RESEARCH REPORT

81

Inadequacies in the Water Reforms in the Kyrgyz Republic

An Institutional Analysis

Mehmood Ul Hassan, Ralf Starkloff and Nargiza Nizamedinkhodjaeva

International Water Management Institute

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Cover photo by Mehmood Ul Hassan shows a farmer in the head reach of Aravan-Akbur Canal of Kyrgystan being interviewed by the IWRM-Fergana project team.

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Contents

Summary

Transition economies in Central Asian countries and elsewhere face unique challenges of carrying out synchronized reforms in most of the sectors simultaneously. A study of such reform efforts provides useful insights and lessons for many other similar countries. This report analyzes the evolving water-management institutions and their performance of five core water management functions, in the context of the ongoing economic and agrarian reform in the Kyrgyz Republic. These core water-management functions are, operation of water systems, maintenance, resource mobilization, conflict resolution and organizational management. Besides, the separation of the institutional powers of the four basic roles of regulation, governance, management (or implementation) and arbitration has also been studied. The separation of these functions supports clear relations of accountability and avoids conflicts of interest, which may occur if some of these powers are vested in the same organization. The report also identifies key issues and challenges that constrain effective stakeholder participation in water-resources management.

While the Agrarian reform in the Kyrgyz Republic has been rapid and comprehensive, the markets are however, weakly developed, and constraints on the availability of cash have led to the operation of a vast oc0i(raTj0dfunctful availargani-by)T TD0priv92ater-man17 Tc0gulatized reted in the same organi

more water, inequity ensued and scarcity intensified downstream throughout the irrigation systems.

The emergence of an increasing number of agricultural units complicated water management, as it tended to multiply the quantity of individual demands and thus made the design, timing and observance of water distribution plans difficult. The financial constraints led to suboptimal maintenance and rehabilitation of canals and caused considerable losses of water resources, which caused suboptimal operating conditions, and contributed to inequity and the undersupply of tail reaches of the canal systems. The requisite financial resources far exceeded the capacities of the water users and the Government of the Kyrgyz Republic.

The frequently delayed and partially in-kind payment of irrigation service fee (ISF) and budget allocations imposed significant constraints on the ability of water managers to discharge their tasks efficiently, in addition to their financial hardships. The rate of ISF collection varied greatly, and the levels of ISF failed to cover the actual operation and maintenance (O&M) costs of Water User Associations (WUAs), particularly if they applied volumetric rates and were affected by inequity. The ISF was levied on a volumetric basis, but water measurement infrastructure was inadequate, especially along the secondary and tertiary canals. The dominance of the barter system and the weakness and inefficiency of markets prevented cultivators from realizing the value of their production in monetary terms.

Effective organizational management was constrained by an outdated command-oriented management model and organizational culture. The accountability was only upwards and the staff was organized in strict organizational and departmental hierarchies. Insufficient team orientation and the tendency toward administrative formality prevented critical internal debate and open exploration of problems and solutions. Consequently, the organizations' capacity for innovation, problem-solving and staff motivation were constrained. Formal opportunities for stakeholder participation, especially of water users, in the governance process and debates within the Water Management Organizations (WMOs) were absent. Governance and executive functions were vested in the same leading WUA officers. Thus, the quality of management and service delivery depended very much on the personality and level of initiative of these organizational leaders. The need for formal structures and an institutional culture that facilitate high-performing management organizations, were not widely perceived among stakeholders.

Generally, the approach to WUA development tended to remain within the entrenched model of government services and did not sufficiently embed the WUAs in the communities they served. WUA mobilization was mainly carried out by the staff of WMOs and local government agencies. A coherent and well-designed participatory approach to social mobilization, which targeted and involved both water users and managers and built their capacity for carrying out the core functions of water-resources management did not exist. Participatory structures and values were underrepresented and the WUAs became a mere mechanism for the transfer of system rehabilitation funding and labor mobilization to water users. The need for professional social mobilization in the water-resources sector had not been recognized. A legal framework was under development in the Republic but it had not been debated thoroughly with all stakeholders. The granting of institutional powers to WUAs had only been observed recently. Institutional mechanisms for conflict resolution and the establishment of WUAs on the basis of hydrological boundaries were not considered in the proposed legal framework.

The growing barter exchange due to underdeveloped markets constraining the capacity of the WMOs and WUAs to finance all the core functions needs to be curtailed immediately through rationalized fiscal and monetary policies. The water resources managed along territorial bound-

aries of provinces, districts and Soviet-time farms need to be reorganized, at all levels, along hydrological boundaries following the principles of integrated water resources management, where the four roles of regulation, management, governance and dispute resolution are clearly separated, stakeholders' interests are strategically brought in through the governance representative structures, which should also be both formally charged with the responsibilities of dispute resolution at their own level and responsible for unresolved disputes from the lower levels. The democratic governance structures at all levels need to be introduced, through professional social mobilization rather than through the existing top-down, and bureaucratic governmental apparatus. The key elements of mobilization should be awareness-creation, consultation, information-sharing and capacity-building of the stakeholders and their governance structures at all levels. Such an approach would lead to greater ownership of the WUAs and WMOs by the stakeholders, and to ensuring willingness to pay for O&M.

Under the growing water-scarcity conditions, an increasing number of poor and small farmers, increasing crop diversification, incompatible water-delivery infrastructure and lack of water measurement devices to measure water for each farmer, the current demand-based water management might not be relevant to the current needs, and therefore, a proportionate supply-based system might need to be adopted, like that in some South Asian countries.

The ISF structures and levels need to be rationalized. The low levels and inappropriate structures of the ISF, coupled with the poor capacity of the farmers to pay and weak markets, necessitate exploring the potential of unconventional means to finance the O&M and rehabilitation needs of the irrigation and drainage infrastructure. Such unconventional means could include, for example, growing and selling fruit and other fast-growing timber on the canal banks, selling the nutrient-rich silt for earth-filling or improving farm fertility, or selling out fishing rights.

The current and forthcoming rehabilitation efforts through development projects, which partially subsidize rehabilitation, should be implemented in such a way that encourages investments by the stakeholders in the infrastructure, rather than creating a dependency on external sources. Such an approach will lead to greater ownership of infrastructure and management organizations by the local stakeholders.

Inadequacies in the Water Reforms in the Kyrgyz Republic: An Institutional Analysis

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Introduction

The Kyrgyz Republic, like other Central Asian countries, is in transition toward a market economy. With the transition from administratively centralized and river-basin-oriented water-resources management in the Soviet Union to management by five independent Central Asian republics, the vast and complex irrigation system of the region has become fragmented. The management of water is now organized along administrative boundaries of provinces and districts, ignoring hydrological principles. In addition, the Kyrgyz economy is undergoing agrarian reforms of property relations in the agriculture sector. The former Sovkhozes and Kolkhozes (FSKs), the state and collective farms, respectively, are being transferred to private ownership and/or lease rights.[1] This causes the fragmentation of the former on-farm water-management system into many smaller units and poses the problem of reallocating management authority at this level. All these circumstances entail serious management challenges, which are currently causing suboptimal O&M of irrigation systems at best and conflict over water resources, at worst.

Moreover, considerable seasonal variation of water availability, insufficient financial resources for WMOs, inadequate system maintenance, poor irrigation practices and unreliable water supply characterize irrigation systems in the Kyrgyz Republic, as is the case in the rest of Central Asia. These conditions have resulted in increasingly inequitable water distribution, which exacerbates the potential for conflict, excessive water use by some, significant water losses and, consequently, high volumes of drainage. Under given geological conditions, drainage water is recycled into downstream subsystems as increasingly saline runoff, which threatens the ecological sustainability of irrigated agriculture.

This report describes the results of an institutional assessment of water management institutions and water user associations (WUAs) in the southern Kyrgyz Republic in the context of the ongoing agrarian and water reforms. The analysis was carried out in the Fergana Valley under a broader assignment for the project entitled, "Integrated Water Resources Management in the Fergana Valley."[2]

The goal of this analysis is to provide an insight into the inadequacies of the reform, which have continued to, and will continue to, constrain effective water management in the country. This report proceeds with a methodological section,

[1]While the state farms were owned and managed by the government for research and production purposes, the collective farms were owned collectively by the members of the farms and management was appointed by the state for producing the state-determined crops and production levels.

[2]This was funded by the Swiss Agency for International Development Cooperation.

which provides the underlying parameters of analysis. The section then outlines the research procedure and methods employed by the study team. Section 3 presents an overview of the key features of the post-Soviet reforms in the Republic. Section 4 describes the results of the case study in two irrigation systems, as well as the vision of the respondents about the future regarding reforms. The concluding section identifies constraints to effective IWRM in the Republic and makes some recommendations.

Methodology

Conceptual Framework

This conceptual framework outlines the key concepts underlying the study. The study draws on accepted principles and a common body of knowledge, which have accumulated through institutional research on irrigation management in recent decades and applies them to specific issues in Kyrgyzstan that were identified during fieldwork for this study.

Core functions of WMOs

The study investigates five core functions of WMOs that must be implemented in any institutional arrangement for water-sector management organizations. While there are slight variations in the conceptualization of these key functions in the literature (Brewer et al. 1999; Vermillion and Sagardoy 1999; AHT and WAPDA 2001; Bandaragoda and Memon 1997; Starkloff and Zaman 1999), five fundamental areas of activity are recognized by most of them: operations, maintenance, resource mobilization, conflict resolution and organizational management.

Institutional powers

Besides water-management functions assigned to WMOs and related organizations, there are four basic roles exercised by irrigation organizations. These are commonly in need of being separated organizationally or exercised by different units within an organization. These are regulation, governance, management (or implementation) and arbitration. The separation of these functions supports clear relations of accountability and avoids conflicts of interest, which may occur if some of these powers are vested in the same organization.

IWRM and participatory irrigation management (PIM)

IWRM is defined as “a process [or concept] which promotes the coordinated development and management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (GWP 2000). This definition considers water as everyone’s business, the management of which cannot be effectively achieved without real participation of all stakeholders at their respective levels and beyond.

Participation of the users of public services in the management of these services has been a longstanding concern among development officers and irrigation professionals. In the water-resources and irrigation sector, this has spawned extensive debate, experimentation and reform worldwide. A considerable body of literature and

common concepts has emerged. There are a number of key terms, which go along with the concept of participation and PIM. They describe some of the essential ingredients of participation, i.e., empowerment, accountability, transparency and equity.

If farmers of different farm types and the keepers of backyard gardens are expected to take on new responsibilities in irrigation-service provision, such as ownership of infrastructure, management of O&M and payment of ISF, they will also require incentives, which will justify the increased transaction costs of irrigation services. Participation and empowerment provide such incentives by which farmers will be able to actively contribute to ensuring that improved irrigation services can lead to improved agricultural productivity and higher incomes. Farmer-managed irrigation systems are globally recognized for their cost-effectiveness and often perform better than government-managed systems (World Bank 1994; Merrey 1996; Tang 1992; Benjamin et al. 1994; FAO 1982; Yoder 1994).

Participation. Participation will provide farmers with access to institutional representation from which they may have been excluded previously. It may mean that farmers will have increased rights and influence over irrigation-system management. Rights also convey responsibilities, such as rule-bound behavior and competent execution of tasks. However, participation is not only about the participation of farmers or water users. A genuinely participatory approach to water-resources management ensures the participation of all relevant stakeholders, including water-management professionals, nonagricultural water users and political representatives. Participation confers appropriate levels of rights and responsibilities on these actors and builds their capacity to participate accordingly. The meaning of what constitutes "appropriate levels of rights and responsibilities" for all stakeholders is subject to debate, and agreement among these stakeholders would be their first task in the development of participatory water-resources institutions. The meaning of participation can be further clarified by distinguishing several levels of participation.

- *Debates and decisions.* There are debates and decisions about the design of reformed irrigation institutions from the start of the reform process and subsequently as a routine feature of management at all system levels. This creates ownership and motivation, because stakeholders' needs, interests and concerns are considered.
- *Social mobilization, change and capacity building.* Without mobilizing all stakeholders and promoting change and capacity among them, some may lack understanding while others may resist. Stakeholders' active involvement through education and experimentation is required, so that they can shape the process of change.
- *Governance of WMOs.* The key mechanism for empowering stakeholders is entrusting governance to water users or participatory arrangements for stakeholder representation or both. It involves ongoing discussions and decision making about systems management while keeping in view the requirements of all stakeholders.
- *Resource mobilization.* Mobilizing and controlling financial and other resources, which make the management of irrigation systems viable in the long run, are a primary concern and also a mechanism for holding users and managers accountable. *ISF,* water-user labor contributions in maintenance and joint investment in repairs and rehabilitation are vital contributions toward sustainable management.
- *O&M of irrigation and water-supply systems.* Adequate and equitable O&M are the goals of PIM. Particularly in large systems, O&M would be carried out by salaried

professionals, supervised and governed by water users and other stakeholders.

- *Organizational management.* Competent day-to-day implementation of responsibilities by WMO officers and other staff crucially contributes to the sustainability of PIM as well.
- *Regulation, monitoring and evaluation M&E.* Participatory M&E take the perceptions and experiences of all stakeholders into consideration and provide feedback to stakeholders, service providers and regulators about the quality and effectiveness of services.

Empowerment. Participation in the ways just described implies the empowerment of stakeholders, such as farmers, who have thus far lacked some of the rights and responsibilities indicated; it also implies that others, who may already have such rights, will share them. Empowerment means an increase of the power which a group or an actor can exert. Power is about the relationships between people and thus the degree of autonomy and dependence in these relationships (Giddens 1979). Empowerment of farmers means increased access to institutional powers, including the governance of management organizations in the water sector.

Stakeholders' relations of power must be designed in such a way as not to hinder a WMO's capacity to discharge the responsibilities assigned to it through PIM. In other words, the powers assumed by farmers and their partners, and the degree of autonomy of their organizations should match their responsibilities. Without changes in their power relations, "joint management as currently practiced is often business as usual with only cosmetic changes" (Merrey 1996, 2).

*Accountability***.** Accountability is a pivotal issue, and institutions must be structured, in combination with the tasks assigned, so that government officials, irrigation personnel and farmers achieve mutual accountability for law, rules, resources and decisions. Accountability implies that an actor or group of actors must justify their decisions and courses of action before a legitimate authority or body. Accountability involves control mechanisms by which actions are kept within agreed and socially approved boundaries.

Merrey (1996) notes that in centralized bureaucratic irrigation systems, accountability is typically oriented upwards toward superiors and the political level. Accountability is not mutual. In an institutional arrangement of interlocking, but autonomous, management organizations, mutual accountability between providers and end-users of services needs to be designed within the structure of authority established among the stakeholders. According to Hofwegen (1996), this involves service agreements or contracts, which determine the rights and responsibilities of the parties involved, as well as the procedures to be followed in the case of nonfulfillment of obligations. The same applies for accountability within organizations, where representative bodies of users of services monitor the performance of their staff and elected office bearers.

Transparency. Transparency is of fundamental importance for institutionalized accountability. Stakeholders need free access to relevant information, so that they can judge the appropriateness and legitimacy of decisions and actions.

"We say that an organization has transparency if it is easy for any stakeholder (that means any person who is affected by the organization's actions) to find out information about its activities and performance" (Abernethy 1998, 85).

Therefore, transparency involves a "right to know" about the relevant details of organizational action, which thus requires meticulous record keeping. In the water-resources sector, data on

the flow and distribution of water, services and money are of particular relevance.

Equity. The normative concept of equity is about fairness in the distribution of irrigation water to all users of a system. As such, it is subject to debate among stakeholders about what is considered fair. Local power relations often infringe on equity and the resolution of conflicts over inequity may define, for the time being, what is considered equitable or fair enough (Boelens 1998).

Equity concepts also depend on the operational parameters and conditions of an irrigation system. In supply-based systems where fixed per hectare discharges based on predetermined water allowances for agro-climatic zones are provided, equity is defined by the simple per hectare equality of water deliveries. It is up to users to determine at what cropping intensity they will use their fixed water supply and under what kind of crop. Here, equity means that all levels of an irrigation system receive discharges proportionate to the extent of their command areas. In demand-based systems, equity may be defined as the delivery of water quantities to each farmer proportionate to standard crop water requirements and the extent of land under such crops. The equitable sharing of water scarcity would imply reduction of supplies to each user proportionate to the overall reduction of availability. In demand-based systems this is more complicated as water users, in principle, should adjust their cropping patterns in light of scarcity, and thus the overall pattern of demand could change.

Equity, though not a fixed concept, is of the greatest importance since it crucially affects the operation of any system. Irrigation systems are inherently susceptible to inequity due to their physical structure, which makes the disproportionate appropriation of water by head-reach users at the expense of tail enders possible at any level of the system, unless strong institutional mechanisms and values define and favor equity. Where head-tail inequities tend to be chronic, conflict is frequent and adversely affects system productivity and the effectiveness of irrigation managers. However, where conflict is present, inequity can be overcome through social mobilization, negotiation and participatory institution building.

The discourse on participation outlined above provides relevant indicators for the study of the status of irrigation systems carried out in the situation analysis for irrigated agriculture in the Kyrgyz Republic. Reference will be made to the opportunities of stakeholders to participate in institutional processes, to the status of accountability and transparency of current management processes, and to the degree of equity in the distribution of irrigation water and its effect on relations among stakeholders.

Research Methods

The research team carried out a rapid-appraisal study involving stakeholder consultations with 98 respondents and observation of two irrigation systems and their agricultural production units, as well as drainage facilities, in two sample provinces, Osh and Jalalabad, in southern Kyrgystan. In addition, two WUAs, one with separate governance and management and one with merged functions, were selected in each of the two sample irrigation systems.

Open-ended, structured questionnaires were prepared for several types of organizations and persons, from ministries to district WMOs, and from private farmers and WUA representatives to local government staff. These questionnaires served as guides for in-depth discussions with individuals and groups.

Irrigation operational and financial data, as well as information on agricultural production were collected from WMOs, farm units and other sources. The intended methodology would permit the study to establish a relationship between

agricultural production (yields, prices, costs, gross and net value of production[3]) and the cost of irrigation-system O&M (estimated, needed, actual), as well as operational data on water supply, in order to analyze the proportionate share of O&M costs in the gross and net value of farm production, the amount of the ISF relative to the total O&M costs, as well as the productivity of water at various irrigation-system levels. However, some data availability and access constraints reduced this intention to a merely indicative exercise, which points at probable issues and problems, but is hardly sufficient or satisfactory from a scientific perspective. The study team found that much data are not available, that data from several sources, but for the same irrigation system, are inconsistent, and that in many cases the veracity of the data provided appears questionable. Data on both cost of vegetable production, an increasingly significant cash crop and production in family plots are not available. The year 2000 was selected for analysis, but as agro-economic data for the Osh Province were not available, a provincial-level agro-economic analysis had to be omitted for Osh. The year 2000 is an instructive year because, while prices for cotton had remained good, water had become scarce, thus enabling analysis of how the system is affected by scarcity conditions without also being affected by unusual price slumps.

It was impossible to analyze the relationship between agricultural production, O&M costs and water productivity at the hydro-system level because of the nonavailability of agro-economic and irrigation-system O&M data at the canal-system level, and the lack of access to some canal-operational data. However, data on the basis of administrative units were assembled and analyzed. This indicates a major constraint, which is due to the lack of hydro-boundary management.

A range of relevant project and government documents were studied as well. These are given in the list of literature cited items.

The study team started with Provincial WMOs (administrative units), as these are the most available sources of information about hydraulic units. Once suitable hydraulic units for the study were identified, in particular IFCs and main canals (MCs), several WMOs, farm units and other stakeholders within the hydraulic units were selected. In addition, a number of representatives from the government, the donor, and project agencies were interviewed.

The Post-Soviet Agrarian and Water Reforms in the Republic

During the 1990s, the transformation in Kyrgystan was characterized by comparatively rapid and radical changes in the agriculture sector, which precipitated related reforms in the water-management sector. The dismantling of the Sovkhoz and Kolkhoz structure of property and production relations and the consequent far-reaching privatization of agricultural land left the on-farm irrigation system without a responsible WMO in charge of its O&M. The abolition of economic planning and state-order production in agriculture required that agricultural producers develop entrepreneurial capacities and participate in markets. The weakness of local markets and recent price declines in cotton in the world market have constrained farmers' incomes and the state's ability for the taxation of land and production. As a result, financial resources for irrigation system O&M have become constrained as well, making effective system management precarious.

[3]The gross value of product is derived by multiplying the received price by the total production; the net value of product is the difference between the gross value of product and the total production cost.

In reaction to these new conditions, the water-resources sector is undergoing extensive reforms, which are supported and influenced by international donors. The reforms center on the introduction of WUAs, responsible for on-farm O&M and ISF, to gradually cover the management of both the on-farm and the inter-farm/main irrigation systems. This institutional change is coupled with the rehabilitation of the irrigation system for which the WUAs are a vehicle for user participation, financially and otherwise. The long-term perspective of the reformist government is the expansion of WUA responsibilities beyond the OFCs[4] to the IFC system and the gradual withdrawal of the state from management of the irrigation systems, which is supported through the agricultural development and infrastructural rehabilitation projects funded by international development and financial institutions, such as the World Bank and the Asian Development Bank.

This section will first outline the salient features of the new landownership system. Then, the structure and functions within the Republic's WMOs at various levels of the administrative and irrigation system will be presented. Their capacity to fulfill the core functions of irrigation management will be assessed through the analysis of the case study material.

Agrarian Reform

The legal basis for the privatization of land is the "Land Code of the Kyrgyz Republic" and the "Law on Farming," both of 1999 (IWMI 2001). The former establishes private property rights in land and the latter makes general provisions for the legal status of farms as independent economic entities.

The privatization process is carried out through the local government and the central government's Land Allocation Funds (LAF). The government agents are appointed within a top-down hierarchy. The President of the Republic appoints the Provincial Governors who, in turn, appoint district government agents who, in their turn, appoint the government agents of the village governments. The government agents, their deputies and staff are in charge of the general management of public affairs, including agriculture and water. They supervise the local branches of government departments under the ministries and thereby establish a system of "double-subordination" through which the presidency achieves direct influence over local affairs and ensures the implementation of top-level policies on the ground. The local government is a powerful institution, which responds to requests and complaints from the general population and is directly involved in both land- and water-sector reforms.

Through the privatization process several new forms of farms and property relations have emerged. The peasant farm has been the instrument for achieving full privatization of land distributed among the rural population. Every working-age member of the Former Sovkhoz (FSK) is entitled to 0.13 hectare of irrigated agricultural land to which he or she receives a land title with full rights of sale, inheritance and renting. In addition, a family can retain its home and kitchen gardens, allocated during the Former Soviet Union (FSU), as private property.

The second form of farm is the private or farmer's farm, which operates as an entrepreneurial entity or company with bylaws and a business plan, i.e., as a "legal entity." Land for private farms is leased from the state through the local government, initially for 5 years and thereafter extended for up to 50 years. The local government assesses an applicant's business plan and bylaws, as well as financial and farming capabilities before granting its approval. There is

[4]It is pertinent to note that although the acronym OFCs in the former Soviet Union means "on-farm canals" in almost all water/irrigation/agriculture-related literature it means "other field crops."

no rental charge for these lands whose extent is generally about 15 to 30 hectares but, in some cases, it can be more than 100 hectares, including nonirrigated land.

The LAF has retained about 25 percent of the total land area of the FSKs under state control. These lands are either leased out on a short-term basis through auction or used for public purposes, such as government buildings and roads. Some respondents reported that in their FSK the local government leased out the undistributed land on a sharecrop basis and prescribed cropping patterns, while in others the lessees were free to cultivate whatever they liked and paid a predetermined rent in cash or kind.

The process of land allocation appears to generate inequity of land distribution. Influential members of the FSKs, such as former directors, agronomists and hydro-technicians, as well as government officials in various government departments and well-connected investors with financial means, were reported to have preferential access to larger and better-quality land in the head reaches of the command areas of irrigation systems.

The new agricultural production entities, if they are established on irrigated land, are individual water users who depend on the provision of water-supply services. As traditional recipients of services at the on-farm system level, they are accustomed to communicating demand and receiving supplies according to actual availabilities. Yet, as the on-farm system has lost its managers, they are expected to fill a vacuum, which contributes to the deterioration of a service on which they depend more than ever. They are now independent farmers responsible for a range of activities that, under the Soviet system, had been carried out through a specialized technical division of labor, situated within a vast social division of labor, which took care of anything from input provision to work plans, and from the distribution of the agricultural products to the provision of public services.

Water managers are also going through a difficult and uncertain process of transformation of their organizations, the definition of their roles and the sources of their livelihood. Still at the beginning of this process, they are struggling with economic hardships and a deteriorating infrastructure.

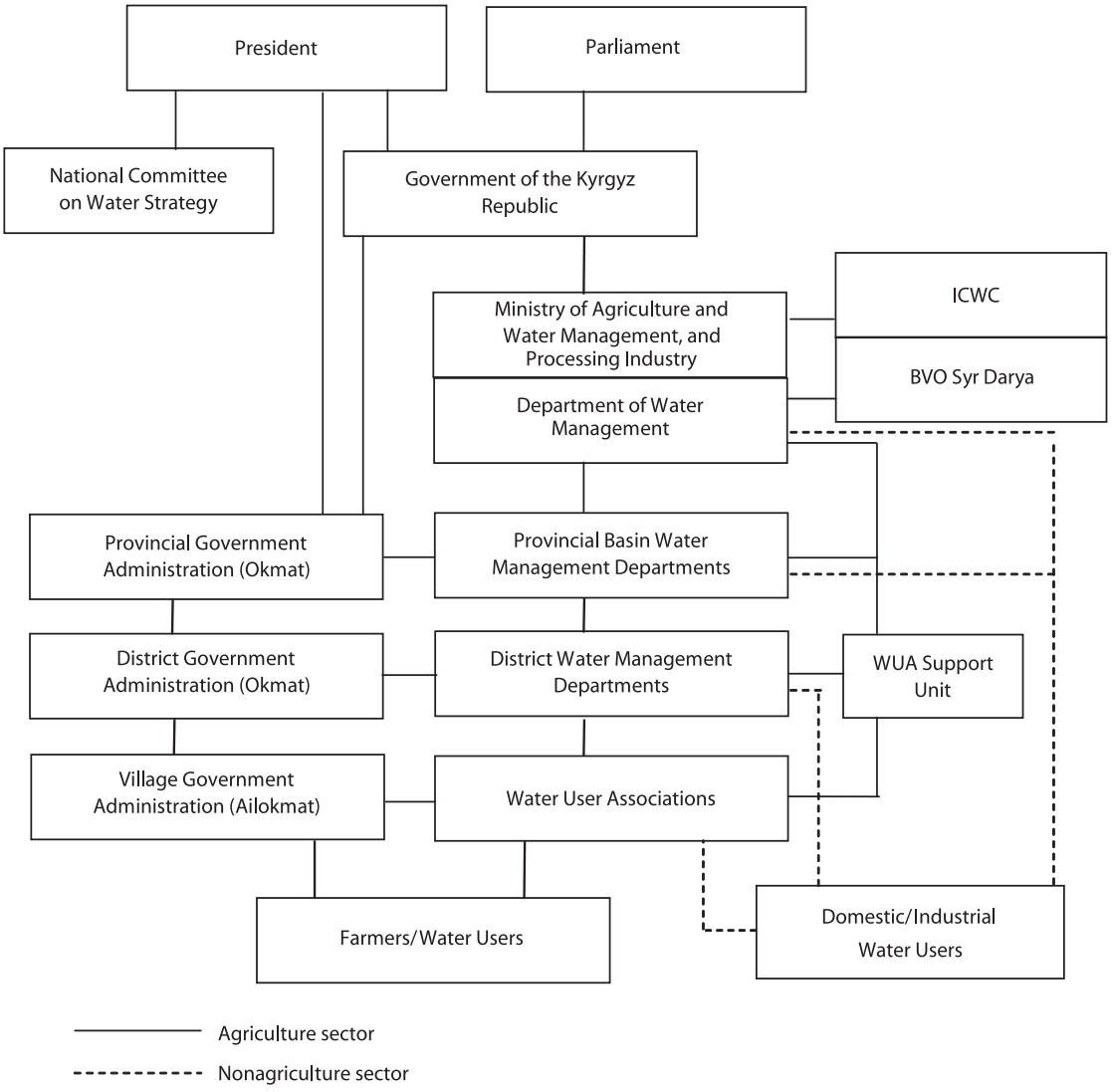
All of these actors are indispensable contributors to a social-production process, which has yet to generate the capacity and resources to permit an adequate and effective flow of goods and services and sustain livelihoods at a satisfactory standard. The social capital of well-institutionalized organizations and practices is a crucial factor in the establishment of such a production process. The Kyrgyz society has embarked on a reform process that seeks to put the key elements of such an institutional setting in place. The evolving institutional structures in the water sector are a central component of this process of change.

Institutional Structures and Service Relations

Water resources in Kyrgystan are the property of the state, according to the Water Law of 1994 (IWMI 2001). A hierarchy of state WMOs at the national, provincial and district levels carry out water-management functions within their areas of administrative jurisdiction. The WMO hierarchy under the Ministry is under the direct authority of the President and the Parliament (figure 1). The village-level local government has been established on the territories of the FSKs and operates hydro-service departments with *mirobs*[5] (hydro-technicians). In recent years, WUAs have

[5]The local term mirob (irrigator) originates from the pre-Soviet irrigation systems, which were managed by the then much-respected mirobs. Mirob in the local language means “water master”

FIGURE 1.
Institutional structure of water management in Kyrgystan.



been formed by district governments and village governments to involve the water users in OFC management.

As the WMOs exchange water, finances and information, and maintain relations of superordination, subordination, cooperation, competition and conflict, they form a network, which carries out the core functions of water management. The structure establishes a hierarchy with unequal relations of power and participation where farmers appear at the bottom of the structure.

The top layer of the institutional hierarchy primarily exercises *regulatory* and *governance* functions in the water sector. The Parliament as lawmaker debates and decides on the legal

framework for the management of water resources. The President, who is supported by the advice of the National Committee on Water Strategy, a think tank of scientists and experienced water professionals, determines the country's water policy and is involved in the process of law-making. So is the Ministry of Agriculture and Water Management (MAWM) whose leadership participates in the regulatory and policy processes by making draft proposals and providing information and expert assessments. The government, through its budget and the Ministry of Finance, provides financial resources to the MAWM and its subordinate WMOs. It directs and reviews their performance.

The MAWM and the provincial and district WMOs are the primary *executive* bodies undertaking water management. They maintain administrative relations with each other rather than contractual ones. Each is upwardly accountable within the hierarchy of organizations through direct subordination to a supervising officer. Supervisory, control, planning and technical design functions increase toward the top, while actual physical work in the canal system and interactions with WUAs and water users are concentrated at the district level.

The Minister of Agriculture and Water Management participates in the interstate meetings and the agreements on interstate water allocations.[6] Where irrigation systems in Kyrgystan receive water directly from the main tributaries of the Syr Darya, the River Basin Organization (RBO) distributes water resources at canal headworks. The irrigation systems studied were supplied from smaller tributaries under the authority of the national WMOs where the RBO is not involved.

In the Osh Province, contractual agreements regulate relations between districts, sharing responsibility for an interdistrict canal system. The upstream district thereby guarantees the supply of volumes of water according to an agreed schedule to the downstream district. Both are subordinated to the monitoring and control of the Osh Province. In the Jalalabad Province, by contrast, interdistrict canals were managed by Interdistrict Canal Management Departments under the province.

The districts and the WUAs or where the latter do not yet exist, the village governments interface through contractual relations. These contracts determine the volumes of water exchanged for ISF. WUAs have contracts with individual water users, which again determine the obligations of the parties to deliver water and pay the ISF. Though physically dependent on the services of the district, the WUAs are viewed as formally independent organizations buying water from the state. However, allocation remains in the hands of the state WMOs while the WUAs are registered by the Ministry of Justice. A presidential decree has tentatively set the ISF as a flat charge per unit of water used, which does not vary by soil, climate, type of crop, etc. Several secondary and tertiary canals do not have measurement structures, and water levels fluctuate considerably. Thus, the fee collection process is at best based on guesstimates and hunches.

Larger nonagricultural water users, such as municipalities or industries, are provided with services through contractual relations with the MAWM, provinces and districts. They can either obtain licenses to abstract water from streams and other water bodies as primary users, or enter into contracts with a primary user, such as a province or district. Individual rural domestic water users are not formally integrated with such institutional mechanisms, and have not found representation in WUAs as yet.

[6] Due to centralized planning, there is a theoretical setup of collecting water demand from users, aggregating it to higher levels on the one hand, and forecasting availability and then issuing "water limits," or maximum permissible water use for each cropping season by states, provinces and then by districts and farms.

Operation. The main operational activities are allocation through demand aggregation and water distribution. The *allocation* process starts at the farm level. Each farming unit communicates the extent of its cultivated area and cropping pattern to its WUA or the hydro-service department of its village government administration. The WUA or hydro-service department of WMO aggregates the demand of all farm units within its area in a seasonal water use plan, and submits it to the district in charge of the district WMO. The district again aggregates the entire demand within its area and develops a district water use plan. Water losses in the respective canal systems calculated, based on standards developed in 1960s, are incorporated into the demand, which is now moved upwards to the province at provincial level, where the same process is repeated. The province reconciles the demand with the estimated water availability in water sources such as reservoirs throughout the season and instructs the district about the proportionate *distribution* of water. These instructions in some way act as maximum limits. However, within the irrigation systems studied in Kyrgystan, formal limits are either not recorded or they are always recorded as identical with demand. Only demand and actual supply differ, as a result of the availability situation.

Actual supply and distribution result as much from pragmatic considerations, such as the immediate needs of crops in a certain reach of the system or demands made by influential stakeholders to provide special concessions, as from the consideration of equity and proportionality. Actual releases of water are made by the districts' hydro-sections and are regularly recorded through measurement of discharges at diversion structures. This information is then again moved upwards in the hierarchy and aggregated for monitoring purposes.

Maintenance. Maintenance activities are carried out primarily by districts and interdistrict canal management units at the MC and IFC level, as well as by the WUAs and water users at the OFC level. They assess costs on the basis of annual maintenance-needs reports. Maintenance capacities and actual activities are directly linked to the amount of financial resources available to a WMO. The willingness of water users to participate in annual-maintenance campaigns in the on-farm system and the ability of the WUA to make labor contributions obligatory also affect the functionality of the system and its performance.

Resource mobilization. In the relations between water users, WUAs/local government and districts, the operational data mentioned above form the basis of monitoring the fulfillment of their terms of contract. The ISF is based on volumetric charges, and payments for water delivery are made according to the actual amount of water delivered. The cash or in-kind payments to the districts, in principle, cover 50 percent of their operating cost. The level of ISF is decided by the Parliament. Charges for WUA services are added to the water users' bill, but they vary from WUA to WUA, depending on expenses and how total charges to individual users are determined (volumetric- or area-based).

The remaining 50 percent of the O&M costs of the district is covered from the government budget. Again, a demand-aggregation process takes place. A district estimates its salary, O&M costs and registers its requirement for the coming year with the province, which aggregates all financial demands of the district and includes its own budget needs and submits its financial demand to the Ministry. The Ministry aggregates all demands from the province along with its own requirements and submits these to the Ministry of Finance. Based on the availability of financial resources and budget allocations from the Ministry of Finance, actual financial allocations are made to the provinces and districts flowing down the hierarchies within the administrative units involved. The availability of financial resources is determined by the level of

aggregate tax income and allocation decisions within the government. Actual expenditures among WMOs are recorded and monitored upwards.

Conflict resolution. The institutional structure of WMOs has not institutionalized formal mechanisms of conflict resolution. Dispute resolution and dealing with complaints remain more or less informal. By necessity, conflict resolution is directed toward the same persons who are in charge of O&M of the system, which follows its hierarchical order. Accordingly, farmers can complain to their mirob, who may complain to a WUA chief or canal-section head of the district. If no resolution is achieved the complaint moves upward and higher-level WMO officers get involved. Local governments exercise a certain regulatory power, as aggrieved water users can seek their assistance in difficult disputes, which then lead to consultations with the water managers. The latter reported that these channels of resolution normally work, while water users' responses were more mixed. Less-influential small farmers from the tail reaches of canals have little faith in their capacity to mobilize means of redress, despite the existence of WUAs.

*Accountability and decision-making power***.** In this system, accountability and decision-making power are oriented upward, ultimately toward the central government and the MAWM. Decisions on the legal framework, financing and policy lie in the hands of the Parliament, the President and the Government and while stakeholders are consulted to some degree, there is no formally institutionalized process of participation in discussions and decision making by lower-level stakeholders. Demands are made upward and actual resource allocations are decided top-down. Lower-level water managers and users have no representation in this process although they are held accountable for actual service delivery and expenditures. It is only at the WUA-district interface that a direct relationship between service delivery and payment for services is emerging. However, levels of charges are not related to the actual O&M costs.

The discussion has so far presented water-resources management as a system of relationships among WMOs and other key stakeholders. These WMOs themselves are organizational systems whose internal structures, functions and staff are organized to enable them to play their role within the wider institutional framework.

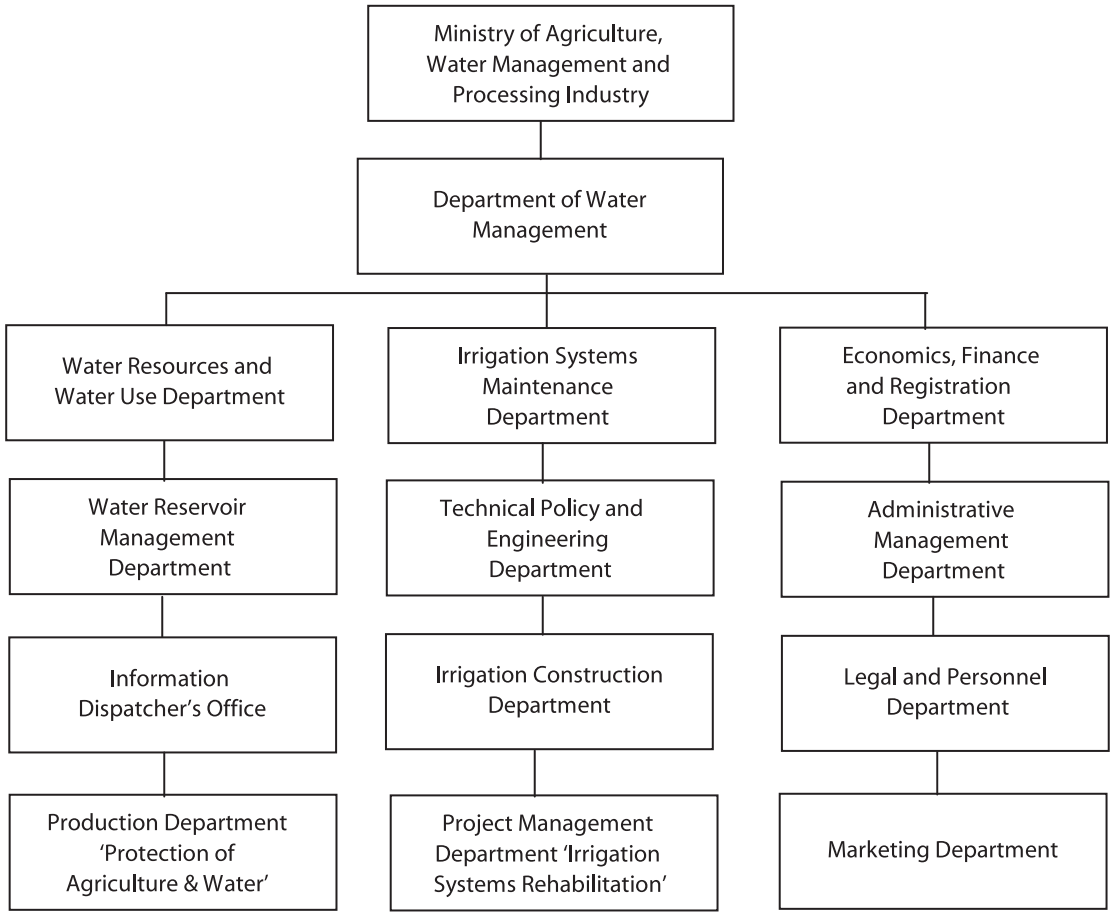
Structures and Functions of WMOs

The structures and related functions presented are typical ones, exemplifying the essential setup in Kyrgystan. As far as they are relevant to the discussion, variations in other organizations will be pointed out.

The Department of Water Management under the MAWM

The Ministry of Agriculture and Water Management amalgamates three related spheres of activity, i.e., agriculture, water management and the processing industry. The key departments of relevance for this study are the Water Resources and Water Use Department, which is responsible for allocation and distribution; the Irrigation Systems Maintenance Department, which controls the physical upkeep of the system; the Economics, Finance and Registration Department, which controls the distribution of financial resources; and the Project Management Department under which come development projects like the World Bank WUA Support Units and the On-Farm Irrigation Management Project (OIMP). These structures are sketched out in figure 2.

FIGURE 2.
Organogram of the Department of Water Management.

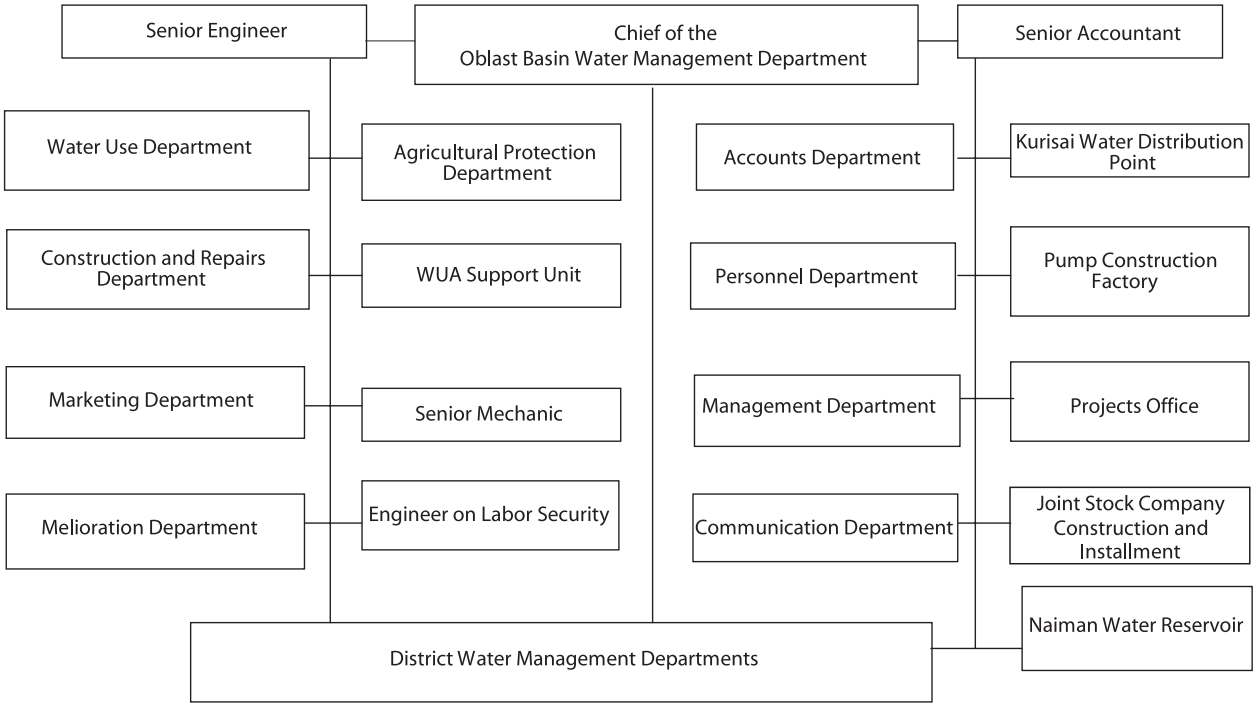


Basin Water Management Department: Oblvodkhoz

The key departments of the province mirror those of the Water Management Department under the MAWM (figure 3). The Water Use Department under a senior engineer develops a schedule of irrigation for the provincial irrigation system on the basis of demand received from districts and reconciles district water-use plans with estimated availability. It controls and monitors water use. The Construction and Repairs Department prepares a provincial plan of repair and maintenance needs on the basis of assessments by the hydro-sections of the districts. Costs are estimated through the Accounts Department and requests to the ministry are developed. These and all other departments and sections are accountable to a Chief.

The provincial-level interview respondents characterized the functions of the organization as mainly supervisory. The province controls the activities of the districts in the province with regard to water distribution, water-use plan and the observance of allocation plans, maintenance

FIGURE 3.
Organogram of the Osh Province Basin Water Management Department.



and repairs, and approval of activity plans. The stated goal is to ensure equitable distribution of the available resources. It collects data on all management activities from the district and aggregates the data on allocation, financial requirements and expenditures for submission to the Water Management Department.

The province maintains interprovincial relationships with neighbors concerning the O&M of shared canals. They solve problems and manage cross-boundary issues, such as water deliveries or repair needs, through negotiation and joint decisions on the basis of their records. Furthermore, the province implements the rehabilitation plans of the Republican Department and hires construction companies for large projects.

District Water Management Department: Raivodkhoz

The districts are the implementation departments for all water-management functions in the general canal systems in both provinces studied. Given the relatively small size of the systems in Osh and Jalalabad, they manage most MCs and IFCs, with the exception of one main system under an Interdistrict Department. Their internal structure is again similar to that of the province but their staff is larger since they include hydro-sections responsible for a canal sector (figure 4). Under the supervision of a Chief, the following departments and functions are typical:

- The Water Use Department is led by a Head Engineer (hydro-technical engineer) responsible for the O&M of the irrigation

system, in particular the allocation of water to users and delivery to the OFC offtakes. Two engineers are responsible for the supervision of the hydro- sections' implementation of the department's plans and one engineer is specialized in land reclamation. The Department also gets involved in the regulation of conflict situations among both water users and staff. Each hydro-section has a Section Head and 6 to 12 technicians who carry out O&M activities at the canal, including minor cleaning and repairs. They also control the level of discharges at the OFC headworks, negotiate water releases with farmers, and record and communicate to the Communications Department the actual discharges from IFC sections.

- The Repairs and Construction Department is headed by a hydro-technician and assisted by a construction engineer. They coordinate all repairs and construction activities. Capital repairs involving contractors require a tender process carried out by the district's Tender Committee. Annual maintenance and repair plans are developed and estimates submitted to the provinces.
- The Communication Department headed by a junior technician has four telephone operators with radio telephones who collect operational information three times a day and record the data in a "book of supervision" or canal register. This crucial function tracks the development of the water-supply situation in the district-canal system.
- The Mechanization Department is headed by a senior mechanic who supervises an assistant mechanic for repairs, a dispatcher and five drivers. The Department runs five tractors, five excavators and three trucks, used for maintenance, repairs and transport.
- The Supplies Department consists of one person handling and guarding the province's construction materials.
- A Senior Accountant heading the Department of Accounts maintains all accounts, does banking, and is responsible for salaries and computerized records. He also heads the personnel department, which looks after all relevant personnel matters, including records and hiring.

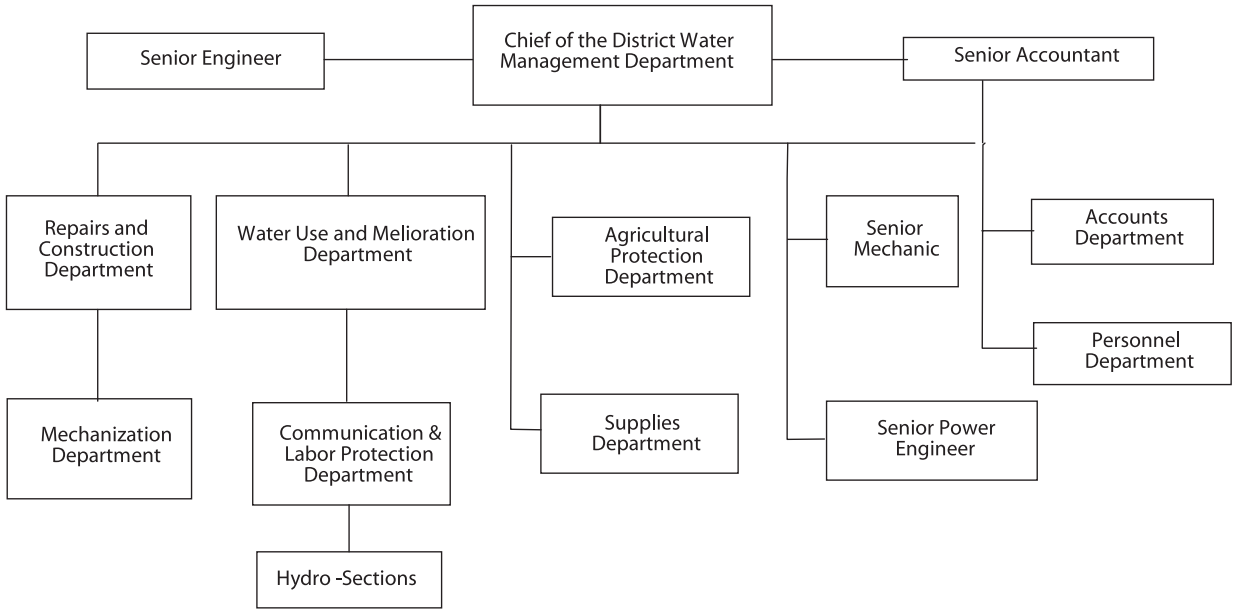
Water User Associations

WUAs have been a recent development in Kyrgystan. Since 1996 there have been initiatives by the village and district governments to establish some level of responsibility for OFCs among water users, because these are the most deteriorated parts of the canal system and the village government administration lacks the financial and human resources to carry out the necessary O&M tasks.

WUAs were initially established and formally recognized under a 1995 government decree on the "Regulations on WUAs in Rural Areas" and eventually in the more comprehensive 1997 decree on the "Statute for WUAs in Rural Areas." The latter permits the transfer of OFC infrastructure and the trade of water, requires operational record keeping and ISF payments, and enables WUAs to sanction the violation of rules and regulations.

There were 42 WUAs in the Osh Province and 44 in the Jalalabad Province when this study was carried out. The WUAs collect an ISF from their members and pay the district for the delivery of water to their OFCs. They collect an additional fee from their members to maintain their staff and offices. The staff is in charge of O&M activities, resource mobilization and conflict resolution at the OFCs within their area of authority. Maintenance activities are carried out during the winter months, when canals are mostly dry, and involve labor mobilization among the farmers receiving supplies from the respective canals. Since they were developed by the FSK administration and the district, their typical organizational setup closely resembles the

FIGURE 4.
Organogram of the Karasu District Water Management Department.



structural model of the collective farm administration and state WMOs and is dominated by their chairman.

The procedure of selection of the WUA office bearers is not uniform among the WUAs. Some elect their council directly in general membership meetings. In others, a WUA's command area is divided into sections and the cultivators in each section select a section representative to the WUA council. Here the council elects a chairman, either from among the council members or from the general members. In some cases, the chairman is not a farmer in the command area, but hired as a technical manager. Members of staff are hired and salaried. There have been several projects supporting WUAs under donors, such as the World Bank and the ADB. The current projects promoting WUA establishment and strengthening are the World Bank's On-Farm Irrigation Projects (OIP) and the IWRM-Fergana Project.

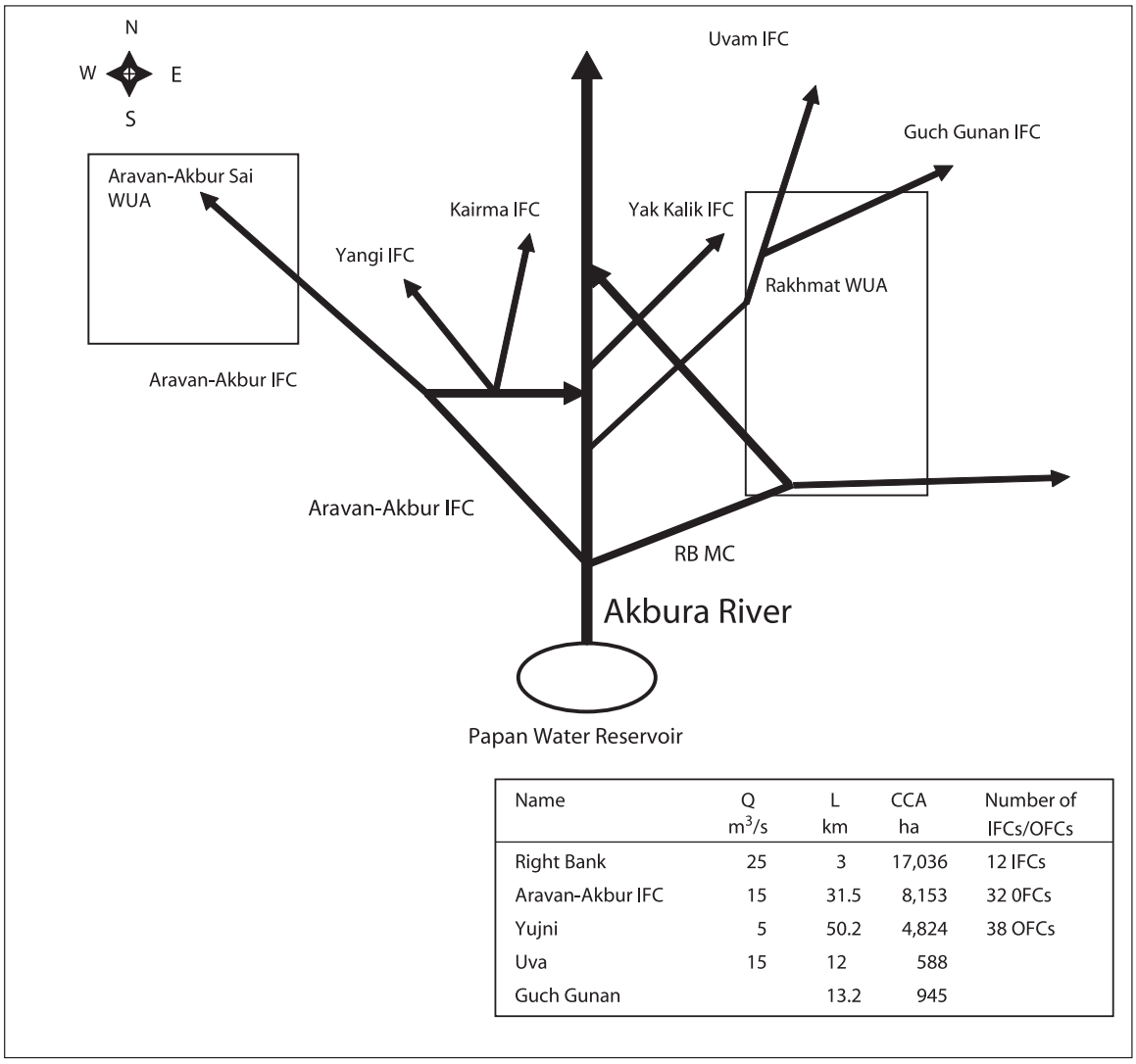
Case Study of Two Irrigation Systems in Kyrgystan

This section looks at the constraints of effective management of irrigation systems at their various levels, in the context of the ongoing reforms, by taking a case study approach. After the brief introduction of the irrigation systems studied, the discussion will be organized according to the core functions of irrigation management taking place in the reformed irrigation systems. It concludes with a review of some key issues in the implementation of water reforms and development of WUAs in Kyrgystan to date.

Akbura River System

This system is located in the Osh Oblast of Kyrgystan and is thus under the authority of the Osh Province. It is below the Papan reservoir on

FIGURE 5.
Akbura river system.



Name	Q m^3/s	L km	CCA ha	Number of IFCs/OFCs
Right Bank	25	3	17,036	12 IFCs
Aravan-Akbur IFC	15	31.5	8,153	32 0FCs
Yujni	5	50.2	4,824	38 OFCs
Uva	15	12	588	
Guch Gunan		13.2	945	

the Akbura river, a former tributary of the Kara Darya now terminating at the South Ferghana Canal. Hence, several short MCs offtake from both banks of the river south of the city of Osh. These MCs form a small complex system in which the water resources abstracted from the Akbura river can be distributed to six IFCs or redirected to the river to enable system managers to regulate water-resources flexibly (figures 5).

The Yujni and Uvan IFCs offtake from the RBMC and supply command areas of 4,824 and 588 hectares, respectively. The sample "Rakhmat" WUA, serving an irrigated area of 3,509 hectares on a section of the territory of the former Kolkhoze "Kurmanjan Datka," receives a part of its water supply from the Yujni IFC in addition to the Uvan and Osh Feeder IFCs. The WUA is located in the head reach of the IFCs. Karasu District is responsible for the operation of the right bank main canal (RBMC) and the two IFCs serving the Rakhmat WUA.

On the left bank of the Akbura, the Aravan-Akbura MC offtakes and eventually splits into the Aravan-Akbura IFC and an MC branch, which serves two further IFCs and eventually flows back to the river. The Aravan-Akbura IFC serves a

command area of 8,153 hectares, of which 2,200 hectares are located in the Aravan District and the balance in the Karasu District. The Aravan-Akbur Sai WUA is responsible for the OFC system serving the entire territory of the former Sovkhoze "Kerma-To" and manages an on-farm irrigation system with a command area of 2,078 hectares. It receives its total water supply from the Aravan-Akbura IFC and is located in its tail reach. The IFC also serves as a feeder canal for the Aravan Sai, a seasonal stream, which irrigates four agricultural units (FSKs) in the Aravan District. The IFC adds about 1–2 m^3/s to the Aravan Sai during most of the cultivation season, but may carry up to 9 m^3/s within the Aravan District, to provide the Aravan Sai with 5–6 m^3/s during the season of peak water demand and low to zero flow in the Aravan Sai. The responsibility for the Aravan Akbura IFC is shared by the Karasu and Aravan districts.

Karaungur River System

The Karaungur river system (figure 6) is located in the Jalalabad Province, which manages the canal system offtaking from the Karaungur river's right and left banks. The Karaungur is a tributary of the Kara Darya. The RBMC serves a command area of 18,000 hectares, supplies 104 IFCs and runs through the Bazarkurgan and Nokeen districts. The Massi IFC is fed by the RBMC and commands an area of 2,424 hectares. The sample Murat Murap WUA manages the on-farm irrigation system offtaking from the Massi IFC. The Vakhum Aral IFC also offtakes from the RBMC and irrigates a command area of 2,240 hectares. It is the main source of the irrigated area of the Aral village. Here the Aral Sai WUA manages the on-farm irrigation system. Both WUAs are located in the mid-reach of the RBMC. The Aral Sai WUA covers the entire IFC, while the Murat Murap WUA is in the head reach of the Massi IFC. Nokeen and Bazakurgan districts are responsible for the IFCs, while the RBMC, together with the Left Branch Main Canal (LBMC) and the Karaungur dam is under the Karaungur Interdistrict Department. The LBMC was not included among the sample sites selected.

Operation

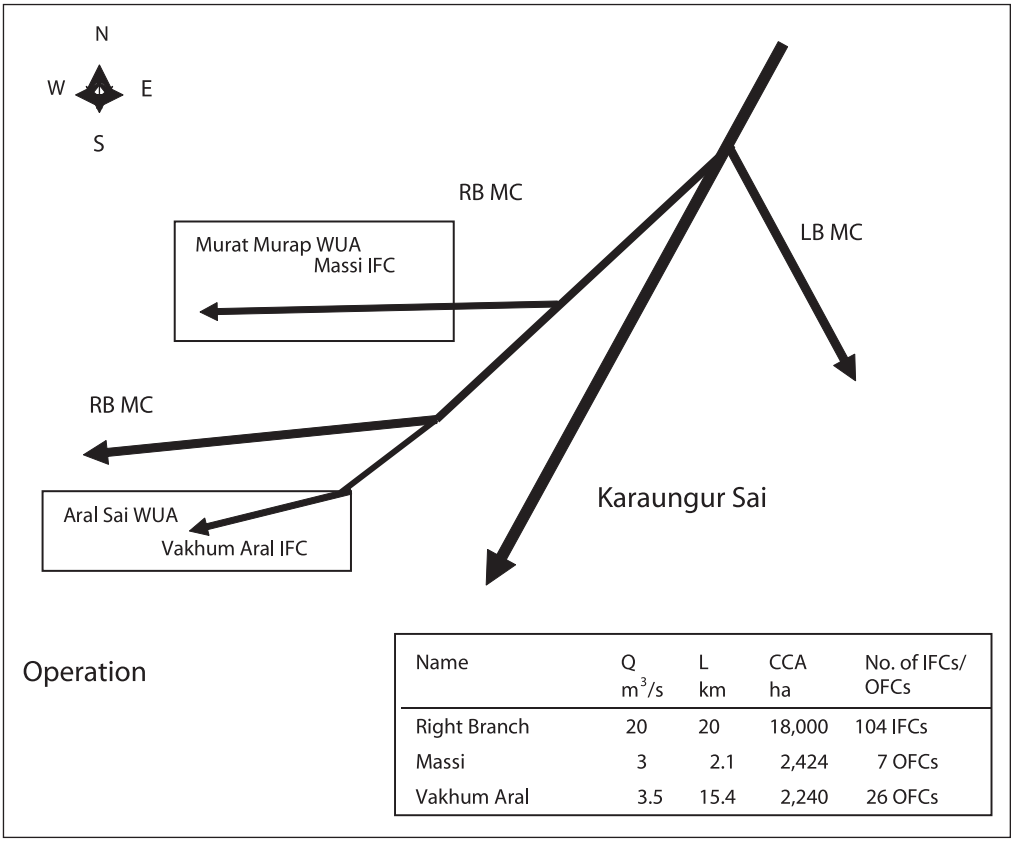
Considerable losses due to rehabilitation and maintenance deficits in the irrigation systems of Central Asia interact with serious inequities in the distribution of water to impair effective water management.

The irrigation systems of Central Asia are operated as demand-based systems. However, under conditions of water scarcity, a demand-based system can turn into an opaque supply-based system.

There are indications that the demand-based system in Kyrgystan is no longer truly operative. The data in table 1 show that, in almost all sample sites considered, demand cannot be satisfied and actual supplies are consistently below demand. Yet, limits no longer appear to be imposed as an operational parameter. The data recorded by the WMOs sampled in the Osh Province only show demand and actual supply while in the Jalalabad Province demand and limits are consistently shown as identical. This situation may be viewed as an indicator that Kyrgystan no longer perceives the institution of limits as binding. In fact, during the highly water-scarce summer cultivation season of 2000, the Republic consumed 124 percent of the allocated limits of the River Basin Organziation (RBO) (ICWC 2001).

The consistent inability to satisfy demand suggests scarcity conditions, which is borne out by the general agreement among all water users and managers in the Ferghana Valley that the year 2000, the year of this study, was a "dry year" in terms of water availability. The low inflow levels into the Andijan reservoir in the Kara Darya subbasin at 34 percent of averages, recorded by the Syr Darya RBO, confirm this (ICWC 2001).

FIGURE 6.
Karaungur river system.



Operation

Name	Q m^3/s	L km	CCA ha	No. of IFCs/ OFCs
Right Branch	20	20	18,000	104 IFCs
Massi	3	2.1	2,424	7 OFCs
Vakhum Aral	3.5	15.4	2,240	26 OFCs

The practice of assuming that demand and limits can be equal proves to be dangerous, because, as in 2000, scarcity will be a phenomenon that the system is ill-prepared to deal with.

Under scarcity conditions, limits are intended to modify demand across the entire system in proportion to the deficit in water availability. This would mean that scarcity is shared equitably. However, if limits are no longer considered, this equitable reduction of demand is no longer operative. A water manager may respond to actual availabilities and seek to distribute scarcity equitably, or he may respond to pressures from water users and their influential allies on a short-term basis. The latter is especially likely because farming in the region is habituated to a cropping-plan-dominated system, supplied with seemingly unlimited water resources. Therefore, cultivators need to compete for water to meet crop demand.

Farmers are also used to making short-term requests within a few days of intended field irrigations. The prevailing system of irrigation scheduling tends to follow a first-come-first-serve principle at all levels, which entails inefficiencies. Given scarcity, while crop demand is not adjusted to availability, competition for the scarce water resources intensifies and head-reach users may appropriate water according to their demands while tail-reach users will no longer receive even three turns of irrigation for a crop requiring four or five turns.

Scarcities are also temporarily concentrated during the peak evaporative period of July and August. During this critical period competition

TABLE 1.
Operational data for sample areas (Kyrgystan, 2000).

Unit of analysis	CCA	Demand		Actual		Supply/ Demand	Real system losses	Compen sation for system losses	System losses incurred by WUA	Adjusted supply/ demand including real losses incurred	Adjusted deficit	ISF collection rate
	A	B	C	D	E	F	G	H	I	K	L	M
	ha	million m^3	m^3/ha	million m^3	m^3/ha	%	%	%	%	%	%	%
Osh Province	132,791	952.612	7,174	81 8.196	6,162	85.9						45
Jalalabad Province	129,140	907.2	7,025	760.5	5,889	83.8						65
Aravan District	22,310	135.272	6,063	109	4,886	80.6						80
Karasu District	42,464	320.83	7,555	309.729	7,294	96.5						70
Nooken District	22,9 00	168.1	7,341	180.2	7,869	107.2						65
Rakhmat WUA	3,509	40.032	11,408	20.038	5,710	50.1	45	25	20	70	30	na
Murat Murap WUA	2,312	17.1	7,396	9.09	3,932	53.2	39	25	14	67	33	75
Aral Sai WUA	2,269	10.5	4,628	7.08	3,120	67.4	39	25	14	81.5	18.5	80
Aravan-Akbur Sai WUA	1,907	na	na	na	na	na	na	na	na	na	na	61.9

turns into conflict and water users are reported to be stealing water, by manipulating gates at IFCs and by taking water from OFCs out of turn, both day and night.

Table 1 presents the data collected from the records of the Osh and Jalalabad provinces, Aravan, Karasu and Nooken districts and the Rakhmat, Murat Murap and Aral Sai WUAs. It indicates a remarkable difference in the proportional reduction between demand and actual supplies between higher-level units, the province and the district, and the lower level WUAs at the on-farm level, ranging between 32.5 and 50 percent.

It could be assumed that the WUAs are not paying sufficient ISF thereby receiving reduced actual supplies. Yet, this assumption is not consistent with the pattern of the ISF collection rate in the sample areas. According to information received from the concerned WMOs, the ISF collection rate for the Osh Province was a mere 45 percent, while 85 percent of its

demand was received. The situation in Jalalabad is slightly better at a collection rate of 65 percent, but is hardly reflected in its level of demand satisfaction. In Nokeen Rayon, the collection rate is 65 percent and the actual supply is 107 percent. The lack of correlation between actual supply and ISF rate is even clearer in table 1.

The next possible reason for the WUAs' gross reductions in supply relative to demand is that the losses in the main and inter-farm systems are extreme and can range from 26 to 50 percent. However, in the Aral Sai WUA, losses exceed supply deficits, which could be erroneously interpreted as limited inequity in favor of Aral Sai.

However, if compensation for losses in the WMOs' water plans is considered at a conventional rate of 5 percent for MCs and 20 percent for IFCs, i.e., a total of 25 percent, the picture changes. Compared to the overall supply rates in their districts, the Rakhmat WUA receives 26.6 percent less than the average water users within the Karasu District, and the Murat Murap and Aral Sai WUAs receive 40 and 25.5 percent less, respectively, than the average water users in the Nokeen District. Considering there is a +/- 10 percent variation in proportional distribution between canals within reasonable margins of equity (Bhutta and Vander Velde 1993), these deficits indicate considerable inequity in all three cases.

It is possible that water unaccounted for may have been used in the sample sites because all WUAs reported (see table 3 below) above-average yields compared to their districts, while their per hectare water supply, based on recorded actual supply, would, in several cases, be below normal crop demand.

At the sample sites, both users and managers reported equity issues. Many farmers reported that fights flare up when too many farmers are queued up and wait their irrigation turn and the mirob would favor certain farmers over others. District officials at all sample sites confirmed that head-tail inequity was prevalent at the IFCs and OFCs since, in high-demand times, upstream water users would steal water and downstream farmers consequently do not receive sufficient amounts.

In a water-scarce demand system, which has turned into a nontransparent supply-based system, such coping mechanisms of individual cultivators are rational, as they cannot rely on the system to be equitable and fair.

"There are problems with water distribution, because our system does not have water measurement devices," Chairman and Director of the Kermetoo Akbur Sai WUA.

WUAs need to be strengthened to fulfill this role of management of common water resources through cooperative action of free individual producers, rather than through compulsory state organizations. At present, there is a danger of building another government organization besides or within the village, which manages irrigation systems by policing farmers and giving unfulfilled promises.

The water managers appeared to be unclear about their capacity for *sanctioning irrigation offenses.* The means of sanctioning are the reduction of supplies for individual canals or the stoppage of water that can be unfair to innocent parties. Therefore, more frequent and perhaps more effective is the exertion of social pressure involving the villages and districts. However, this can be inefficient, if water managers spend too much time resolving conflicts. Institutionalized means and decentralization of negotiated resolution through WUAs are therefore desirable.

"People steal water from each other. They (farmers) try to solve these problems on the general meetings, but are never successful. We do not fine people…." Chairman of the Rakhmat WUA.

In a context of water scarcity and potential inequity, *measurement of water* becomes all the more crucial to ascertain proper distribution

patterns and resolve disputes on the basis of reliable data. However, despite the water managers' claim that they had sufficient devices, measured twice daily, and that they maintained and frequently calibrated their gauges, the availability of functional measuring devices was observed to be highly uneven. Measurement structures in reasonable working condition were generally present only at the MC and IFC levels. Given that farmers pay volumetric charges, twice daily measurements cannot accurately account for fluctuations in the system. Flow measurements with current meters to receive more accurate sample readings were reported to be used for special purposes, such as dispute resolution.

Guessing is involved at the OFC level in most systems observed, and at most WUAs or villages, the volumetric ISF rate is recalculated on a per hectare basis for lack of measuring capacity in the Kermetoo WUA and in many others. Thus, rates can be considerably higher than in systems using volumetric charges, a condition, which may remain nontransparent to the average water user.

Another condition affecting operational capacity, much lamented by many water managers, is the complexity of the irrigation system, which has increased considerably with the breaking up of collective farm units into smaller private and peasant farms. This impaired OFC management from a maintenance perspective and responsibility has also created a multitude of potentially competitive demands.

At present, there appears to be a need to accommodate requests for water from a host of users at the same time. The practice of first-come-first-serve in listing turns between users on an OFC appears wasteful and reduces operational efficiency of a system. Water and time are wasted as the turn is moved up and down the canal. Recognizing this problem, some WUAs have resorted to irrigating in sections, which take subsequent turns, either in groups or individually, depending on flow levels. Again this requires discipline and means of sanctioning, and the mobilization of WUAs is expected to resolve these new difficulties.

"*We use the canal water for laundry, cleaning of houses, bathing, etc., as there is no domestic water supply system in our village,*" A farmer of the Kermetoo WUA.

Irrigation plans and schedules have also become more complicated since a greater variety of crops having different water requirements are grown. In addition, district staff complained about receiving cropping plans too late from WUAs and villages, which impairs timely planning at their own level.

Another consequence of farm fragmentation and privatization is that the new farmers are not yet well experienced in water management, farming and marketing and have to acquire multiple skills. These include prompt and accurate scheduling of irrigation turns and preparing cropping plans, which then need to be coordinated within OFC command areas.

The interconnected nature of the system adds to complexity as well, where, as for example in the Rakhmat WUA, the irrigated area under the WUA is served from three IFCs plus another branch IFC and where small canals the size of field ditches offtake from IFCs as much as from OFCs. The establishment of WUAs on all or part of the FSK territory, instead of on hydro-systems with clear hydro-boundaries, makes operation complicated and inefficient, since irrigation turns must always be coordinated with other units. Such arrangements lead to recurrent conflicts with upstream and downstream units.

In Osh, at the IFC system level, interprovince and interdistrict relations across shared canal systems are organized rather informally. There is no unified canal management, but more or less informal communication across administrative boundaries and, at the district level, a contractual

agreement. The latter stipulates agreed amounts of discharges and forms the basis for negotiations in cases of conflict or the need to reduce water supplies due to water scarcity. Besides being inefficient from an operational point of view, this leaves room for interpretation of rights and each party would seek to first represent and serve the interests of "his or her" canal section and area of authority, especially if there are additional pressures from "their" farmers and *Okims* (local government officials). They place two agencies with equal levels of authority in a head-tail relationship. Negotiations between two districts at provincial boundaries can be particularly cumbersome since these may be moved upwards to the provinces when four agencies get involved in settling matters of one canal. However, the Chief of the Osh Province would only get involved in rare cases when serious disagreements over downstream water releases are developed.

In the Jalalabad Province, conflicts between two districts sharing the Karaungur system, about water theft by upstream users and alleged complicity by upstream districts had been too frequent to be handled effectively so that the province resolved to create the Karaungur Interdistrict Management Department. Its Chief is authorized to give orders to the District Chiefs on water operational matters. The province has institutionalized a higher-level authority to control conflicts from above, rather than creating internal mechanisms, which would enable the districts to effectively manage the hydro-system for which they are responsible. At the same time, administrative control replaces real integrated hydro-boundary management.

Maintenance

Maintenance is highly uneven and follows an informal system of prioritization, as the financial resources for optimal care of the canals are not available. First, urgent repairs of damages, which would undermine the operation of the system are attended to, such as the restoration of headworks structures and major breaches in canals. However, leakage due to cracks in lined canals, reconstruction of canals, which no longer conform to design parameters, and removal of obstructions by gravel are deferred until they develop into needs for urgent repairs. Often, this means years of suboptimal operating conditions, including high losses, obstruction of flow and heading-up of level in the head reaches of canals, all of which adversely affect downstream water availability.

"*We develop an O&M plan every year, but we have difficulties in implementing it,"* Chairman and Director, Kermetoo Akbur Sai WUA.

At the on-farm level, WUAs and village governments claim to carry out routine cleaning of silt with the participation of farmers. Yet, financial resources of WUAs are as yet insufficient to enable them to hire the necessary excavation equipment to undertake heavier cleaning activities and to carry out much-needed repairs of damaged canals.

The losses at the on-farm system create a serious problem in accounting for the ISF payment. As water is measured at the head of an OFC, downstream users require larger amounts during their turn, if losses of up to 50 percent occur. In such cases, the per hectare charge, which is levied in WUAs without measuring devices, appears fairer.

On the sample sites, seepage from fields is collected in on-farm drains managed by WUAs and returned to the many seasonal streams crossing the irrigated areas. The drains were observed to be in an unmaintained state, overgrown with weeds, silted up and damaged and, in many places, breaching. These cause waterlogging in adjacent areas including agricultural fields, as the drainage flow is obstructed.

Resource Mobilization

The ability to mobilize sufficient resources to cover the O&M costs, including the cost of ISF collection, determines the financial sustainability of a WMO and its irrigation system.

The cost of irrigation services can be paid from two main sources, the direct fee payment by service users or the payment through government subsidies. In many countries, financial resources from donor countries in the form of grants or loans subsidize irrigation services to some extent.

Regardless of these sources of income, the assumptions about cost recovery and ability to pay for required O&M, as opposed to mere running of the system with deferred maintenance, are crucial considerations for any irrigation system and for investments in the irrigation sector. To ascertain the financial capacity of the irrigation system to pay for itself, an analysis of the value of production of key crops in the sample areas, as well as of the O&M costs and recovery through ISF was carried out (tables 2 and 3). In addition, we attempted to estimate the value of water in the sample areas (table 4). This analysis should be considered as roughly indicative of the current situation.

TABLE 2.
Relationship between the O&M costs of irrigation systems, ISF and value of agricultural production in the sample areas (Kyrgystan, 2000).

Unit of analysis	Actual O&M expenditure	Estimated O&M cost	Estimated O&M *2	O&M gap	O&M gap*2	ISF collection rate	ISF WUA or district
	A KZS/ha	B KZS/ha	C KZS/ha	D KZS/ha	E KZS/ha	F %	G KZS/ha
Osh Province WMO	277	280	561	4	284	45	na
Jalalabad Province WMO	361	354	708	na	347	65	na
Karasu District WMO	272	311	622	39	350	80	175
Aravan District WMO	191	208	417	17	225	80	103
Rakhmat WUA	29	96	192	68	164	75	21
Murat Murap WUA	31	111	222	80	191	80	34
Aral Sai WUA	na	274	547	na	na	62	102
Aravan-Akbur Sai WUA	na	na	na	na	na	na	175
	US$/ha	US$/ha	US$/ha	US$/ha	US$/ha	%	US$/ha
Osh Province	5.80	5.9	11.8	0.1	6.0	45	na
Jalalabad Province	7. 57	7.4	14.8	na	7.3	65	na
Karasu District	5.71	6.5	13.1	0.8	7.3	80	3.7
Aravan District	4.01	4.4	8.7	0.4	4.7	70	2.2
Rakhmat WUA	0.60	2.0	4.0	1.4	3.4	75	0.4
Murat Murap WUA	0.65	2.3	4.7	1.7	4.0	80	0.7
Aral Sai WUA	na	5.7	11.5	na	na	62	2.1
Aravan-Akbur Sai WUA	na	na	na	na	na	na	3.7

Note: US$1.00 = Kyrgyz Soums (KZS) 47.677 in all tables.

Table 2.—Continued

Unit of analysis	ISF/actual O&M expenditure	ISF/ estimated O&M cost	ISF/ estimated O&M cost*2	Actual O&M expenditure /gross value	Estimated O&M cost/gross value	Estimated O&M cost*2/ gross value	O&M gap /net value	O&M gap*2/net value
	I	K	L	M	N	O	P	Q
	%	%	%	%	%	%	%	%
Osh Province WMO	na	na	na	na	na	na	na	na
Jalalabad Province WMO	na	na	na	1.5	1.4	2.9	na	na
Karasu District WMO	64	56	28	1.0	1.1	2.2	0.2	1.9
Aravan District WMO	54	49	25	0.7	0.7	1.4	0.1	1.2
Rakhmat WUA	75	22	11	0.1	0.4	0.7	0.4	1.0
Murat Murap WUA	109	30	15	0.1	0.3	0.6	0.3	0.8
Aral Sai WUA	na	37	19	na	na	na	na	na
Aravan-Akbur Sai WUA	na	na	na	na	na	na	na	na

Unit of analysis	Total ISF/GV	Total ISF necessary to cover estimated O&M costs		Total ISF necessary to cover O&M/GV	Total ISF necessary to cover estimated O&M*2		Total ISF necessary to cover estimated O&M*2/GV
	R	S	T	U	V	W	X
	%	KZS/m^3	KZS/ha	%	KZS/m^3	KZS/ha	%
Osh Province	na	na	na	na	na	na	na
Jalalabad Province	na	na	na	na	na	na	na
Karasu District	0.73	0.043	311	2.2	0.085	622	2.2
Aravan District	0.41	0.043	208	0.7	0.085	417	1.4
Rakhmat WUA	0.6	0.059	407	1.6	0.143	814	3.1
Murat Murap WUA	0.4	0.088	465	1.4	0.236	930	2.7
Aral Sai WUA	na	0.148	628	na	0.402	1255	na
Aravan-Akbur Sai WUA	na	na	na	na	na	na	na

Table 2.—Continued

Unit of analysis	Total ISF/GV	Total ISF necessary to cover estimated O&M costs		Total ISF necessary to cover O&M/GV	Total ISF necessary to cover estimated O&M*2		Total ISF necessary to cover estimated O&M*2/GV
	R	S	T	U	V	W	X
	%	US$/m^3	US$/ha	%	US$/m^3	US$/ha	%
Osh Province	na	na	na	na	na	na	na
Jalalabad Province	na	na	na	na	na	na	na
Karasu District	0.73	0.001	6.5	2.20	0.002	13	2.2
Aravan District	0.41	0.001	4.4	0.70	0.002	9	1.4
Rakhmat WUA	0.57	0.001	8.5	1.60	0.003	17	3.1
Murat Murap WUA	0.4	0.002	9.7	1.40	0.005	19	2.7
Aral Sai WUA	na	0.003	13.2	na	0.008	26	na
Aravan-Akbur Sai WUA	na	na	na	na	na	na	na

TABLE 3.
Gross and net value of production of major crops in the sample areas (Kyrgystan, 2000).

Unit of analysis	Crop	CCA	Proportion of CCA	Yield	Price	Gross value	Cost	Net value	Gross value	Cost	Net value
	A	B	C	D	E	F	G	H	I	K	L
		ha	%	t/ha	KZS/t	KZS/ha	KZS/ha	KZS/ha	US$/ha	US$/ha	US$/ha
Osh Province		132,791	na	na	na	na	na	na	na	na	na
Karasu District		42,464									
	Cotton		18.6	2.61	11,086	28,934	9,998	18,936	607	210	397
	Wheat		4.9	3.87	6,268	24,257	10,499	13,758	509	220	289
	Rice		0.3	1.67	17,551	29,310	500	28,810	615	10	604
	Average					27,976	9,981	17,995	587	209	377

Table 3.—Continued

Unit of analysis	Crop	CCA	Proportion of CCA	Yield	Price	Gross value	Cost	Net value	Gross value	Cost	Net value
	A	B	C	D	E	F	G	H	I	K	L
		ha	%	t/ha	KZS/t	KZS/ha	KZS/ha	KZS/ha	US$/ha	US$/ha	US$/ha
Rakhmat WUA		3,509									
	Cotton		15	2.37	11,086	26,274	9,998	16,276	551	210	341
	Wheat		57	4.17	6,268	26,138	10,499	15,639	548	220	328
	Rice		Not grown								
	Average					26,166	10,395	15,771	549	218	331
Aravan District		22,310									
	Cotton		12.6	2.97	11,086	32,371	9,998	22,373	679	210	469
	Wheat		29.1	4.22	6,268	27,454	10,499	16,955	576	220	356
	Rice		0.3	4.07	17,551	65,465	500	64,965	1,373	10	1,363
	Average					29,201	10,277	18,923	612	216	397
Aravan-Akbur Sai WUA		1,907									
	Cotton										
	Wheat		43.1	4.22	6,268	26,451	10,499	15,952	555	220	335
	Rice		Not grown								
	Average					26,451	10,499	15,952	555	220	335

Note: Data for year 2000 prices were provided by the Provincial Statistics Departments. All cost data for the Jalalabad and Osh provinces at all levels were taken from the Report of the A-2 Component of the GEF Project on “Participation in Water Saving” (GEF & DHV 2000)

Table 3. —Continued

Unit of analysis	Crop	CCA	Proportion of CCA	Yield	Price	Gross value	Cost	Net value	Gross value	Cost	Net value
	A	B	C	D	E	F	G	H	I	K	L
		ha	%	t/ha	KZS/t	KZS/ha	KZS/ha	KZS/ha	US$/ha	US$/ha	US$/ha
Jalalabad											
Province		129,140									
	Cotton		16.3	2.6 7	11,086	29,600	9,998	19,602	621	210	411
	Wheat		31.9	3.47	6,268	21,750	10,499	11,251	456	220	236
	Rice		na	na	na	na	na	na	na	na	na
	Average					24,405	10,330	14,075	512	217	295
Nooken											
District		22,900									
	Cotton		45	2.5	11,086	27, 715	9,998	17,717	581	210	372
	Wheat		28	2.7	6,268	16,924	10,499	6,425	355	220	135
	Rice		na	na	na	na	na	na	na	na	na
	Average					23,576	10,190	13,386	494	214	281
Murat Murap											
WUA		2,312									
	Cotton		47.7	4.1	11,086	45,453	9,998	35,455	953	210	744
	Wheat		36.1	3.1	6,268	19,431	10,499	8,932	408	220	187
	Rice		Not grown								
	Average					34,243	10,214	24,029	718	214	504
Aral Sai WUA		2,269									
	Cotton		41.9	na	11,086						
	Wheat		32.7	na	6,268						
	Rice		6	na	17,551						
	Average										

Note: The formulae applied to calculate average values and cost are as follows:

Average gross value = Ó $(y*p*F_{CCA})_{i1-x}$ / Ó $F_{CCA\,i1-x}$

Average cost = Ó$(c*F_{CCA})_{i1-x}$ / Ó $F_{CCA\,i1-x}$

Average net value = Ó$(n* F_{CCA})_{i1-x}$ / Ó $F_{CCA\,i1-x}$

where, y = yield, p = price, c = cost, F_{CCA} = proportion of irrigated area for crop type, n = net value (y*p-c), and i1-x = different crop types.

TABLE 4.
Value of water in sample areas (Kyrgystan, 2000).

Unit of analysis	GVP		Net value of production		Actual water delivered	Gross value of water (actual water delivered)		Net value of water (actual water delivered)		Actual water delivered + losses in WUAs	Gross value of water (actual water delivered + losses in WUAs)		Net value of water (actual water delivered +losses in WUAs)	
	A	B	C	D	E	F	G	H	I	K	L	M	N	O
	KZS/ ha	US$/ ha	KZS/ ha	US$/ ha	m^3/ha	KZS/ m^3	US$/ m^3	KZS/ m^3	US$/ m^3	m^3/ha	KZS/ m^3	US$/ m^3	KZS/ m^3	US$/ m^3
Aravan District	29,201	612	18,923	397	4,886	6.0	0.13	3.9	0.08					
Karasu District	27,976	587	17,995	377	7,294	3.8	0.08	2.5	0.05					
Rakhmat WUA	26,166	549	15,711	331	5,710	4.6	0.10	2.8	0.06	12 ,690	2.1	0.04	1.2	0.03
Jalalabad Province	24,405	512	14,075	295	5,889	4.1	0.09	2.4	0.05					
Nooken District	23,576	494	13,386	281	7,869	3.0	0.06	1.7	0.04					
Murat Murap WUA	34,243	718	24,029	504	3,932	8.7	0.18	6.1	0.13	10,081	3.4	0.07	2.4	0.05
Aral -Sai WUA	na	na	na	na	3,120	na	na	na	na	8,001	na	na	na	na
Aravan - Akbur Sai WUA	na	na	na	na	na	na	na	na	na	na	na	na	na	na

With the introduction of ISF in 1999, the state began a process of reducing its financial responsibilities for irrigation management. Now the state has assumed responsibility for the cost of the MAWM and the provinces and for 50 percent of the O&M costs of the districts. The remaining 50 percent and the entire cost for OFC systems are to be borne by water users through ISF. The present rate for ISF is not determined by the actual cost of the respective systems, but by an across-the-board volumetric fee of KZS 0.03/m^3 of water supplied to OFCs. The on-farm O&M costs are determined by the WUAs or respective villages, and thus in WUAs, at least in theory, by the water users.

Table 2, column F shows that the approximate rate of ISF collection varies greatly within the sample areas. Columns G and H show the amount of ISF paid per hectare and adjusted according to the ISF collection rate for each unit of analysis and based on actual water supplied in 2000 (table 4, column E). Table 2, column G shows the fee collected for the WUA or district separately and column H shows the combined ISF rate for the on-farm (WUA) and inter-farm levels. Where the WUA members pay a volumetric charge, the WUA's own per hectare income is very low compared to the WUA which charges a high per hectare rate.

Table 2, column A shows the actual O&M expenditure per hectare for 2000 reported by the WMOs sampled and column I indicates the recovery rate of actual expenditures by ISF collected. The relatively high recovery rates for the WUAs with available data, despite less than full collection rates, are explained by their very

low level of actual expenditure for maintenance (lack of funds) and, in the case of Murat Murap, by the higher ISF rate. The two districts actually recover more than 50 percent of their actual costs with ISF payments. This picture changes considerably if the estimated cost or requested/ planned budget of the WMOs is considered (columns B and K). The Karasu District can still cover more than 50 percent of its estimated cost, while the Aravan District can cover 49 percent of its estimated cost. All WUAs fall short of their anticipated O&M costs by 78 to 63 percent.

The estimated O&M costs are not a very good indicator of actual O&M needs. WMO staff stated that they always requested budgets very much below (almost half of) their real needs for repairs and maintenance, because they knew that actual requirements would never be covered. The WUAs also do not budget real needs because they also know that their ISF share would never cover such expenditures.

To get a somewhat more realistic idea of actual O&M needs and the capacity for cost recovery, the estimated O&M costs of the WMOs were doubled (column C). This assumption is based on the perceptions of the higher-level WMO staff that they intentionally reduce O&M needs by half, because they know by experience what will be funded. At the doubled rate of estimated O&M costs, the present ISF can only cover about a quarter of assumed expenditures at the district level and only between 11 and 19 percent of WUA costs (column L). The somewhat higher recovery rate of the Aral Sai WUA is due to its higher per hectare ISF.

The data presented so far clearly show that only districts cover about or more than the expected 50 percent of both their actual and estimated O&M costs from the ISF. Among the WUAs, actual costs cannot be met at present collection rates and present levels of ISF.

It is often argued that volumetric charges are a useful means to force water suppliers to fulfill their contractual obligations and thus promote accountability and equity. However, this market mechanism does not work when general availability is uncertain and losses are high.

Nevertheless, the situation discussed is once more aggravated by the fact that the Kyrgyz economy is extremely cash-poor, as a consequence of the government's fiscal policy. As a response, an extensive barter economy has emerged in Kyrgystan, which entails a considerable, yet hard-to-estimate, volume of economic transactions. This has significant adverse consequences for resource mobilization by WMOs and their ability to provide an effective service.

WUAs depend entirely, and the districts in part, on IFS paid by water users whose ability to pay in cash is highly constrained due to the circumstances described. Therefore, the government permitted water users to pay a part of the IFS in kind. The water managers interviewed at all sample WMOs reported that the cash/kind ratio was anywhere between 50/50 and 20/80 against the prescribed 70/30.

"*Last year (2000), we collected 70% of the ISF, 30% in cash and 70% in natural products (in-kind). I do not get anything for maintenance, as the ISF is only enough to pay salaries, which we pay in natural products,"* Chairman of Kermetoo Akbur Sai WUA.

For the districts, the situation is slightly less adverse than for WUAs. Since the districts receive about 50 percent of their budget from the government coffers, they have some access to cash. However, the districts reported that at times they receive cloths or machine parts. In order to procure necessary consumables, such as fuel for vehicles or construction materials, the water managers have to sell the goods received or barter them for the needed goods.

The barter economy and in-kind payment of ISF have decreased the efficiency and effectiveness of water management. Members of staff waste time with marketing goods, and procurement of necessary O&M inputs has become more expensive as a result of receiving low prices for their goods. Altogether, the ISF

and budget remittances are mainly spent on salaries and consumables, while capital repairs are neglected entirely, unless foreign exchange funds from donors can be secured.

This situation notwithstanding, the ISF payments in cash or kind are all accounted for in money terms by the WMOs and, therefore, it is possible to analyze the relationship of ISF to O&M costs, as well as to agricultural production. To understand how present O&M costs and ISF affect farmers' income and whether higher ISF charges would be reasonable, the gross and net value of production was calculated on the basis of available data on agricultural yields, prices and production costs. In these calculations the key crops cotton, wheat and rice (for others, data were not available) were considered first and then average gross and net values derived based on their proportional share in the total cropped area.

Table 3 shows general consistency in the gross and net values of production between the various units of analysis with variations owed to differences in agricultural yields.

A comparison of the actual O&M expenditures and the gross value of production (GVP) in table 1, column M, suggests that to cover the present WUA O&M costs only 0.1 percent of the GVP would be required, while at the district level 0.7 to 1 percent would be needed.

Columns D and E indicate the O&M gap between actual cost and estimated cost (O&M gap1) as well as doubled estimated cost (O&M gap2). The relationship between O&M gap1 and net value of production (NVP) and O&M gap2 and NVP is explored in columns P and Q, respectively.

To get a sense of the total cost incurred by a WUA member at present ISF rates, the proportion of total ISF (WUA + district) of the GVP is presented in column R of table 2.

Next, in columns S and T the necessary total ISF required to cover simple estimated costs is calculated as a per cubic meter and per hectare rate.

Finally, table 4 presents an analysis of the value of water. The data show that the gross value of production per unit of water at rates between US$0.06/$m^3$ and US$0.18/$m^3$ compares well with data from India, Pakistan, Sri Lanka and Iran, which range between US$0.04/$m^3$ and US$0.15/$m^3$ (Molden et al. 2001; Perry 2001). However, if the losses incurred at the various irrigation system levels are figured in for the Rakhmat and Murat Murap WUAs, the value of water declines by more than half. Thus, there is all the more incentive to invest in the improvement of the system in order to reduce losses.

On the basis of this analysis it may be concluded that, while the current ISF cannot cover the present O&M costs of the WUA and district levels, it amounts only to a very small fraction of the gross value of production (GVP) in the sample sites. If the IFS is raised to a realistic level of O&M cost recovery, the increase needs to be considerable, yet it would amount only to around 3 percent of the GVP. This level of IFS can be considered a reasonable investment in one of the most crucial means of production and may, therefore, provide a feasible target for long-term rate increases, particularly considering the extensive need for system rehabilitation.

Yet, the optimistic data, gleaned from the analysis of production costs, yields and prices, need to be put into perspective. Agricultural markets in Kyrgystan are insufficiently developed and many farmers are unable to sell enough of their products to achieve a reasonable standard of living. The decline of farm-gate prices of cotton in 2001, from about KZS18/kg in 2000 to KZS6/kg[7] has caused considerable losses, as the profitable year of 2000 motivated all the farmers to increase the area under cotton. This change in market conditions shows the vulnerability of the Kyrgyz market situation. Farmers lack

[7]US$1.00 = 40 KZS.

appropriate information sources about market trends and do not fully understand the effects of oversupplying the market with a single crop. They are not sufficiently familiar with crop diversification and are reluctant to invest in new crops, as they do not see any, and may well lack, opportunities for their marketing. There is a gross lack of information services about anything from agricultural techniques to marketing and processing.

Considering that marketing is a key problem, farmers were asked about their willingness to form marketing and input-purchasing cooperatives. They failed to see any value in such efforts as these ideas reminded them of the Soviet period. the Kyrgyz society still fails to value the importance of civil-society institutions, which underpin individual freedom with functioning community services, based on shared responsibility for common goods and interests.

Market constraints are among the key obstacles of sustainable institutional change in water-resources management in Kyrgystan. The farmers' inability to earn sufficient cash and pay higher ISF in cash, despite a reasonable production, seriously jeopardizes the sustainability of the O&M of irrigation systems.

Conflict Resolution

The provinces and districts do not maintain a formal structure for dealing with complaints and there is no culture of institutionalized debate and negotiation among stakeholder groups. A case that cannot be resolved through informal negotiation will be moved along the hierarchies of the double-subordination structure of government administration and eventually top-down solutions will be directed.

The local governments constitute one of the chief mechanisms for dealing with complaints, which may be concerned with problems between farmers and the government WMOs, and also between farmers. While farmers were reported to directly communicate with the districts through their hydro-sections in the first instance, they approach their village head, if disputes are not resolved satisfactorily at this level. The water managers recognize the local government as an arbitrator, whose authority may bring persistent conflicts to an end, but they also find that the Okim can reach solutions and impose demands, which interfere with the allocation and distribution system they have established. In Kyrgystan, the Okims have no formal administrative authority over WMOs, but their political and moral authority is strong and in the case of WUAs, the role of the village head in resolving problems is undisputed.

It was only at the Rakhmat and Murat Murap WUAs that a formal conflict-resolution mechanism was institutionalized in the form of arbitration committees. Recognized and entrenched conflict-resolution mechanisms are a signal that arbitration is taken seriously and offenses are not tolerated, and they help relieve the burden of water managers in spending time in resolving disputes. They also provide transparency and avoid conflicts of interest, as they keep executive staff out of formal arbitration.

The conflict-resolution mechanisms are thus a mix of informality and top-down imposition of resolutions. Stakeholders, including farmers, are used to complaining and appealing to authorities. A WUA is not necessarily recognized among farmers as a means of getting their disputes resolved. Formal and recognized mechanisms for joint resolution, based on mediation and negotiation among stakeholders, are a new concept in a culture in which civil-society initiative and responsibility are weak.

"*People steal water from each other. They try to solve these in general meetings, but are not successful,*" Chairman of Rakhmat WUA.

Organizational Management

All WMOs including WUAs reported that they were appropriately staffed, with the exception of the hydro-sections, which require additional staff during the peak irrigation season, in order to patrol canals during nights to prevent water theft. Members of the technical staff have the requisite levels of educational qualification. The organizations' departments are well established and structured according to functional requirements. Roles and tasks are clearly assigned and divided in a technical division of labor. The interface of departments within districts was reported to work usually without problems and, financial means permitting, key tasks are accomplished. However, members of the staff interviewed were, at times, unable to report on the roles and functions of other departments except those of their own.

The layers of state WMOs and their departments keep extensive records of all their transactions, from water to finance, by which service is accounted for internally and performance is monitored. Staff evaluation and sanctioning of rule violations are in the hands of chiefs and department heads. The record-keeping activity was meticulous in some WUAs and incomprehensive in others.

Members of staff are frustrated by their low level of pay, which ranges from as little as KZS400 (or US$10) for a dispatcher to about KZS1,299 (US$30) for a WMO chief, and by the unreliable and untimely receipt of payments, most of which are received in kind. Such a situation can make water managers susceptible to rent seeking and toleration of rule violation.

Internal accountability is organized upward within a conventional hierarchy of subordination and superordination, and lower-level administrative units are subordinated within a structure of increasing centralization. Accountability to the users of services is not institutionalized and is an alien concept to local water managers.

The formal organizational structures of a WMO are not based on a team approach but on a system where orders are handed down and members of lower staff report upwards. Yet, especially in the districts, where daily problems are solved and staff work in the field, a good deal of debate and discussion for joint problem-solving was observed. The dysfunctional demand system appears, in practice, to have been abandoned and is replaced by an approach which juggles available supplies with the needs communicated at the field level.

The system as a whole practices an outdated command-oriented management model and organizational culture, which is not based on critical internal debate and joint exploration of problems. From the WUA to the province all members of staff are focused on the chiefs and their decisions, as well as on procedures. Such systems tend toward ritualism and formal task fulfillment, but are less-effective in searching for, and finding, optimal solutions for problems and in motivating staff dedication.

Formal opportunities for stakeholder participation are nonexistent. There are no management or review boards or similar institutional mechanisms through which representatives of farmers, the local government and others could participate in the governance of irrigation and water-resources management. In fact, governance and execution of irrigation management at the local level are not separated but both are concentrated in the hands of WMO chiefs who, in turn, are governed by the ministry and central government. Only the local government exercises a certain amount of governance and regulatory power over the WMOs, which are however insufficiently formalized and transparent, as open participatory structures are missing.

Some members of WMO staff are, generally, supportive of irrigation rehabilitation or modernization projects, as these promise financial resources for system rehabilitation or additional income opportunities for participation in

project activities. But they are worried that reorganization of water management along hydro-boundaries may endanger the job security of other members of staff and of themselves; they are also worried about the integrity of the irrigation system if IFCs are to be transferred to WUA Federations. Both of these concerns betrayed a lack of knowledge about the process of WUA formation and the meaning of hydro-boundary management and how it may be organized through new types of WMOs. This is not surprising because the present approach to WUA development has been formalistic and has done little to enhance the capacity of WUAs to improve their irrigation system. The discussion on hydro-boundary management has been restricted to policymakers and technical specialists. WUAs and, especially, hydro-boundary management are at this point not entirely demand-driven propositions and their implications are not widely understood as yet.

WUA Mobilization

The purpose of WUA establishment since the mid-1990s has been to compensate for the disappearance of state and collective farms as water managers in the old on-farm system. Although village governments initially hired mirobs to fill the gap, they and the districts eventually wanted to turn over responsibilities to WUAs. Meanwhile, the WUA concept was promoted through donor and government initiatives. Thus, villages and districts started to establish WUAs in their areas of authority without demand from the new farmers. This has had two important consequences.

Separation of powers

The organizational structure and distribution of powers resemble those of WMOs and collective farms. The functions of general assemblies and meetings are minimal and the organization is centered on its chairman. The functions of governance and execution are vested in the chairman, who is a member of the council and simultaneously the director of the staff. The WUA acts as a service organization under the local government and not as a civil-society association embedded in the community (figure 7).

The consultants (Johnson III, 1999) realized this problem and developed the OIMP WUA Support program and they proposed an alternative model with clear separation of the functions of governance by General Assembly, Council and Chairman, who employ and govern their salaried staff including its Director (figure 8). The governance structure is intended to be the community's mechanism for ownership and control, while the executive structure is its instrument for irrigation services.

Mobilization process

The OIMP's mobilization approach is not sufficiently oriented toward the development of a WUA from within the community it serves. The present process of mobilization and training is focused on establishing formal structures and developing competencies in assuming roles and fulfilling tasks among office bearers and staff, and eventually it gears toward undertaking rehabilitation measures. The widespread order-and-control mode of institutional and organizational management prevents genuine participation of water users in the governance of the WUAs as much as in higher-level WMOs.

"*The chief of ailokomat (local government), raivodkhoz chief (district WMO) and some farmers participated in the discussions on the WUA charter...I am not satisfied about the mobilization process, as chairman, accountant and 6 mirobs are employed…I do not know how many are the WUA members…I am inexperienced and do not know what to do…The farmers' task is to get water and pay for it until the end of the year.…The farmers have no status (other right).…There are a lot of problems*

FIGURE 7.
Organogram of the Aral Sai WUA.

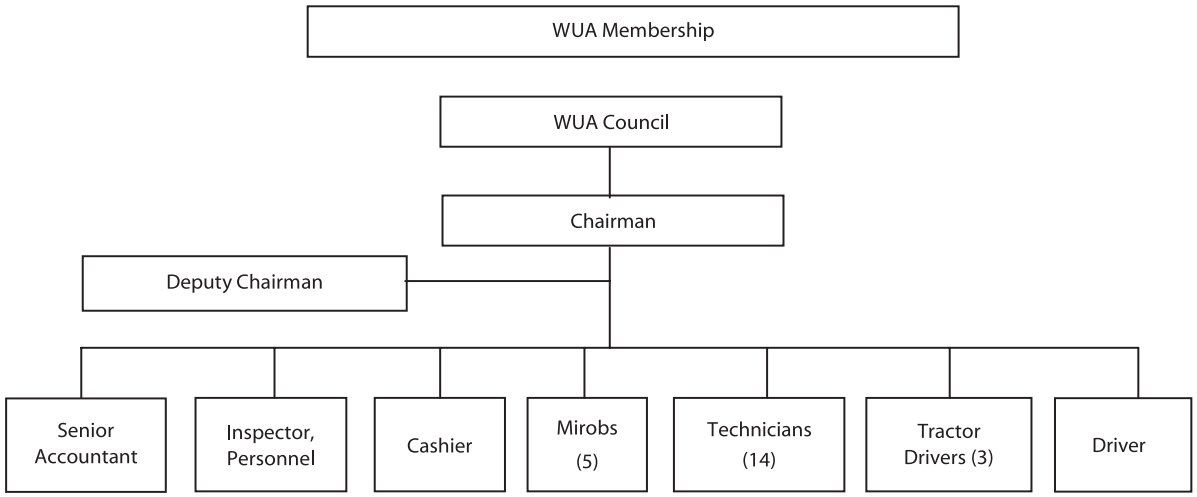
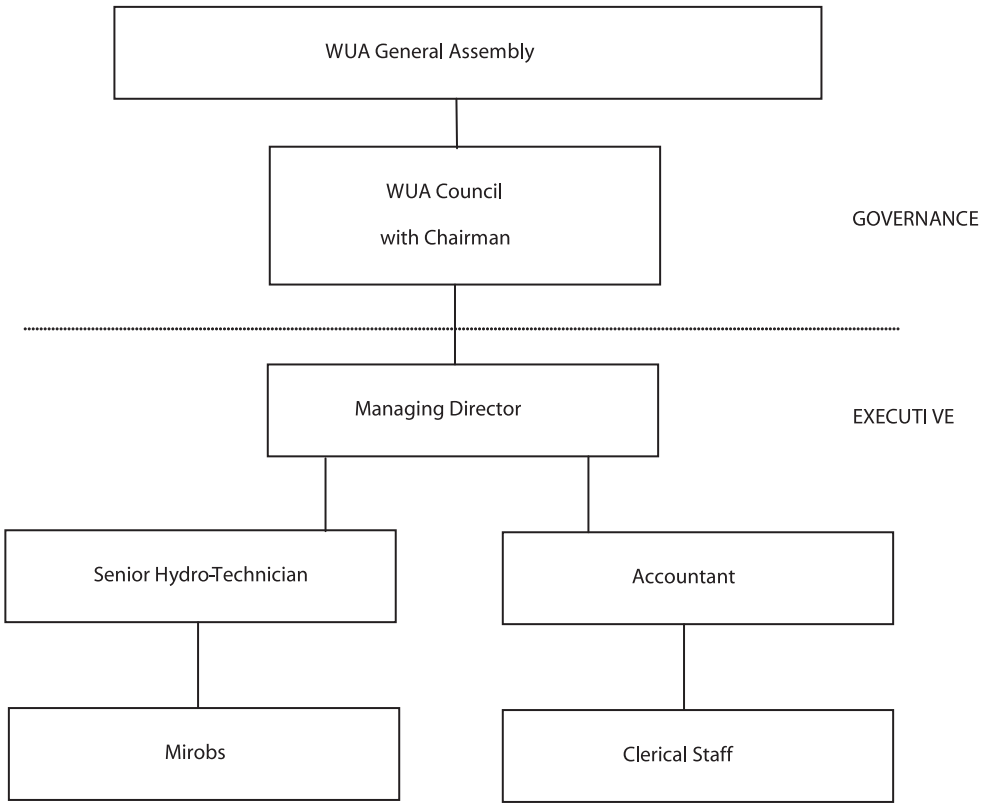


FIGURE 8.
Alternative WUA structure separating governance and executive powers.



with farmers, because they don't pay and are illiterate…," Chairman and Director, Kermetoo-Akbur Sai WUA.

Farmers' empowerment, accountability of water managers to water users and transparency of decision-making and management processes do not appear to be on the WUA agenda. The concern about lack of community ownership of the WUAs is borne out by the field data. The water users expressed a clear sense of alienation from the WUAs responsible for their irrigated areas. The WUAs were perceived as someone else's organizations, either of the chairman or of the village.

The farmers interviewed thought of them as other government agencies trying to manage their OFCs, which favored their personal friends while demanding money for their services. They complained about having to pay ISF without any guarantee that the amount of water stipulated in the contract between the WUA and the water users is actually delivered.

If the WUAs are to be capable of implementing equity in the distribution of water and of motivating farmers to maintain their canals and pay ISF, the associations will need to be based on the participation and commitment of the water users they serve. The water users need to build the organization and the new management practices among themselves with the help of well-prepared social mobilizers, who understand that for a WUA to be embedded in the community of water users, the mobilization process needs to start at the grass roots and not with a chairman/director promoted by districts and local-government agents.

A participatory mobilization process first explores the water users' key problems and needs. The social mobilizers need to build an understanding of, and rapport with, the community through participatory appraisal. Based on a shared understanding of the issues at stake, an organization with a leadership by competent and trusted members can be developed, which discusses the WUA's structure, tasks and functions and adopts its bylaws. The mobilization process will have to clarify the definition of, and values implied in, equity, accountability, transparency and empowerment. Once office bearers are elected to the board of a WUA, i.e., a governance structure has been built, management staff including a technical director can be hired and business and irrigation plans developed. Capacity-building measures need to provide WUA members, office bearers and staff with the requisite skills for their roles throughout this process and, especially, while the community and WUA professional staff undertake the required PIM tasks. According to the WMO staff, formal ownership of the canal system will only be transferred once the WUA members and staff have demonstrated their commitment and capacity for effective management.

There are several positive examples around the world, like those in parts of India, Nepal, Sri Lanka, Turkey and Pakistan, to mention a few, where deployment of specialized social mobilization teams has led to greater ownership and sustainability of WUAs, despite a hostile policy environment (see for instance, Ul Hassan et al. 2003) .

If farmers truly come to own their association and irrigation system in this fashion, they may have developed a sense of trust in the reliability and equity of the services they are paying for, and may no longer feel impelled to compete against each other for the most precious and scarce resource in their production system.

Future Vision

Their vision for the future was discussed with water managers at the provincial and district levels. They expect that the state's commitment to reorganize the irrigation system within the coming 10 years will lead to the gradual disappearance of the present government WMOs and to the increasing privatization of the system. One proposal entails the formation of joint stock

companies, which would own the IFCs from which WUAs can buy shares.

The proposed arrangements bear some dangers. If privatization at the higher system levels should proceed without building participatory structures in which the OFCs are represented, a joint stock company may function no differently from the present districts. Ownership is a public good, such that water must not depend on the capacity to buy shares, but on an entitlement deriving from stakeholdership—in this case, the need to receive an equitable share of water to ensure economic production and livelihoods.

Instead, WUAs on one IFC system should federate by sending representatives to a Water User Federation (WUF) Board, which will then govern the IFC management organization in the same manner as at the WUA/OFC level. Thereby the interests of all sections of the IFC, from tail to head, can be represented and social ownership of the system by its users achieved. The key principle is always that, in order to generate cooperation and compliance with the rules governing the irrigation system and the WMOs, all water users must be able to trust that services are delivered equitably and their livelihoods ensured. For farmers to understand and trust such propositions a thorough and grass-roots-based mobilization approach is needed.

It must be understood clearly that even if districts should disappear in the long run, the professions of irrigation engineers, hydro-technicians and the auxiliary staff will remain indispensable. The new arrangements will place them under a new participatory-governance framework, which makes them accountable to water users. For irrigation engineers to be able to function productively within a participatory framework they also need to undergo a socialization process in which they can overcome their apprehensions about the new management arrangements and power relations. A culture of partnership needs to be fostered and nurtured with practical experiences.

Conclusions

The agrarian reform in Kyrgystan has been rapid and comprehensive, and most agricultural land has been privatized or leased to private land users. The markets are, however, weakly developed, and constraints on the availability of money have led to the operation of a vast *barter system,* which involves both the private and the government sectors. The restructuring has not only caused an increasing inequity of land distribution but created an institutional vacuum for the secondary canal-level water-distribution system (formerly on-farm irrigation system). The capacity of water users to jointly operate and maintain their irrigation system with WUAs, especially at the secondary canal level, is only slowly emerging.

The management of water resources for agricultural and nonagricultural uses, except for drinking water, is under the authority of an extensive system of governmental WMOs, structured along *administrative territorial boundaries* of states, provinces, districts and local management units. These administrative entities crosscut and fragment river and canal systems at all levels. In response to problems arising from fragmentation, interdistrict WMOs have been set up by higher-level provincial WMOs in some areas. However, these remain fundamentally committed to the administrative-territorial principle, since the main task of these WMOs is to act as a link between provincial and district WMOs by distributing MC water to districts and by maintaining the MC system through district hydro-sections. They fail however to achieve hydro-boundary management of unified canal systems. The consequence of this

complex, but fragmented, setup is competition for, and conflict over, relatively scarce water resources. This occurs particularly during the peak demand period not only between water users but also between water management units operating within the same hydro-system.

Though the local government system has direct control over water-resources management only at the village level, the relationship at higher levels was characterized by water managers as one of consultation and influence, which may cause inequity and interfere with the canal's operational regime. Analyses of data and reports of water managers and users indicate that, in Kyrgystan, competition for relatively scarce water resources, particularly during the peak demand period, leads to widespread *inequity* between the head and tail reaches at all levels of the irrigation system, from the river basin through the MCs, IFCs and OFCs. The tail-end farmers interviewed at the Murat Murap WUA considered this as a major problem. Data on annual water supply and demand suggest that moderate inequity also exists at the higher system levels, with deficits relative to demand ranging between 5 and 20 percent. At the on-farm level WUAs reported deficits of up to 50 percent, or up to 30 percent if losses are considered.

The majority of respondents reported that the head sections of OFCs and IFCs sought and generally succeeded in appropriating water resources beyond their entitlements, by using various means, such as placing obstructions across canals to increase discharges to their OFCs and opening or raising gates at canal heads. Within district sections and even at the provincial level, cultivators and farm units also negotiate for additional supplies or irrigation releases out of turn with considerable success. All such interventions disorganize the operational regime. Tail enders suffer losses of water and income.

Water managers stated that they often feel powerless. They attempt to solve disputes ad hoc and by informal means, but frequently resort to the punishment of offenders through fines and water stoppages. Conflict resolution is normally informal and frequently involves the imposition of top-down resolutions by higher authorities. Within WMOs, formal, participatory and transparent *conflict resolution,* involving local stakeholders, appears to be absent. Institutionalized debate and negotiations are missing. Formal arbitration committees had been established only at two WUAs studied in Kyrgystan. The obsolescence of the present allocation system, based on demand aggregation and limit setting, is among the chief causes of competition for water resources. A demand-based system becomes dysfunctional under conditions of water scarcity and turns into a nontransparent supply system. In Kyrgystan, where adherence to limits has become questionable at the interstate level, limits no longer function as an operational parameter at lower levels in the sample sites studied and demand cannot generally be satisfied. As the head reaches take more water, inequity ensues and scarcity intensifies downstream throughout the irrigation systems.

The emergence of an increasing *number of agricultural units* due largely to privatized lands in Kyrgystan complicates water management, as it tends to multiply the quantity of individual demands thus making the design, timing and observance of water-distribution plans difficult. In Kyrgystan, WUAs have been established to provide the many water users at the OFC level with a management organization. However, it is questionable whether these WUAs command sufficient authority among the water users, to successfully deal with equity problems. Furthermore, most have been established on the territory of former collective and state farms, rather than on the basis of hydrological boundaries. If they manage fragments of several OFCs or even IFCs, they inevitably compete with neighboring WUAs or villages, since these new WMOs lack appropriate institutional means of unified canal operation and conflict management.

Due to financial constraints, *maintenance and rehabilitation* of canal systems are suboptimal causing considerable losses of water resources to the respective systems and their various levels. Only the most urgent repairs, such as of headworks structures and canal breaches, are carried out, while repair of, for example, damaged canal lining and joints is generally deferred for years. The resulting combined losses at the main and IFC levels of the sample systems were reported to be between 26 and 45 percent and OFC losses are estimated to be up to 50 percent. The lack of functional measuring devices at the OFC level makes an accurate assessment of losses, as well as reliable and equitable distribution of water supplies, difficult. The IFCs and MCs are generally outfitted with measuring devices. The state of both disrepair and inadequate maintenance causes suboptimal operating conditions, which contribute to inequity and the undersupply of tail reaches of the canal systems.

Considering the immense rehabilitation needs of irrigation and drainage systems in the country, financial resources required far exceed the capacities of the water users and the governments of the Central Asian Republics. At present, in Kyrgystan, the frequently delayed and partially in-kind payment of ISF and budget allocations impose significant constraints on the ability of water managers to discharge their tasks efficiently, in addition to their financial hardships. The budget requests for O&M of systems are chronically underestimated and *resource mobilization* is inadequate. The rate of ISF collection varies greatly, and the present ISF charges fail to cover the actual O&M costs of WUAs, particularly if they apply volumetric rates and are affected by inequity. At a more realistic doubled rate of estimated O&M requirements (relative to real system needs), the WUAs and districts would run deficits of more than 75 percent. The present ISF charges in Kyrgystan are too low. To achieve a reasonable coverage of O&M needs at combined OFC and IFC levels, the ISF would need to be raised 5 to 7 times its present value. But this would still only require 3.1 percent of the GVP. While this indicates a feasible investment in water-resources management, well within levels for comparable irrigation systems in Asia and Europe, at present, the dominance of the barter system and the weakness and inefficiency of markets in Kyrgystan prevent cultivators from realizing the value of their production in monetary terms. Therefore, their capacity to cover the O&M costs at the OFC and IFC levels are constrained.

Effective *organizational management* is constrained by an outdated command-oriented management model and organizational culture. Chiefs dominate upwardly accountable staff, organized in strict organizational and departmental hierarchies. Insufficient team orientation and the tendency toward administrative formality, typical for such a management style, prevent critical internal debate and open exploration of problems and solutions. Consequently, the organizations' capacity for innovation, problem-solving and staff motivation are constrained. Formal opportunities for stakeholder participation, especially of water users, in the governance process and debates within the WMOs are absent. Governance and executive functions are vested with the same leading officers of WMOs. Thus, the quality of management and service delivery depends very much on the personality and level of initiative of these organizational leaders. The need for formal structures and an institutional culture that facilitates high-performing management organizations have not been widely perceived among stakeholders as yet.

Generally, the approach to WUA development tends to remain within the entrenched model of government services and does not sufficiently embed the WUAs in the communities they serve. WUA mobilization is mainly carried out by the staff of WMOs and local government agencies. A

coherent and well-designed participatory approach to social mobilization, which targets and involves both water users and managers and builds their capacity for carrying out the core functions of water-resources management is nonexistent.

Participatory structures and values are underrepresented and there is a danger that the WUAs will become a mere mechanism for the transfer of system-rehabilitation funding and labor mobilization to water users. The difficult tasks of improving system operation and resolving conflicts over inequity require more sustainable and committed organizations mobilized at the grass-roots level. The need for professionalization of social mobilization in the water-resources sector and the development of organizations capable of providing mobilization services have not yet been recognized. A comprehensive legal framework is under development in the Kyrgyz Republic. This requires further debate, refinement and eventual approval by the authorities. The granting of institutional powers to WUAs has only been observed in Kyrgyzstan since the inception of the On-Farm Irrigation Project. But it has not yet been formalized. Institutional mechanisms for conflict resolution and the establishment of WUAs on the basis of hydrological boundaries are not yet considered in the proposed legal framework.

The study found that, at present, a shared understanding of key *concepts* in integrated and participatory water-resources management, as well as of a commonly *accepted terminology,* which reflects the recent changes in irrigation systems and facilitates the design of reformed institutions, has yet to emerge.

It was also observed that the availability of operational, socioeconomic and financial *data* is constrained. Transparent data-sharing among water professionals has not been institutionalized as yet. Data for hydrological, rather than administrative, units of analysis are not collected or not available. Therefore, a transparent, comprehensive and reliable Management Information System (MIS) needs to be developed. The purpose of the MIS should be to enable the water-management institutions at all levels to monitor, evaluate and improve the performance of the water systems, and for informed decision making by their representative structures.

The above discussion reveals that a barter exchange system has emerged due to underdeveloped markets, which seriously constrains the capacity of the WMOs and WUAs to finance all the core functions. This barter-exchange tendency needs to be curtailed immediately through rationalized fiscal and monetary policies. The water resources at all levels (small river systems, main, secondary and tertiary canals) are currently managed along territorial boundaries of provinces, districts and Soviet-time farms, leading to inequity in water distribution and potential for conflict. These organizations need to be reorganized, at all levels, along hydrological boundaries following IWRM principles, where governance and management are clearly separated and stakeholders' interests are strategically brought in through the governance representative structures, which should also be made formally responsible for dispute resolution at their own level, and for unresolved disputes from the lower levels. The democratic governance structures at all levels need to be introduced, through professional social mobilization rather than through an existing top-down and bureaucratic governmental apparatus. The key elements of mobilization should be awareness-creation, consultation, information-sharing and capacity-building of the stakeholders and their governance structures at all levels. Such an approach would lead to greater ownership of the WUAs and WMOs by the stakeholders, and to ensuring willingness to pay for O&M.

It is also evident that under the growing water-scarcity conditions, an increasing number of poor and small farmers, increasing crop diversification and incompatible water-delivery infrastructure and lack of water-measurement devices to measure water for each farmer, a demand-based water management might not be

relevant to the current needs and, therefore, a proportionate supply-based system might need to be adopted, like those in some South Asian countries. Under such a system, it will be adequate if main and secondary canals, and the head structures of tertiary canals are provided with water-measurement devices, which to a large extent do exist, and the water is delivered to the users in proportion to the available supplies, which can be negotiated and agreed between the stakeholders and the water managers through their representative structures.

The ISF structures and levels need to be rationalized. The low levels and inappropriate structures of the ISF, coupled with the poor capacity of the farmers to pay, and weak markets, necessitate exploring the potential of unconventional means to finance the O&M and rehabilitation needs of the irrigation and drainage infrastructure. Such unconventional means could include, for example, growing and selling fruit and other fast-growing timber on the canal banks, selling the nutrient-rich silt for earth-filling or improving farm fertility, or selling out fishing rights.

The current and forthcoming rehabilitation efforts through development projects, which partially subsidize rehabilitation, should be implemented in a way that encourages investments by the stakeholders in the infrastructure, rather than creating a dependency on external sources. Such an approach will lead to greater ownership of infrastructure and management organizations by the local stakeholders.

Literature Cited

Abernethy, C. L. 1998. The functions of information, communication, transparency and accountability in promoting institutional reform and cooperation. In *Institutional reform and co-operation in irrigated agriculture, with special reference to Lao PDR and Vietnam: Proceedings of the International Workshop held from April 27 to May 2, 1998 in Luang Prabang*, ed. C. L. Abernethy and F. Heim. Feldafing: Zentralstelle für Ernährung und Landwirtschaft (Food and Agriculture Development Center)

AHT (Agro-Hydro Technik GMBH); WAPDA (Water and Power Development Authority. 2001. *Chashma right bank irrigation project stage III: Action plan for user controlled O& M.* Lahore: AHT International GMBH.

Bandaragoda, D. J.; Memon, Y. 1997. *Moving toward participatory irrigation management*. Report No. R-26. Lahore: International Irrigation Management Institute.

Benjamin, P.; Lam, W. F.; Ostrom, E.; Shivakoti, G. 1994. *Institutions, incentives and irrigation in Nepal*. Decentralization: Finance and Management Project. Burlington: Associates in Rural Development.

Bhutta, M. N.; Vander Velde, E. J. 1993. Equity of water distribution along secondary canals in Punjab, Pakistan. *Irrigation and Drainage Systems* 6: 161–177.

Boelens, R. 1998. Equity and rule-making. In *Searching for equity: Conceptions of justice and equity in peasant irrigation*, ed. R. Boelens and G. Davila. Assen: Van Gorcum.

Brewer, J.; Kolavalli, S.; Karlo, A. H.; Naik, G.; Ramnarayan, S.; Raju, K. V.; Sakthivadivel, R. 1999. *Irrigation management transfer in India: Policies, processes and performance.* New Delhi and Calcutta: Oxford and IBH Publishing Co. PVT LTD.

FAO (Food and Agriculture Organization of the United Nations). 1982. *Farmers' participation and organization for irrigation management*. The International Support Program for Farm Water Management, Land and Water Development Division. Rome.

GEF (Global Environmental Facility); DHV Consultants. 2000. *Participation in water savings.* Regional Monitoring Report. Tashkent.

Giddens, A. 1979. *Central problems in social theory. Action, structure and contradiction in social analysis.* Berkeley: University of California Press.

GWP (Global Water Partnership). 2000. *Integrated water resources management*. TAC Background Paper No. 4. Technical Advisory Committee Background papers. Stockhom.

Hofwegen, P. 1996. Accountability mechanisms and user participation in three agency managed systems in Morocco, Indonesia and The Netherlands. Paper presented at the 16th International Congress on Irrigation and Drainage, Cairo.

ICWC (Interstate Commission on Water Coordination). 2001. *ICWC Bulletin* No. 26, April.

IWMI (International Water Management Institute). 2001. *The Kyrgyz Republic: National water legislation; legal aspects of managing and regulating water relations; legal basis of activities of water users' associations.* Legal Consultant's Report. Tashkent.

Johnson III, S. 1999. *Kyrgyz Republic on-farm irrigation project.* Pre-appraisal mission report (Water Users' Association Specialist). Kyrgystan: Ministry of Agriculture and Water Management.

Merrey, D. J. 1996. *Institutional design principles for accountability in large irrigation systems*. Research Report No. 8. Colombo: International Irrigation Management Institute.

Molden, D.; Sakthivadivel, R.; Habib, Z. 2001. *Basin-level use and productivity of water: Examples from South Asia.* Research Report No. 49. Colombo: International Water Management Institute.

Perry, C. 2001. *Charging for irrigation water: The issues and options, with a case study from Iran.* Research Report No. 52. Colombo: International Water Management Institute.

Starkloff, R.; Zaman, W. 1999. *Farmers' participation, power and the institutional reform of Pakistan's irrigation and drainage sector: Key concepts and farmers' perceptions*. Report No. R-89. Lahore: International Water Management Institute.

Tang, S. Y. 1992. *Institutions and collective action: Self-governance in irrigation*. San Francisco: Institute for Contemporary Studies Press.

Ul Hassan, M.; Hamid, A.; Khan, R. 2003. Short-term impacts of irrigation management transfer in the Hakra 4-R Distributary Canal in Pakistan's southern Punjab*. Journal of Applied Irrigation Science* 38(1): 73–91.

Vermillion, D.; Sagardoy, J. 1999. *Transfer of irrigation management services: Guidelines.* Rome: FAO.

World Bank. 1994. *Pakistan irrigation and drainage: Issues and options*. Report No. 11884-PAK. Washington, D.C.

Yoder, R. 1994. *Locally managed irrigation systems: Essential tasks and implications for assistance, management transfer and turnover programs*. Colombo: International Irrigation Management Institute.

68. *Malaria and Land Use: A Spatial and Temporal Risk Analysis in Southern Sri Lanka.* Eveline Klinkenberg, Wim van der Hoek, Felix P. Amerasinghe, Gayathri Jayasinghe, Lal Mutuwatte and Dissanayake M. Gunawardena. 2003.

69. *Tubewell Transfer in Gujarat: A Study of the GWRDC Approach.* Aditi Mukherji and Avinash Kishore. 2003.

70. *Energy-Irrigation Nexus in South Asia: Improving Groundwater Conservation and Power Sector Viability.* Tushaar Shah, Christopher Scott, Avinash Kishore and Abhishek Sharma. 2003.

71. *Policies Drain the North China Plain: Agricultural Policy and Groundwater Depletion in Luancheng County, 1949-2000.* Eloise Kendy, David J. Molden, Tammo S. Steenhuis and Changming Liu. 2003.

72. *Development Trajectories of River Basins: A Conceptual Framework.* François Molle. 2003.

73. *A Method to Identify and Evaluate the Legal and Institutional Framework for the Management of Water and Land in Asia: The Outcome of a Study in Southeast Asia and the People's Republic of China.* Ian Hannam. 2003.

74. *A Diagnostic Model Framework for Water Use in Rice-based Irrigation Systems.* Wilfried Hundertmark and Ali Touré Abdourahmane. 2004.

75. *Prospects for Adopting System of Rice Intensification in Sri Lanka: A Socioeconomic Assessment.* Regassa E. Namara, Parakrama Weligamage and Randolph Barker. 2004.

76. Small Dams and Social Capital in Yemen: How Assistance Strategies Affect Local Investments and Institutions. Douglas L. Vermillion and Said Al-Shaybani. 2004

77. *Simulating the Hydrology of Small Coastal Ecosystems in Conditions of Limited Data.* V. U. Smakhtin, S. C. Piyankarage, P. Stanzel and E. Boelee. 2004.

78. *Irrigation Kuznets Curve, Governance and Dynamics of Irrigation Development: A Global Cross-Country Analysis from 1972 to 1991.* Madhusudan Bhattarai. 2004.

79. *Strategic Analysis of Water Institutions in India: Application of a New Research Paradigm.* R. Maria Saleth. 2004.

80. *Robbing Yadullah's Water to Irrigate Saeid's Garden: Hydrology and Water Rights in a Village of Central Iran.* François Molle, Alireza Mamanpoush and Mokhtar Miranzadeh. 2004.

81. *Inadequacies in the Water Reforms in the Kyrgyz Republic: An Institutional Analysis.* Mehmood Ul Hassan, Ralf Starkloff and Nargiza Nizamedinkhodjaeva. 2004.

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