains, inappropriate agricultural policies, a poor natural resource base, and inadequate agricultural support services. In such cases, a solution to the association's financial problems may be possible only if the underlying problems in the agricultural sector are addressed. If these problems cannot be solved, then the options are for the government to have other agencies provide technical assistance to increase production or to provide the association with special subsidies. As a last resort, the government may have to consider taking back the responsibility of system management and financing. However, as irrigation service fees typically constitute only 3 to 10 percent of total production costs, reducing them will generally not solve underlying problems of high agricultural production costs and low productivity.

Rehabilitation is identified as a third important second-generation problem for irrigation associations. All irrigation systems require periodic rehabilitation and modernization. While usually less expensive, in real terms, than the original construction, rehabilitation is a costly undertaking and is usually beyond the financial and technical means of an association to undertake. Seldom is there a clear and consistent government policy on responsibility for rehabilitation.³ In the absence of such a policy, the tendency is for associations to defer needed rehabilitation in the hope that the government will step in and take responsibility for it. In this case, IAs usually underinvest in system improvements between rehabilitations. This tendency is reinforced if the government retains ownership of system physical facilities while transferring to associations only the use rights of the facilities. Associations may thus regard the responsibility to rehabilitate those facilities as belonging to the government unless a different policy is clearly stated in the agreement between the government and the association.

A related problem is that of cost sharing between the government and the association for rehabilitation. Because irrigated agriculture benefits people beyond the ranks of system irrigators, and because full coverage of rehabilitation costs is usually beyond the means of the irrigators themselves, sharing costs is appropriate. Government responsibility for even a share of the costs involved will tend to counteract the inclination of an association to defer maintenance, as noted earlier.

To cover its share of future rehabilitation costs, associations usually need to accumulate a capital replacement fund over a number of years, and there needs to be a legal basis for establishing such a fund. There should also be incentives for establishing and contributing to such a fund. Unfortunately, fiscal and monetary policies in many countries such as Mexico and Turkey have led to high rates of inflation and low or negative real interest rates on savings, which acts as a powerful deterrent to fund accumulation. Governments may need to create special investment opportunities for associations that allow them to earn reasonable rates of return on accumulated funds. Likewise, there should be incentives for associations to make improvements in physical infrastructure. One way to do this is to establish a trust fund, perhaps with donor financing, from which associations could request funds to complement their own investment funds. The matching ratio for such a funding facility should be established and made known in advance.

A number of support services are required specifically to support system rehabilitation. These include assessments of system facilities, credit, and design and construction assistance. Regular assessments of the condition of system facilities can be done jointly by the association and the government agency, as in Turkey, or may be contracted out to an engineering consulting firm acceptable to both the association and the agency. Such assessments can be used as a basis for annual maintenance planning, for selective improvements in system facilities, and for planning whole-system rehabilitation.

If an association is unable to accumulate its share of rehabilitation cost before rehabilitation and does not have the ability to assess a special charge on the members, it will need a source of credit. Credit can come from private banks, government banks or other lending facilities, or from insurance pools in the case of rehabilitation induced by natural disasters such as floods, typhoons, or volcanic eruptions. Such a credit facility can also be a source of financing for capital equipment needed for system maintenance.

Rehabilitation will also require external technical services for design and construction. Because they are sharing costs, both the association and the government should be involved in the selection of consultants and contractors and in monitoring their performance. A federation of associations might usefully give advice and guidance to the association on handling these tasks, because rehabilitation occurs only infrequently in any one association.

Lack of financial and administrative management expertise is the final topic identified as a high-priority second-generation problem by workshop participants. There are several possible responses to this problem. One would be skill enhancement through staff training programs. Skills can also be enhanced by

^{3.} This policy may be left deliberately vague during a transfer program, while implying that support would be forthcoming, to increase farmer acceptance of the transfer.

replacing less skilled people with more capable ones. Contracting out for specialized services is another important way of addressing management deficiencies in associations.

One extremely important step in improving the quality of association management is to increase the transparency of management processes. This has a number of positive effects. It can (a) reduce the potential for misappropriation of funds, (b) help ensure that salary levels and benefits are realistic, (c) help ensure that maintenance allocations are appropriately targeted, (d) reduce favoritism in making personnel appointments, and (e) improve responsiveness of association staff to users.

A number of steps can be taken to increase transparency in association management. These include:

- Regular external audits of financial accounts
- Use of standardized budgeting and accounting frameworks
- Wide dissemination of simplified budgets, plans, and financial statements
- Active involvement of the board of directors in forward planning, budgeting, and auditing
- Broad user representation on the association board of directors.

There is broad scope for employing external support services to improve management of the association. Services that may be required include:

- Advice on establishing and revising management systems and procedures
- Advice on establishing financial budgeting and accounting systems, including software
- Establishment of standard budgeting and accounting formats
- Standards and requirements for regular external audits
- Management training.

These services can be obtained by the association from a variety of sources, including private firms, a national or regional federation of associations, NGOs, government agencies, and universities and training institutes. The government is the logical party to establish mandatory standards and requirements for external audits, but the audits themselves could be done by a private firm of chartered accountants. Other services, such as management and accounting system advice, could come from a variety of sources, with private sources being generally preferred.

One argument in favor of the provision of these services by government agencies will often be that they can be obtained at no or low cost. What makes this lower cost provision possible, however, will generally be implicit government subsidies to the service providers. A preferred alternative would be to provide the funds supporting these subsidies instead to the associations as grants to be used for obtaining management support services. This would allow the associations to contract for these services among alternative providers. The demand-driven competition thus induced would be a healthy force acting to hold down service prices and improve quality of services delivered. Provision of such grants during the transition phase from government agency to association management could be a useful institutionstrengthening activity.

Irrigation Agencies

Dislocation of staff is the most prominent problem experienced by agencies following irrigation management transfer to users (box 6.3). This problem is typically dealt with in several ways. First, O&M staff levels are reduced by attrition. When positions become vacant due to retirement or resignation, they are left vacant or filled by internal transfers rather than new hiring. Second, financial incentives are often provided for early retirement of older staff. Third, existing staff members are transferred to other positions that become vacant rather than filling them from outside the agency. In some countries such as China, where it is difficult to lay off staff, sideline enterprises have been created that can generate income for the irrigation district and cover the salary costs of the involved personnel. In the Philippines, this has taken the form of an irrigation consulting company, NIA-Consult, Inc. which was created as a subsidiary

Box 6.3. Second-Generation Problems for Agencies

- · Dislocation of staff
- · Erosion of technical capacity
- Need to define and assimilate new role

of the National Irrigation Administration to provide irrigation advisory and design services within the Philippines and abroad. In some cases, redundant agency staff may also be reemployed by the newly created associations that assume management responsibility for the schemes. Such employment should be at the discretion of the association.

Loss of technical capacity in the national irrigation agency is a common problem faced by agencies that transfer management of significant irrigated areas to associations and experience loss of technical staff. To address this problem, agencies can do the following:

- · Obtain specialized expertise from outside consulting firms as needed.
- Increase salaries to attract and retain high quality staff.
- Provide in-service training opportunities for employees.
- Revise job descriptions to bring in new personnel with the desired qualifications.

Defining a new role for the agency is another important challenge (box 6.4). With their operational responsibilities transferred to associations, the agencies need to design a new role to address emerging problems. Doing this requires discussion among staff within the agency and at higher levels of the government, with broad participation by all involved parties. The aim should be to build broad consensus and political commitment for the new role. In some cases, changes in legislation may be required to enable the assumption of new responsibilities.

The new mandate should contain a clear definition of roles and responsibilities and should define skill requirements to carry out the new responsibilities. It should also contain a timetable for accomplishing the shift to the new mandate. Support services that could be useful in this process include:

- Comprehensive diagnosis of the agency-association relationship and the associations' support needs
- Professional assistance with the agency's strategic planning process
- Consulting services to design new management information systems for the agency.

Box 6.4. Possible New Roles for Irrigation Agencies

- River basin planning
- · Water resource allocation and monitoring
- Development of new policies and regulations
- · Environmental monitoring and enforcement
- Groundwater monitoring and control
- · Project planning, design, and construction
- Technology transfer to associations
- Advisory services to associations
- Monitoring of association performance
- Arbitrating disputes

In Colombia, the national agency INAT is employing professional consultants to help them define a new role for themselves under an Inter-American Development Bank credit.

Farmers

Second-generation problems experienced by individual farmers relate mainly to the need to increase farm productivity to pay higher irrigation fees and to take advantage of possible improvements in irrigation service quality. Support services required may include:

- Production credit
- · Extension advice
- New technologies
- Markets and market information
- · Access to inputs
- · Postharvest services.

Although government agencies are the traditional source of many of these services, in many countries, private or other organizations are playing an expanding role in supplying some or all of them. There is also the question of the potential role of the association itself in providing other agricultural services in addition to irrigation service. As a general rule, the association should demonstrate competence in its core activity of irrigation management before considering such ancillary activities as providing other agricultural inputs.

Government

The principal second-generation problem for government, beyond those already identified for the irrigation agency, is the reduced control it will have over irrigation activities at the system level and a diminished ability to use irrigation as a tool to implement other national policies and priorities. An example might be the government's wish to promote cultivation of upland crops rather than rice during a particular season. In the past it could work through the national irrigation agency to adjust water delivery schedules and volumes to try to achieve this end. Following transfer, this becomes more difficult. There are other tools, such as support prices and subsidies, to achieve the same ends, however, so that losing control of irrigation system management should not pose a significant problem for agricultural policymakers.

Summary and Conclusions

Experience is now available from a number of developing countries that have recently implemented PIM programs, and there is additional evidence from industrial countries that transferred irrigation management functions to locally based organizations many years ago. In the case of developing countries, while the overall benefits of PIM have been positive, in some cases second-generation problems have manifested themselves and, consequently, have tended to reduce the magnitude of the potential benefits.

In the process of introducing PIM programs, political will at the highest level is a critical background condition for a rapid and sustained transfer program. A second important element is that the irrigation infrastructure is in fair condition so that it can deliver irrigation water as required. A suitable legal framework is also necessary for the sustainable functioning of the transferred systems. Lack of clear water rights has led to second-generation problems including conflicts with municipal and industrial users as well as other irrigation organizations.

PIM is designed to shift the financial burden for irrigation service from the agency to the users. This aspect has to be made clear when the process of transfer is introduced. Failure to address the financial side of system management is a primary cause of second-generation problems. In general, countries that have a clear policy on irrigation service fee rates and collection practices have sustainable water users' associations.

The type and nature of the associations depend on the structure of the broader economy as well as the type of irrigation and the tradition of management prevailing in the country. Where economies are more developed and diversified and irrigation systems are large, associations have tended to evolve successfully. These associations are generally large and can hire their own staff and purchase specialized irrigation equipment. In contrast, in countries where economies are still developing, agriculture is more subsistence oriented, irrigation systems are small, and the associations tend to be small and more problematic in terms of management.

These changes in management structures and processes have had important positive and negative impacts on four main target groups: farmers, the irrigation association, the irrigation agency, and the government. For example, while increased service fees have reduced the financial burden on the government and increased the sustainability of the IAs, they have added to the costs of production for the users. However, from the perspective of the farmers, transfer has resulted in a sense of ownership, reduction in conflict, and improved maintenance.

Transfer has reduced the O&M staff of irrigation agencies and consequently the overall number of civil servants working in the irrigated agriculture sector. However, in a number of cases, this has also reduced governments' control over cropping patterns and over water resources more generally. This reduced government control has generally led to greater farmer satisfaction, more transparency in decisionmaking, and greater overall economic efficiency.

Changes in management responsibility have led to second-generation problems in most countries, some of which are already affecting the involved parties while others loom as potential problems. Insecurity of water rights was identified as the most serious second-generation problem affecting transferred systems. The primary solution is to establish a secure legal right that has both quantitative and qualitative dimensions. Federations of associations can provide assistance and legal representation.

Financial shortfalls comprise another second-generation problem. The principle source of revenue for the association is the irrigation service fee. A two-part fee consisting of a fixed connection charge and a volumetric charge can provide greater financial stability. Increasing the productivity of irrigated agriculture is also an important element in improving the financial health of associations. Outside assistance may be useful in analyzing and improving management systems set up to assess and collect service fees.

Rehabilitation poses a number of second-generation problems. In the absence of a clear and consistent policy on rehabilitation, maintenance is often deferred. There is a valid argument for developing a cost sharing formula in which the government pays a share and the users pay the remaining cost. If possible, the IAs should have a sinking fund for accumulating funds to cover their share of future rehabilitation costs. When this is insufficient, it is important to have an outside source of affordable credit. Other needed supporting services include assistance with maintenance assessment practices and technical design and construction services.

Effective financial and administrative management of the associations requires specialized staff training and increased transparency. Support services such as external audits and standardized accounting packages can also contribute to better management of the associations.

Irrigation agencies also suffer from a number of second-generation problems. Dislocation of staff, loss of technical capability, and the need to define a new role for the agency are all problems found in countries that are instituting PIM programs. In particular, the problem of what to do with excess staff is a difficulty faced by almost all agencies. Solutions include attrition, retirement incentives, creation of specialized consulting units, retraining and assistance with job placement, and transfer to other units. Along with the problem of staff displacement, agencies also face the problem of the loss of specialized skills. These may be replaced by outside private consultants but may also require the agency to provide specialized training for existing staff.

Second-generation problems of farmers are related to the need to increase agricultural productivity, including the need to shift to higher value crops. Services such as credit, agricultural extension, market access, technical inputs, and postharvest assistance are all needed. In some cases these services will come

from the government, but increasingly from the private sector as well. Federations of the IAs can also play an important role in the provision of such services.

A shift from public agency control to local participatory management is unlikely to happen without some second-generation problems. Rapid institutional change will almost always require corrective measures to address unexpected issues. Countries with flexible policies and procedures will be able to address these problems as they arise.



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1818 H Street, N.W.

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