ROLES AND ISSUES OF WATER USERS' ASSOCIATIONS FOR SUSTAINABLE IRRIGATION AND DRAINAGE IN THE KYRGYZ REPUBLIC AND UZBEKISTAN IN CENTRAL ASIA

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ABSTRACT

The Kyrgyz Republic, Uzbekistan, Kazakhstan, Tajikistan, and Turkmenistan in the Aral Sea basin in Central Asia have some of the largest irrigation and drainage infrastructure in the world. In the Soviet era, a huge amount of irrigation and drainage infrastructure was constructed by the government, mainly to increase the production of cotton and wheat. However, the irrigation and drainage infrastructure has severely deteriorated since the independence of the Central Asian countries in 1991, mainly due to the lack of necessary funds for operation, maintenance, and rehabilitation. The governments intend to establish and develop water users' associations (WUAs), which are expected to play an important role in operation and maintenance (O&M) of the irrigation and drainage infrastructure. However, the use of WUAs for O&M is quite new in Central Asia. Therefore, the Asian Development Bank, the World Bank, and other donors have been implementing projects not only for the rehabilitation of the deteriorated irrigation and drainage infrastructure, but also for the establishment and development of WUAs. The roles of WUAs for O&M in Central Asia are very important in having an efficient and sustainable irrigation and drainage system. The roles and issues facing WUAs in the Kyrgyz Republic, which has adopted a rapid approach to reform, and Uzbekistan, which has taken a gradual approach, were reviewed in this study.

INTRODUCTION AND BACKGROUND

Introduction

The Aral Sea basin in Central Asia contains five countries: the Kyrgyz Republic, Uzbekistan, Kazakhstan, Tajikistan, and Turkmenistan. These countries became independent in 1991 with the collapse of the former Soviet Union. The region is expected to experience rapid economic development in the near future because it has abundant natural resources such as petroleum, natural gas, and various rare metals.

The annual precipitation in Central Asia is extremely limited, ranging between 50 mm and 600 mm, and more than half of the region is desert. Traditionally, the people of Central Asia made a living by raising sheep, horses, and camels either in the vast areas as nomads or locally by using irrigated agriculture in river basins and areas of oasis. However, the lifestyle and land use changed drastically after the area was annexed by the Soviet Union. Under the planned economy of the Soviet Union, the agricultural lifestyle shifted from nomadism to settlement.

Large-scale irrigation and drainage infrastructure was introduced in the 1940s in order to

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increase agricultural production in the region. By the late 1980s, more than 7.5 million ha of land in Central Asia were irrigated, mainly for the production of cotton and wheat. The irrigated areas are distributed along the Syr Darya and Amu Darya Rivers (Fig. 1), which are the primary source of the water used for irrigation although groundwater is also used. Because the two rivers empty into the Aral Sea, the Aral Sea has become smaller as a result of the diversion of river water for irrigation.

Figure 1. Irrigated Areas of Central Asia (World Bank, 2003)

The irrigation and drainage infrastructure has been rapidly deteriorating since the independence of the countries (Fig. 2). The main reason for the deterioration is the lack of governmental funds and human resources necessary for the operation, maintenance, and rehabilitation of the infrastructure. Farm productivity and farm income have seriously decreased as a result of this deterioration, as well as because the agricultural sector has been changing from a planned economy to a market economy.

Because irrigation and drainage are very important for improving agricultural productivity and alleviating farmers' poverty, the governments have decided to introduce a management system called "Water Users' Associations" (WUAs). These associations are organized by individual farmers for operating, maintaining, and rehabilitating the irrigation and drainage infrastructure. However, the concept of the WUAs is quite new in these countries, and the governments need donors' support and assistance for establishing and developing WUAs, as well as in training WUA staff and members.

Figure 2. Deteriorated Irrigation Canal (Thurman, 2001)

The Asian Development Bank (ADB), the World Bank, and other donors have, therefore, funded projects that include not only the rehabilitation of deteriorated irrigation and drainage infrastructure but also the establishment and development of WUAs (Table 1). After the completion of the donors' projects, WUAs are expected to play an important role in the operation and maintenance (O&M) of the irrigation and drainage infrastructure. Thus, WUAs are expected to also play a large role in maintaining a sustainable irrigation and drainage infrastructure.

Table 1. Main Irrigation Projects for WUA Development in Central Asia

Country	Project	Donor
Kyrgyz Republic	Agriculture Sector Program	ADB
	Agriculture Area Development Project	ADB
	Irrigation and Rehabilitation Project	WB
	On-Farm Irrigation Project	WB
	Natural Resources management Program	USAID
	Water User Associations Support Program	USAID
	Integrated water Resources Management in Fergana Valley	SDC&IWMI
Uzbekistan	Ak Altin Agricultural Development Project	ADB
	Grain Productivity Improvement Project	ADB
	Amu Zang Irrigation Rehabilitation Project	ADB
	Rural Enterprise Support Project	WB
	Drainage, Irrigation and Wetland Improvement Project	WB
	Natural Resources management Program	USAID
	Integrated water Resources Management in Fergana Valley	SDC&IWMI
Kazakhstan	Water Resources Management and Land Improvement Project	ADB
	Irrigation and Drainage Improvement Project	WB
	Natural Resources management Program	USAID
Tajikistan	Agriculture Rehabilitation Project	ADB
	Irrigation Rehabilitation Project	ADB
	Farm Privatization Project	WB
	Rural Infrastructure Rehabilitation Project	WB
	Natural Resources Management Program	USAID
	Water User Associations Support Program	USAID
	Integrated Water Resources Management in Fergana Valley	SDC&IWMI
Remarks: 1) ADB: Asian Development Bank		
2) WB: World Bank		
3) USAID: United States Agency for International Development		
4) SDC: Swiss Development Cooperation		
5) IWMI: International Water Management Institute		

Organizational Structure and Roles of Water Users' Associations

The International Water Management Institute (IWMI, 2003) proposed a typical pyramidal and hierarchical organizational structure for WUAs (Fig. 3). In the proposed structure, a general assembly or a representative assembly has the right to vote on resolutions and elects the members of a revision commission, WUA council, and dispute resolution commission, each of which has different origins and proposes resolutions to the general or representative assembly.

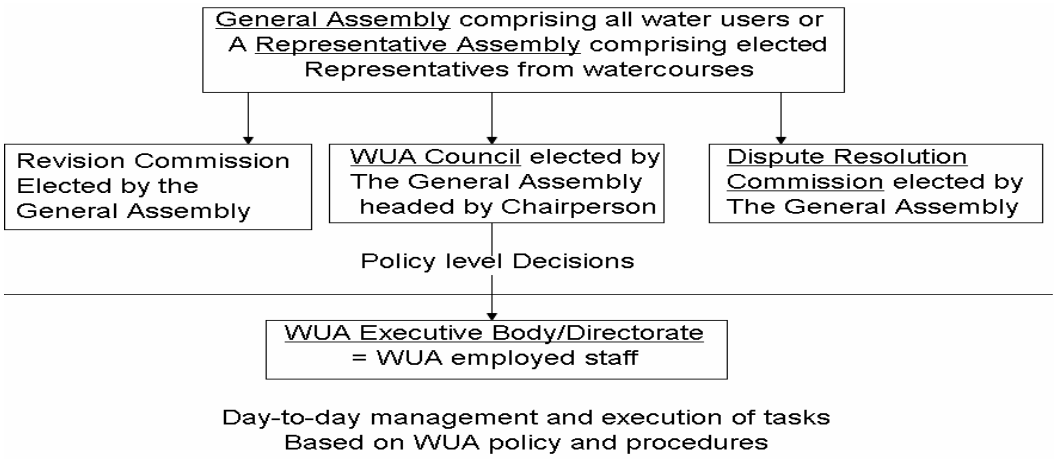

Figure 3. Typical Organizational Structure of a WUA (IWMI, 2003)

The WUAs' roles would include (1) taking responsibility for the O&M of the irrigation and drainage infrastructure, (2) collecting fees from members for O&M and for repayment, (3) ensuring equitable and timely water supply to members, (4) taking the responsibility of cost recovery, (5) participating in the projects' rehabilitation of irrigation and drainage infrastructure, and (6) training members. The ADB emphasizes the importance of the phased turnover of responsibilities for O&M and cost recovery to WUAs (ADB, 2003c).

Since gaining independence from the former Soviet Union, the Central Asian countries have used different strategies in the shift from socialist to capitalist regimes, including in the agricultural sector (Table 2). In this study, the agricultural market reforms, current status of irrigation and drainage infrastructure, and the roles of WUAs for O&M in the Kyrgyz Republic and Uzbekistan are reviewed and analyzed.

These two countries were selected because they are very different in their strategies on agricultural reform. The Kyrgyz government has adopted a rapid approach for moving from a planned to a market economy in terms of agricultural reform and development of WUAs. The Kyrgyz Republic joined the International Monetary Fund (IMF) in 1992, and it has joined the United Nations, the World Bank, the ADB, and other international organizations. The Uzbek government, on the other hand, has taken a much more gradual approach for moving from a planned to a market economy. The government is partly under the old regime and objects to liberal agricultural reforms, including in its cotton market, even though Uzbekistan is the fifth largest producer of cotton in the world.

Table 2. Outline of Central Asian Countries
(Based on Website of Central Asia and Caucasus Research Institute)

Country	Kyrgyz Republic	Uzbekisutan	Kazakhstan	Tajikistan	Turkmenistan
Area (km2)	Total: 198,500 Land: 191,300 Territorial Waters: 7,200	Total: 447,400 Land: 425,400 Territorial Waters: 22,000	Total: 2,717,300 Land: 669,800 Territorial Waters: 47,500	Total: 143,100 Land: 142,700 Territorial Waters: 400	Total: 488,100 Land: 488,100 Territorial Waters: 0km2
Boundary (km)	Total: 3,878	Total: 6,221	Total: 12,012	Total: 3,651	Total: 3,736
Climate	Continental dry climate, moderate in northern foothills, subtropical in Fergana Valley.	Temperate desert, hot summer, moderate winter.	Continental climate, cold winter, dry and hot summer, dry climate.	Continentally hot summer and moderate winter.	Subtropical and desert.
Geographical Features	The mountainous region of the Tian Shan covers over 80% of the country, with the remainder made up of valleys and basins.	Dry, double-landlocked country of which 10% consists of intensely cultivated, irrigated river valleys.	The terrain extends west to east from the Caspian Sea to the Altay Mountains and north to south from the plains of Western Siberia to the oases and deserts of Central Asia.	Mountains cover 93 percent of Tajikistan's surface area. Pamir Mountains and Alay Mountains, Tian Shan skirts northern Tajikistan.	90% of the country is covered by the Karakum Desert. The center of the country is dominated by Turan Depression.
Natural Resources	Water power, gold, rare metal, coal, natural gas.	Natural gas, petroleum, coal, gold.	Petroleum, natural gas, coal, steel.	Water power, uranium, mercury.	Petroleum, natural gas, sulfur.
Land Use (2005)	Arable Land: 6.55% Agriculture: 0.28% Others: 93.17%	Arable Land: 10.51% Agriculture: 0.76% Others: 88.73%	Arable Land: 8.28% Agriculture: 0.05% Others: 91.67%	Arable Land: 6.52% Agriculture: 0.89% Others: 92.59%	Arable Land: 4.51% Agriculture: 0.14% Others: 95.35%
Irrigated Area (km2 in 2003)	10,720	42,810	35,560	7,220	18,000
Natural Risks	Water pollution, salinization.	Drought in the Aral Sea, desertification, industrial water pollution, overusage of fertilizer and pesticide, salinization, soil contamination.	Earthquake in southern areas, debris-avalanche near Almaty	Inappropriate sanitation, increased salinization, industrial pollution, pesticide.	Soil pollution, groundwater pollution, pesticide, desertification, water pollution, deforestation, water pollution in the Aral Sea, drought in the Aral Sea.
Population (2006)	5,213,898	27,307,134	15,233,244	7,320,815	5,042,920
Remarks	Independent in 1991. Implementing the most rapid approach towards a market economy among the Central Asian countries. The most positive for rapid reform.	Independent in 1991. President Karimov amended the Constitution to extend his tenure until 7 years in 2002. Implementing gradual approach towards market economy, with a focus on political stability.	Independent in 1991. Domestic situation is stable under the strong leadership of President Nazarbaev. Maintains good relationship with the ADB, World Bank, and the EBRD. Implementing market orientation and development.	Independent in 1991. Suffered from civil war. Provisional cease-fire agreement was signed in 1994. Peace agreement was signed in 1996. Final agreement was signed in 1997. General election was carried out in 2000.	Diplomatic policy is "positive neutrality." Acknowledged as a permanently neutral country by the United Nations in 1995. Original policy in Central Asia.

KYRGYZ REPUBLIC

Agricultural Reform

The rapid change of the political and economic systems due to the independence in 1991 had done a great deal of damage to all farm products. In 1993 and 1994, agricultural production decreased more than 30 percent due to shortages of agricultural inputs, a decrease in international trade, and a lack of agricultural credit. Farm income also rapidly declined as compared with other sectors' income. Farm income fell from 90 percent of other sectors' income in 1990 to 45 percent in 1994.

Three important issues in the agriculture sector are: (1) severe land degradation, (2) inefficient utilization and management of water resources, and (3) overuse of forest resources. These issues are mainly caused by policies that favor economic development over the sustainable use of natural resources.

Among the Central Asian governments, the Kyrgyz government has most rapidly adopted reform policies for the agricultural sector. These reforms focus on (1) developing and promoting market institutions, (2) encouraging competitive forces in the newly established market, (3) preserving environmental resources, and (4) reorienting and strengthening the public sector. With the support of the World Bank, the government also actively promoted land reform and farm restructuring by 1995.

Furthermore, the government promoted removing official restrictions from the markets and encouraged independent trade. The government abolished quota, licensing, and pricing systems to liberalize international trade of agricultural input goods and production. However, there has not been sufficient time for the reforms to take effect.

Irrigation Infrastructure

Approximately 80 percent of arable land in the Kyrgyz Republic is irrigated. Since 1995 the donors' projects rehabilitating deteriorated irrigation infrastructure have been implemented. However, Kyrgyz economic capacity is small, domestic funds are limited, and the government has difficulty increasing its international debt. Under such serious financial constraints, it is important for the government and the donors to carefully create priorities for the rehabilitation of deteriorated irrigation infrastructure.

Establishment and Development of WUAs

One of the important issues for appropriate O&M of the irrigation and drainage infrastructure in the Kyrgyz Republic is who should be responsible for O&M. The Kyrgyz government promoted the transfer of ownership of the irrigation and drainage infrastructure from the collective farms to individual water users in 1994. The government also promoted the establishment of WUAs that would be responsible for O&M of on-farm irrigation and drainage infrastructure in 1995.

The ADB provided a technical assistance (TA) of "Building Capacity for the Formation and Management of Water Users Associations", together with the Agricultural Sector Program (ASP), in 1995. The TA's objective was to strengthen the capacity of the Ministry of Water Resources (MWR) to facilitate the formation and sound management of WUAs. The TA's scope included (1) reviewing the legislation for WUAs; (2) providing advice on the procedures for organizing WUAs, irrigation fee collection, and farm level system management; and (3) training key staff at the MWR and selected regional levels (ADB, 1995).

In 2002, the Kyrgyz Republic became the first country in Central Asia to enact a comprehensive WUA law on the basis of advice provided by the ADB through the ASP. The WUA law regulates the associations' responsibilities and obligations for collecting irrigation service fees, preparing budgets, making decisions regarding O&M, appropriately distributing water, and rehabilitating irrigation and drainage infrastructure (Table 3).

Table 3. Outline of Kyrgyz WUA Law

Main Components	(1) Purpose and tasks of WUA
	(2) Activity of WUA
	(3) WUA Establishment procedure
	(4) State registration of WUA
	(5) Foundation documents of WUA
	(6) WUA membership
	(7) Rights and duties of WUA
	(8) Reception of new members into WUA
	(9) Termination of WUA membership
	(10) management organs and their powers
	(11) WUA finances and property of WUA

In addition, since 1995, the ADB, the World Bank, and other donors have funded projects for the rehabilitation of irrigation and drainage infrastructure and for establishing and training WUAs for O&M. The ADB's Agriculture Area Development Project (AADP) (ADB, 1999) and the World Bank's On-Farm Irrigation Project (OFIP) (World Bank, 2000) are examples of effective projects for the establishment and development of WUAs (Table 4).

These irrigation projects require that WUAs in the project areas pass a series of determined milestones (Fig. 4) for designing and implementing the rehabilitation of irrigation and drainage infrastructure in order to ensure that the WUAs are operating effectively (Johnson et al., 2002). When a WUA achieves the fourth milestone, it becomes a candidate for the rehabilitation of irrigation and drainage infrastructure under the projects. When a WUA achieves the seventh milestone, a rehabilitation contract can be signed with a contractor. When WUAs cannot achieve the necessary milestones, their rehabilitation projects will be postponed or they will be excluded from the project areas. These milestones enable WUAs to be sustainable bodies and to be actively involved in designing and implementing the irrigation projects.

Table 4. Outline of the Two Irrigation Projects in the Kyrgyz Republic

Project	Agriculture Area Development Project (AADP)	On-Farm Irrigation Project (OFIP)
Donor	Asian Development Bank	World Bank
Targeted Region	Chui Oblast	All 7 Oblasts
Targeted Area	55,000ha	160,000ha
Total Cost	US$ 45 million	US$ 29 million
Main Components	(1) Farm Development	(1) WUA Strengthening Services
	(2)Drainage and Irrigation (Including WUA Development)	(2) Infrastructure Rehabilitation and O&M
	(3) Development of Private Sector Marketing and Input Supply Services	(3) Implementation Support
	(4) Project Management	

Milestone 1	WUA establishment, including legal legislation and bank account opened
↓	
Milestone 2	Recruitment of WUA staff and necessary training
↓	
Milestone 3	WUA Board has prepared a plan of O&M and the general assembly has approved this plan, including setting a sustainable fee to cover O&M and irrigation service fee (ISF) costs
↓	
Milestone 4	WUA members have paid O&M costs and ISF payment to water supplier
↓	
Milestone 5	WUA and MWR have developed alternative for rehabilitation and determined their costs, involving WUA members in these discussion
↓	
Milestone 6	WUA members have selected an alternative for rehabilitation
↓	
Milestone 7	A majority of water users in the WUA have agreed to borrow the credit for rehabilitation and to repayment under the projects' terms and the WUA Board officially requests the credit and signs for repayment

Figure 4. Seven Milestones for WUA Development

WUA Issues

Rehabilitation of the deteriorated irrigation and drainage infrastructure is only one element of achieving sustainable irrigation and drainage. It is also necessary to establish sustainable WUAs that can take on O&M responsibilities. Irrigation projects of the ADB, the World Bank, and other donors employ international and domestic consultants during the project implementation period to establish and develop WUAs. However, after the completion of the projects, WUAs will have to take on O&M responsibilities by themselves and maintain financial sustainability without support. Otherwise, the rehabilitated infrastructure will yet again be allowed to deteriorate.

One of the most serious issues for sustainable irrigation and drainage in the Kyrgyz Republic is the financial weakness of WUAs. Cost recovery and the setting and collecting of Irrigation Service Fees (ISF) are critically important for sustainable WUAs.

The cost recovery under the AADP and OFIP requires farmers to repay 25 percent of the rehabilitation costs of irrigation and drainage infrastructure. However, this figure is determined politically, rather than on the basis of economic and financial analysis. Therefore, it is difficult to say whether it fully takes into account the farmers' repayment availability. Farmers may not necessarily fully understand or agree with the proposed repayment scheme when they sign repayment agreements.

The Kyrgyz government determined the ISF to be 0.03 som (US$0.0007) per ton in 1995. However, that ISF would cover only 30 percent of the total O&M costs even if 100 percent of the ISF were collected. The actual collection rate is only 80 percent, and most of it is in kind. The cash collection rate is only 30 percent (ADB, 2004).

UZBEKISTAN

Agricultural Reform

The Uzbek government has taken a more gradual approach toward agricultural reform since its independence in 1991. The government maintains production targets and procurement prices for cotton and wheat, the two main agricultural products in Uzbekistan. The slow pace of agricultural reform, particularly for cotton, reflects the government's deep concern about the potential impacts of liberalization on the country's political and social stability because cotton has the largest share of export earnings, state budget revenues, and farmers' income. This concern has been reinforced by the negative impact of rapid reform in some of the other Central Asian countries (e.g., the Kyrgyz Republic).

The pace of reform for cotton has been particularly slow. Farmers continue to suffer from excessive state intervention, including production targets that control the entire production of farms and a fixed procurement price that is below production costs. The ADB and the World Bank have requested that the Uzbek government implement more rapid reform, particularly in regard to state-controlled production targets and procurement prices for cotton and wheat.

The Uzbek government is required to implement specific agricultural reforms concerning cotton and wheat under the ADB's Ak Altin Agricultural Development Project (AAADP) (ADB, 2001) and the World Bank's Rural Enterprise Support Project (World Bank, 2001) (Tables 5 and 6). Although these specific assurances are prerequisites for implementing the irrigation projects, these reforms have not yet been fully achieved.

Table 5. Outlines of the Two Irrigation Projects in Uzbekistan

Project	Ak Altin Agricultural Development Project (AAADP)	Rural Enterprise Support Project (RESP)
Donor	Asian Development Bank	World Bank
Targeted Region	Ak Altin Region	5 Oblasts
Targeted Area	37,000ha	162,400ha
Total Cost	US$ 72 million	US$ 43.45 million
Main Components	(1) Institutional Support, Monitoring, and Evaluation (Including Organizing and Training WUAs)	(1) Rural Business Advisory Services
	(2) Rehabilitation of Irrigation and Drainage Systems	(2) Rehabilitation of Irrigation and Drainage Systems (Including WUA Development)
	(3) Farm Machinery Services	(3) Rural Finance
	(4) Project Management	(4) Credits for Agro-Service Enterprises
		(5) Project Implementation Support

Table 6. Agricultural Reform Required by the ADB and World Bank

	Required Agriculture Reform
1	The government will not increase the procurement quotas for raw cotton and wheat in the project area.
2	The government will ensure that farmers in the project area receive advance payments for cotton and wheat production on time, and the final payments within three months after crop delivery.
3	The government will review annually the state procurement prices for raw cotton and wheat, and ensure that any future adjustments of prices for each quality grade will fully reflect the annual inflation rates and changes in international border prices of input and outputs, and adjust for changes in the exchange rate.
4	The government will ensure that the farms and individuals farmers are entitled to sell their above-quota cotton and wheat to buyers in the domestic market at mutually agreed upon prices.
5	The government will review periodically its countrywide state procurement policies for raw cotton and wheat to foster and develop market competition and participation of the private sector.

Irrigation Infrastructure

Irrigation is vital to agriculture in Uzbekistan due to its arid climate. The expansion of the area irrigated began in the 1950s when a huge amount of irrigation infrastructure was constructed to supply water to semi-desert areas. Since the late 1980s, funds for O&M have been lacking. After 1991, the government budget for O&M rapidly decreased, further accelerating the deterioration of the irrigation and drainage infrastructure. Irrigation water is pumped up in many areas in Uzbekistan, and the electricity consumed pumping irrigation water is 20 percent of the country's total electricity consumption. Approximately 70 percent of the government's irrigation budget is used to pay for electricity for pumping, and the budget for O&M is underfunded. This continued lack of funding has lead to even worse deterioration in the irrigation and drainage infrastructure. It is estimated that only 55 to 66 percent of irrigated areas was appropriately operated and maintained from 2000 to 2003 (ADB, 2003a).

Establishment and Development of WUAs

The government has promoted a decentralized administration of water resources in order to cope with the budget shortage for irrigation and drainage infrastructure. Basin irrigation system authorities have been established to rationalize water allocation in every catchment area of main rivers. In addition, each basin irrigation system authority is setting up WUAs to which the responsibility for on-farm O&M is being transferred. However, WUAs do not have adequate human resources or knowledge to deliver the necessary services. Therefore, the ADB, the World Bank, and other donors are implementing irrigation projects, as well as helping to establish, develop, and train WUAs.

WUA Issues

There is no comprehensive WUA law that regulates WUAs' roles, responsibilities, obligations, and legal status in Uzbekistan. Although consultants employed by the ADB, together with the AAADP, prepared a draft WUA law, the government made no comments on it and has thus far seemed to be very reluctant to establish a comprehensive WUA law.

Farmers are required to repay some part of the total costs of repairing the irrigation and drainage infrastructure under the ADB's and the World Bank's irrigation projects. However, the cost recovery rates vary among the irrigation projects because they are determined for political and not economic reasons. The cost recovery rates are even different among irrigation projects funded by the ADB. The rates of cost recovery under the AAADP, Land Improvement Project (ADB, 2006) and Grain Productivity Project (ADB, 2003b) are 39 percent, 29 percent and 65 percent, respectively.

The government's O&M budget expenditure in 2002 was about US$130 million. According to estimates of the Ministry of Agriculture and Water Resources, however, the annual requirement for O&M and depreciation is US$550 million. These estimates do not fully consider energy prices, which could add another US$200 million per year to the cost.

Under the AAADP, WUAs are required to be responsible for the O&M of on-farm irrigation and drainage infrastructure after the completion of a project. The state will continue O&M of inter-farm irrigation and drainage infrastructure for a limited period. However, when WUAs have adequate human resources and knowledge for appropriate O&M, WUAs will be also responsible for the O&M of inter-farm irrigation and drainage infrastructure.

DISCUSSION

Comparison of WUAs in Japan and in the Kyrgyz Republic and Uzbekistan

In Japan, WUAs were originally established more than 200 years ago, while they have only recently begun to be established in the Kyrgyz Republic and Uzbekistan. Japan's WUAs represent a typical example of the successful establishment and development of WUAs. In addition, WUAs have been successfully established in some developing countries with the support of the ADB, the World Bank, and other donors.

WUAs in Japan

In general, WUAs in Japan are well organized, their financial status is balanced, and their staffs are well trained. They were established more than 200 years ago in the Edo era and have historically developed in traditional rural areas. The current WUA law was established in 1949. Currently, the members of WUAs are the actual farmers instead of land owners, and they have comprehensive responsibilities, ranging from the implementation of civil works for irrigation and drainage infrastructure to the O&M (Kunihiro, 1988). The staff and members have enough expertise for O&M, and members can afford to pay for cost recovery and ISF.

Approximately two-thirds of the vast irrigation and drainage infrastructure in Japan, including dams, headworks, and irrigation and drainage canals, is operated and maintained by WUAs. ISF collection from farmers covers the O&M costs for the irrigation and drainage infrastructure. The total O&M cost in 2000 was 225,700,000 yen (US$1,900,000), and WUAs paid for approximately two-thirds of the total O&M costs. Healthy financial management of WUAs is essential for appropriate O&M.

WUAs in the Kyrgyz Republic and in Uzbekistan

The concept of WUAs has only recently been introduced, with the support of the ADB, the World Bank, and other donors, in the Kyrgyz Republic and in Uzbekistan mainly because of the governments' lack of funds for O&M. The WUAs in these countries are therefore not historically established. In the Kyrgyz Republic, the comprehensive WUA law has been established, but appropriate implementation remains an issue. In Uzbekistan, a comprehensive WUA law has not been established, which is a prerequisite for the appropriate management of WUAs.

CONCLUSIONS

In this paper, the elements of agricultural reform, the current status of irrigation and drainage,

and the roles of WUAs in the O&M of the irrigation and drainage infrastructure in the Kyrgyz Republic and Uzbekistan are reviewed and analyzed. These countries have begun to use WUAs to provide for efficient and sustainable O&M of the irrigation and drainage infrastructure. The ADB, the World Bank, and other donors have implemented irrigation projects not only for rehabilitating deteriorated irrigation and drainage infrastructure, but also for establishing and developing WUAs. However, WUAs in Central Asia are still weak. The following steps must be taken to ensure that WUAs are able to take on the required responsibilities for sustainable irrigation and drainage in Central Asia: (1) establishment and appropriate implementation of comprehensive WUA laws; (2) healthy financial management, including cost recovery and ISF; and (3) provision of appropriate training of WUA staff and members.

Financial sustainability after the completion of the donors' irrigation projects is crucial. Healthy financial management of WUAs requires determining the appropriate rate of the cost recovery for the rehabilitation of the irrigation and drainage infrastructure and setting an appropriate ISF. These decisions should not be made on a political basis but rather on the basis of economic and financial analysis, taking into account farmers' ability to pay. Collection rates of the cost recovery and ISF should also be improved. These issues should be addressed, taking into account lessons learned from the successful experiences of WUAs in Japan, as well as in some developing countries.

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