

IRRIGATION AND POVERTY IN CENTRAL ASIA: A FIELD ASSESSMENT

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PREFACE

This field assessment was conducted to provide data for an analysis of investment into the rehabilitation of I&D systems in the Central Asian republics.¹ Fieldwork was conducted during May and June of 2001 in 12 sites in Kazakhstan, Kyrgyzstan, and Uzbekistan by the following local consultants: Takhir Mamadaliev (Uzbekistan), Narbay Ghayibnazarov (Uzbekistan), Gulchehra Zununova (Uzbekistan), Atyrkul Alisheva (Kyrgyzstan), Payaziddin Jooshov (Kyrgyzstan), Kylychbek Supataev (Kyrgyzstan), Igor Petrakov (Kazakhstan), Sapar Ospanov (Kazakhstan), Janat Alyakhasov (Kazakhstan), and Faya Shulembaeva (Kazakhstan). A one-week training workshop in Tashkent, Uzbekistan preceded the fieldwork and a three-day conference in Almaty, Kazakhstan followed it. Mike Thurman (consultant), John Strickland (consultant), Bekzod Shamsiev (resident mission, Tashkent), and Irina Klytchnikova (consultant) provided support and general supervision of the fieldwork under the general guidance of Julia Bucknall (ECSSD). Mike Thurman wrote the final report.

¹ World Bank, *Irrigation in Central Asia: Where to Rehabilitate and Why* (forthcoming).

EXECUTIVE SUMMARY

Irrigation and drainage (I&D) play a critical role in the livelihood of many rural Central Asians, yet over the past decade the condition of I&D systems has deteriorated throughout the region. This study is based upon fieldwork conducted in 12 locales of the republics of Kazakhstan, Kyrgyzstan, and Uzbekistan where there are severe dysfunctions in the operation and maintenance (O&M) of I&D systems. Lack of funding for and disorganization in O&M, as well as declining agricultural productivity and incomes (needed to maintain irrigation and drainage), have made regular crop cultivation a highly problematic proposition in most of the areas studied. Although villagers try to adapt to this unwanted state of affairs by modifying irrigation and agricultural practices or emphasizing livestock production and/or non-agricultural pursuits, most of them lack the resources to successfully make the transition.

Although many stakeholders remember the period before the demise of the USSR in 1991 as a “golden era” of O&M, this view is informed more by the present dilapidated condition of I&D systems than their smooth operation before the onset of independence and reforms. Largely because of rent-seeking by the Ministry of Water Management (Minvodkhoz) in O&M, many I&D systems, especially those in older irrigated areas that were not the focus of recent construction, were in need of repair. Moreover, the command style of planned water allocation implemented at the district level by Vodkhoz irrigation departments and (within kolkhozy and sovkhozy) farm management, while it left little room for farmer participation in decision-making, was characterized by manipulation of “plans” and rent-seeking in water delivery.

Many changes have taken place in the funding and management of O&M since 1991, especially in Kazakhstan and Kyrgyzstan. Funding has dropped off sharply from previously high levels, and in all instances district irrigation departments have fewer resources than before. Water charges introduced in the last 5 years are not demand-elastic and could not possibly cover the cost of O&M, although the rate of collection has increased. New institutions have appeared in the form of Water User Associations (WUAs) in Kazakhstan and Kyrgyzstan, although those in the areas studied have little capacity with which to carry out O&M and possess little authority vis-à-vis many district irrigation departments and FSKs. Most sovkhozy and kolkhozy have been either privatized into family farms or remain as “cooperatives” (hereafter referred to as FSKs, or former sovkhozy and kolkhozy). The latter are predominant in Uzbekistan, although the number of family farms is growing. Whereas imperfect reform has created dislocations and distortions in input and output markets in Kazakhstan and Kyrgyzstan, in Uzbekistan the same conditions exist owing to the dysfunction of the old system of planned production and supply of inputs for the cultivation of cotton and wheat on a grand scale (with which even the so-named “private” farmers must contend). In the former two republics, agricultural productivity dropped severely in the early 1990s, before beginning to recover. In Uzbekistan, the decline in productivity has been less, due to greater stability, yet many longstanding problems have not been addressed.

Falling incomes and a vacuum in management have reduced maintenance to a series of stopgap measures. Water users attempt to clean canals and collectors by hand, but most cannot afford the machinery required to perform the job adequately. In many areas, significant portions of I&D systems, especially drainage collectors and pipes, have not seen any maintenance for five or more years. Although in three of the four sites in Uzbekistan the condition of the canal system could be rated as “fair,” in all cases systems are becoming decrepit. The condition of systems is generally poorer in Kazakhstan and Kyrgyzstan, because of greater shortfalls in incomes and state funding, as well as the disorganization of water management institutions.

The degradation of canal systems and institutional failure in water allocation and delivery has led to a reduction in the supply of irrigation water in all of the field sites except one (in Uzbekistan). Some canals examined in Kazakhstan and Kyrgyzstan have become decrepit to the degree that they will not carry water to the end sections. In some areas studied, such as the Sokh River system of the Ferghana Valley, upstream communities take water that is earmarked in allocation schedules for use by those downstream. Unsanctioned withdrawals by upstream and/or elite farmers are even more common *within* the communities studied. In Kyrgyzstan and Kazakhstan, the few wealthy and/or well-connected water users are commonly able to acquire well-located (upstream) irrigated land, as well as peddle influence or bribe their way to an inordinate share of water. In Uzbekistan, the primary tensions in water allocation are between FSKs and family farms, although the latter also includes a favored elite. The result of the breakdown of canals and unfair allocation is the shrinkage of the area irrigated, which exceeds 50% in some areas (all areas studied in Kazakhstan), as well as tension and conflict within communities (especially in Uzbekistan and Kyrgyzstan).

Because collectors and drainpipes are in worse condition than canals, land salinization encompasses more cropland than before. Ineffective drainage has led to a rise in water tables in many sites, which, along with the increasing mineralization of groundwater (as much as 3 grams per liter in sites in Kazakhstan), has led to the moderate and even severe salinization of over half of the irrigated cropland in some cases. Yields are reduced on such land, although the exact degree of damage done to crop development is still in question. In general, areas in the middle and lower reaches of the Aral Sea basin are worst affected, although this sometimes does not apply within communities, owing to the fact that salinization often appears in a patchwork pattern. Yet location of land is as critical as in avoiding discharges of salt from upstream as in acquiring more water, meaning that less powerful water users also suffer inordinately in this regard.

Water users try to adapt to water scarcity and land degradation in a variety of creative ways, yet the overwhelming majority of them do not possess the resources needed to succeed in this endeavor. Farmers sometimes revert to traditional water-saving methods or seek substitute sources of water, which often ends in irrigation with saline drainage water from collectors. Many change cropping patterns in favor of lower water consumption and heightened salt tolerance (in Uzbekistan, this can only be done on the 35% of cropland not subject to production plans). Because of lack of capital, many farmers cannot afford even stopgap alterations of I&D systems, e.g. the

installation of hand pumps. Lack of capital, the disorganization of institutions, and systemic corruption prevents many villagers from successfully making adaptations. Whereas the system of planned production constrains incomes in Uzbekistan, inequitable privatization, bottlenecks and distortions in input, finance, and output markets prevent most farmers in Kazakhstan and Kyrgyzstan from acquiring sufficient capital.

The degradation of I&D systems in the fieldwork sites, in combination with the downturn in various aspects of agriculture, results in the decline of crops yields. In fieldwork sites in Uzbekistan (for which historical data are available), crop yields per hectare have dropped by as much as factor of two. The drop is even more precipitous in areas covered in Kazakhstan and Kyrgyzstan. According to villagers, yields within communities are 1.5-2 times higher in upstream than in downstream areas.

Aside from adapting agricultural production, farmers respond to the degradation of I&D systems by de-emphasizing crop production in favor of livestock breeding or seeking non-agricultural employment. In some sites in Kazakhstan, irrigated area has contracted to the degree that considerable expanses of former cropland have become pasture. Yet this land is limited, and in some locals land salinization has rendered it unfit even for pasture. Moreover, in many areas the lack of adequate pasture makes the irrigation of land for feed and fodder production imperative. Aside from moving away from crop production, some farmers move away from agricultural production altogether, which, given the lack of non-agricultural jobs in rural areas, usually involves migration as far away as Russia for employment as a menial laborer. The numerous impediments that migrant workers must face, such as internal passport and registration regimes in Uzbekistan, lack of training, regional discrimination and nepotism in hiring, etc. frequently prevent them from sending home remittances that justify the move away. Few migrate permanently, and even fewer do so with their families.

The breakdown of canal and (particularly) drainage systems lowers the quality of drinking water and, in the extreme cases covered in this study, degrades the foundations of houses. Rural water supply systems are for the most part decrepit, and families often use water from canals and even drainage collectors for household needs. Funding for rural water supply systems has shrunk to a fraction of the previous amount (with the exception of Uzbekistan), and, as in irrigation, institutions operate within a vacuum. In some areas of Uzbekistan, the allocation of drinking water is inequitable and thus a subject of contention among villagers. The degradation of I&D systems negatively affects the quantity of drinking water available through its diversion for irrigation by opportunistic (and typically upstream) farmers, while the decline of the of the quality of water in canals impacts those who use this source for household purposes. Moreover, in many areas wells and reservoirs are hydrologically linked with canals and drainage, i.e. drinking water quality declines along with that in the I&D system. In areas with severe drainage problems, water slowly seeps into and damages the foundations of houses and public buildings. Medical specialists in the areas concerned commonly linked low quality drinking water with a high incidence of intestinal and other

maladies and the damp conditions created by seepage into foundations with rheumatism, especially among children.

As one might expect the degradation of I&D systems occupies a prominent place in the villagers' perceptions of poverty. Stakeholders noted the increase in poverty, especially over the last 2-3 years, and most estimated that 70% or more of the residents of their village lives in poverty. Water figures quite prominently in Uzbek stakeholders' perception of what constitutes wealth, while perceptions in Kazakhstan and Kyrgyzstan are focused at least as much on possession of livestock and an adequate input supply. The same is true of rankings that communities assigned to their problems—stakeholders in the communities studied in Uzbekistan placed difficulties associated with the degradation of I&D systems at the top of their list of problems, while those in Kazakhstan and Kyrgyzstan also included lack of working capital, inputs and machinery, and unemployment.

Villagers in Uzbekistan ascribe a much greater role to the state in solving the problems associated with irrigation and drainage than those in Kazakhstan and Kyrgyzstan. In the former case, farmers remain rooted in the Soviet legacy of dependence on the state. In the republics where substantial, albeit highly imperfect reform, has taken place, the severe decline in subsidies of agriculture, coupled with the often-venal actions of many officials under “market” conditions, has led to disillusionment with the state—many have taken the resigned approach that the population must overcome existing problems on their own, since no help will be forthcoming from the state.

1 INTRODUCTION

Irrigation agriculture is critical to livelihoods in the republics of Central Asia, where it accounts for around 90% of crop production. However, in all of the Central Asian republics the vast network of irrigation and drainage (I&D) systems built during the 1960s-1980s has fallen into decay since the demise of the Soviet Union. Given the reliance on the republics on irrigated agriculture, it is clear that some investment will be needed, yet I&D systems are so dilapidated that, by any estimate available, the amount required needed to repair and/or upgrade existing infrastructure is higher than governments can support and donor agencies can deliver (and might put future macroeconomic stability in jeopardy if these debts were not repaid). Therefore, investments must be prioritized.

This study was conceived as a field assessment component of a larger study concerning irrigation networks in Central Asia should be rehabilitated and the reasons why.² The field assessment covers the views of water users concerning the degradation of their I&D networks and its effect on their lives, the ways in which they adapt to this situation, the linkage between I&D system degradation and their perceptions of poverty in their locales, and what they believe should be done to improve matters. Where sufficient information is available, emphasis is placed upon which water users are affected the most, who must adapt, and in what ways.

1.1 Units Of Analysis, Techniques, And Site Selection

Districts, former state and collective farms (FSKs), and villages within them were selected as units of analysis in order to capture the local level dynamics of how people adapt to the degradation of irrigation systems, as well as how the implementation of national policies at local level influence this adaptation. In order to give farmers the fullest opportunity to voice their opinions, the fieldwork for this study employed Participatory Rural Appraisal (PRA) techniques. In a PRA training workshop held in Tashkent, Uzbekistan in May of 2001, teams of local specialists were encouraged to focus on the views of rural stakeholders concerning land tenure, farm production, and water management institutions, as well as perceptions of stakeholders' social and economic status relative to others in their village and its linkage to I&D system degradation.

² World Bank, *Irrigation in Central Asia: Where to Rehabilitate and Why* (forthcoming).

Characteristics of the Sites Selected			
Name of Village or Farm	District, Province	Geographical Area	Farm Types (Year Created); Primary Crops
Kazakstan			
Shoymanova	Otrar, Southern Kazakstan	Steppe (mid-stream Syr Darya basin)	Sovkhoz > production cooperative (1994) > family farms (1999-2000); Cotton-corn
Otrar	Otrar, Southern Kazakstan	Steppe (mid-stream Syr Darya basin)	Sovkhoz > production cooperative (1995) > family farms (1999); Cotton-corn
N. Ilyasov	Syr Darya, Kzyl Orda	Steppe/Desert (downstream Syr Darya basin)	Sovkhoz > production cooperative (1994) > limited liability association and family farms (1999); Rice-alfalfa-cereals
Askar Tokmaganbetov	Syr Darya, Kzyl Orda	Steppe/Desert (downstream Syr Darya basin)	Sovkhoz > production cooperative (1994) > limited liability association and family farms (1999); Rice-alfalfa-cereals
Kyrgyzstan			
Kalba	Talas, Talas	Mountains (upstream Syr Darya basin)	Sovkhoz > large family farms (1995); Cereals-fodder-potatoes
Amanbaev	Kara Bora, Talas	Mountains (upstream Syr Darya basin)	Kolkhoz > conglomerate of family farms (1994); Beans-cereals
Gulbaaar	Aravan, Osh	Foothills (upstream Syr Darya basin)	Sovkhoz > production cooperative (1993) > family farms (1995); Cereals-corn
Birlik	Kadamjan, Batken	Mountains (upstream Syr Darya basin)	Sovkhoz > production cooperatives (1991) > family farms (1994); Cereals-corn-fodder
Uzbekistan			
Ghafur Ghulam	Uzbekistan, Ferghana	Steppe (upstream Syr Darya basin)	Kolkhoz > joint stock company (1997); Cotton-cereals
Pakhtaabad	Nishan, Kashkadarya	Steppe (mid-stream Amu Darya basin)	Sovkhoz > kolkhoz (1993) shirkat (1998); Cotton-cereals
Dostlik	Nishan, Kashkadarya	Steppe (mid-stream Amu Darya basin)	Sovkhoz > kolkhoz (1993) > conglomerate of independent farms (2001); Cotton-cereals
Kirkkiz	Ellikkala, Karakalpakistan	Steppe/Desert (downstream Amu Darya basin)	Sovkhoz > kolkhoz (1994) > conglomerate of individual farms (1995); Cotton-cereals

This study was conducted in 12 sites in Kazakhstan, Kyrgyzstan, and Uzbekistan (4 apiece) during the summer of 2001 (see Table 1.1). Sites were selected according to several criteria. First, all areas have suffered from significant I&D system degradation and associated problems. Second, they cover the range of geographical areas in which irrigated agriculture is practiced in Central Asia. As the table on the preceding page shows, fieldwork was carried out predominantly in lowland (steppe and desert), as well as foothill and mountain areas. The choice of these sites also permits a comparison of upstream and downstream areas, both within the main river basins of Central Asia (the Amu Dray and Syr Darya River basins), within secondary river systems (the Sokh River in the Ferghana Valley), and at the local level within districts (Otrar District in southern Kazakhstan and Nishan District in the Karshi Steppe of Uzbekistan).

In addition to data obtained in the course of fieldwork, this study utilizes a number of qualitative and quantitative sources. Most significantly, data is drawn from a series of in-depth interviews and a survey conducted in spring of 2001 by the World Bank for the Rural Enterprise Support Project, which covers Nishan and Ellikkala Districts in Uzbekistan. Moreover, this survey draws upon fieldwork conducted by the author in the Ferghana Valley (primarily in the Sokh River basin) between 1992 and the present. Finally, relevant data from World Bank and other written reports are included when appropriate.

1.2 Irrigation Agriculture In The Areas Studied

1.2.1 Farm Production Systems

Farm production systems in the republics have undergone substantial changes in the last decade. In Kazakhstan, the formal disbandment of sovkhozy and kolkhozy began soon after independence, although by the middle of the 1990s restructuring largely consisted of changes in name to “joint stock company,” “production cooperative,” and other types of FSKs and/or the division of one FSK into several smaller units (particularly true of sovkhozy, which sometimes reached gargantuan dimensions of over 20,000 ha). During the latter half of the decade many FSKs, were disbanded and land shares given to their members, who subsequently created family farms, conglomerates of them, or one of the types of enterprise (i.e. FSK) permitted by the Government. By 1997 family farms encompassed 20% of agricultural land in Kazakhstan (concentrated mostly in the southern portion of the republic), while the remainder was held by 9,000 FSKs created out of 2,500 state and collective farms. In Kyrgyzstan 33% of arable land was held by individual and groups of family farms, 27% by associations of family farms, and the rest by the few remaining FSKs and the Government’s Land Redistribution Fund. Land in Kazakhstan formally belongs to the state, which grants rights of *use*, but land shares are freely transferable. Kyrgyzstan, after long debate and national referendum, has decided to proceed with full privatization of *ownership* rights, yet this has not yet been put into effect.

Although the privatization of farms continues, it has been characterized by rent-seeking on the part of local officials or farm managers that interpret and manipulate

Government laws and decrees in order to gain an unfair advantage in the division of privatized farmland and assets, lack of transparency to farmers that are often poorly informed and/or kept in the dark concerning the procedures and regulations involved, and lack of farm management capabilities of farmer workers accustomed to simply taking orders to meet the requirements of production plans.³

With the liberalization of input markets, items such as seed and (especially) fertilizer and machinery have become much more expensive (in line with an adjustment towards world market prices), and a private network of suppliers is still nascent. Moreover, although output markets have been liberalized, price distortions and regulation continue to play a significant role. Rural finance is tight, and sometimes bribes are demanded before loans are approved (on the order of 10% of the cost of the loan). In Kazakhstan, FSKs have the best access to credit.

The result of halting and non-transparent farm restructuring, reduced access to inputs and credit, low farmgate prices, and inadequate knowledge of independent farm operations is low agricultural output, which in Kazakhstan has yet to reach pre-independence levels (after a slide to 57% of 1990 output in 1995). In Kyrgyzstan the sector bounced back in the latter half of the decade and exceeded 1990 levels by 1999.

In Uzbekistan, farm restructuring remains largely cosmetic. The predominant type of FSK is the *shirkat* (“production cooperative”), which differs little from kolkhozy, except in size. The land allocated to private farmers and those that rely entirely on garden plots (“dehqan farmers”) is limited (around 20% of cropland). Moreover, shirkats and private farmers are subject to state production plans, highly distorted prices, and state-controlled input supply and financial systems. In Uzbekistan, agricultural output has remained fairly stable at around 3% below 1990. Output in all republics suffered a downturn in 2000 and 2001 owing to a drought that has reduced water supply and diminished crops yields, especially downstream within the Aral Sea basin.⁴

1.2.2 Water Management under Minvodkhoz

The development of irrigation and drainage in Central Asia took place on a massive scale in the 1960s-1980s, the heyday of the former USSR Ministry of Water Management (*Minvodkhoz*), chiefly to advance the goal of increasing cotton production. Between 1960 and 1987 the area of irrigated land in Central Asia rose by a factor of 1.5. Management was strictly centralized and run by well funded departments at republic, province, and district level that were responsible for operations and maintenance (O&M) on inter-farm I&D systems. Water allocation was conducted according to highly standardized schedules set by republic, province, and district departments of Minvodkhoz. O&M on collective and state farms was the responsibility of farm management. Although major decisions such as water allocation among brigades within farms were formally made by a general meeting of members, in fact the farm director and his cronies, the district department (*rayvodkhoz*) and the district Communist Party executive committee decided how a farm’s resources were to be used to meet production targets. Almost all water users

³ World Bank, *Social Assessment of the Kazakhstan Irrigation and Drainage Improvement Project* (Draft).

⁴ *Report on the OCHA-UNDP-WHO Mission to Uzbekistan 1-7 July 2001.*

in the areas studied idealize this period as a “golden age” in irrigation when there were no problems.

However, the golden memories of irrigation in the USSR ignore some unpleasant realities that had already emerged long before the demise of the Soviet Union in 1991. First and foremost, Minvodka ran a near-monopoly on irrigation works. By law, the functions of customer, planner, and contractor were concentrated within this single ministry.⁵ Departments to check on the quality of construction and ensure the efficient use of water resources were part and parcel of the ministry, and oversight at the federal level was minimal until the late 1980s. Thus, Minvodka could “boast a political clout and instinct for self-perpetuation that the powerful U.S. Bureaus of Land Management and Reclamation and the Army Corps of Engineers might envy.”⁶ As one analyst wrote in the mid-1980s,

At present any producer in the irrigation development complex, whether in the building [materials] industry or a construction organization, in essence dictates its own terms to the consumer. Thus, factories and conglomerates for building materials often act on the principle of “take what is given” and construction organizations [on the principle of] “accept the installation as it is.”⁷

Moreover, in newly irrigated areas the mandate of Minvodka extended well beyond simply installing I&D infrastructure. “Settlement” (*osvoenie*), the term used to characterize Minvodka irrigation projects, denotes the construction of entire villages, including roads, schools, and in some cases even housing. In new sovkhozy developed in the 1970s-80s, such as those in Nishan District (Uzbekistan), large construction trusts (in this case *Glavkarshistepstroy*) were responsible for O&M as well as production on new sovkhozy until they reached their “project indicators,” i.e. a certain level of productivity, after which these farms came under purview of Ministry of Agriculture (in one of the fieldwork sites, Nishan District in the Karshi Steppe of Uzbekistan, this process was only complete in 1990).

The monopoly position of Minvodka led to poor construction and maintenance of I&D systems. First, in pursuit of the billions of rubles available for pork barrel funding of irrigation development, Minvodka made greater efforts to initiate projects than to complete them and ensure sustainable O&M in areas already irrigated. Second, farmers were left with incomplete or shoddily constructed infrastructure, even after a project was reported as “complete.” Minvodka commonly “padded the books” in reporting its work, especially earth-moving. Moreover, to “meet the plan” on time in construction, the ministry commonly cut corners on portions of projects, especially drainage.⁸

⁵ T.N. Zatsepina, “Oktiabr’skii (1984g.) Plenum TsK KPSS i pravovye aspekty melioratsii sel’skokhoziaistvennykh zemel,” *Sovetskoe gosudarstvo i pravo*, 1985, no. 10, p. 112.

⁶ Murray Feshbach and Alfred Friendly, Jr., *Ecocide in the USSR: Health and Nature Under Siege* (New York: BasicBooks, 1992), p. 59.

⁷ A.S. Chamkin, *Sotsial’noe upravlenie kompleksnym osvoeniem zemel’ srednei Azii* (Tashkent: Fan, 1985), p. 28.

⁸ See: Francheska Chalidze, “Aral Sea Crisis: A Legacy of Soviet Rule,” *Central Asia Monitor*, 1992, no. 1, p. 32; Thane Gustafson, “Transforming Soviet Agriculture: Brezhnev’s Gamble on Land

Kolkhozy and sovkhozy were formally responsible for maintaining on-farm I&D systems, although district irrigation departments and/or construction trusts commonly assumed responsibility for excavation and cleaning drainage systems pipes (which, in case of subsurface drainage systems, require special equipment). Manual labor for repair and upkeep was organized by irrigation unit of the farm administration, in consultation with brigade leaders, a process in which formally duties were allocated by amount and location of land irrigated, but which in fact could be influenced by connections with the farm director and/or local power structure that controlled the general meeting of the farm. This method of labor mobilization was often referred as *hashar* (or *ashar*), although often it bore little resemblance to the traditional institution from which the term is derived.⁹

Because Minvodkhoz had no incentive to build or maintain systems in accordance with its mandate, I&D systems were already in decline by the waning years of the Soviet Union. It was estimated that by the mid-1980s 2.4 million ha served by I&D networks in Uzbekistan, over half of the total, was in need of capital reconstruction (rivaling the development of virgin land in cost).¹⁰ Shortly after Kazakhstan and Kyrgyzstan attained independence, it was established that I&D systems on roughly half of the area irrigated required rehabilitation.¹¹ Due to the poor condition of canals, water losses were at least 40% of the total withdrawals, which, measured per hectare, were astronomic by world standards (up to 18,000m³/ha). Inadequate drainage, as well as application of inordinate amounts of water to crops resulted in the waterlogging and salinization of land, the latter of which by the mid-1980s encompassed 40-50% of irrigated land in Central Asia and an even higher portion in downstream areas such as Karakalpakstan and Kzyl Orda Province of Kazakhstan.¹² Land salinization and waterlogging also resulted in large areas being taken out of commission (1.1 million ha in Central Asia between 1982 and 1987).¹³

Improvement.” *Public Policy*, vol. 25, no. 3 (Summer 1977); *Izvestiia*, February 7, 1990; Philip Micklin, *The Water Management Crisis in Soviet Central Asia. Carl Beck Papers in Russian and East European Studies*, no. 905 (1991).

⁹ *Hashar* refers to 1) an annual labor corvée levied under the khans and emirs before the Russian conquest of Central Asia in the nineteenth century and 2) a voluntary pooling of labor for irrigation or other major works in the style of “barn-raising” in the United States. In both cases, the principle of allocating duties is *taqsim* (lit. “allocation”), in which location on canals, land quality, amount of water used, and other factors are taken into account. Occasionally khans or corrupt local beks abused this principle, although this was taken to extremes under Stalin—the use of prison camp labor in the late 1930s-50s to build canals in Central Asia was also referred to as a *hashar*.

¹⁰ Akademiia Nauk Uzbekskoi SSR, Institut po izucheniiu proizvoditel’nykh sil, *Ekonomicheskoe i sotsial’nye problemy razvitiia i rameshchenia proizvoditel’nykh sil Uzbekskoi SSR na sovremennom etape* (Tashkent, Fan, 1986), p. 35.

¹¹ Ivan Duyunov, “Measures to Increase the Efficiency of Irrigated Lands in Kyrgyzstan,” in *The Interrelationship Between Irrigation, Drainage, and The Environment in the Aral Sea Basin*, edited by M.G. Bos (Dordrecht: Kluwer Academic Publishers, 1996), pp. 125-26; World Bank, *Kazakhstan Agricultural Sector Review, World Bank Report 13334-KZ* (Washington, DC: World Bank, 1994), p. 5.

¹² One very high estimate claimed that salinization encompassed 60% of irrigated land in Uzbekistan, 40% in Kyrgyzstan, and 70-80% in Kazakhstan. See: N. Glazovskii, *Aral’skii krizis: prichiny voznikoveniia i puti vykhoda* (Moskva: Nauka, 1990). For a more measured estimate of the problem in Uzbekistan, see: David R. Smith, “Salinization in Uzbekistan,” *Post-Soviet Geography*, vol. XXXIII, no. 1 (January 1992).

Before the breakup of the Soviet Union, water allocation was much more strictly controlled than now (see below). An elder of one of the villages in Kara Bora District of Kyrgyzstan (born in 1910) provided the following contrast between past and present: “Previously only one person patrolled the irrigation system, the mirab [on-farm water manager], and people listened to him. Now people have lost their conscience; each works only for himself.” However, in this man’s recollection, as well as the memories of those younger than him, there is an element of idealism. Water allocation was indeed more equitable, owing to adequate funding of district water departments, the very specific focus of Soviet managers on getting as much water to as many people as possible (in accordance with Communist ideology), and the draconian nature of punishments, *when they were meted out*.

The latter qualification is crucial, because underneath the veneer of plan fulfillment reports (*svodki*) was hidden a significant amount of skullduggery in water allocation, from community to republic level. Rent-seeking in water allocation is a tradition in Central Asia that predates the Soviet Union by centuries, and during the Soviet period it merely became restricted to where it was “safe,” meaning behind the office door of the planning division of the district water department or executive committee, which, as noted above, were deeply involved in on-farm management. Moreover, at the local level some forms of rent-seeking in water delivery never died during the Soviet period. Although water users in the Soviet Union did not pay for water in the formal sense, it was possible to “buy” a local mirab or, if more was required, the district water department (usually with vodka, a sheep, or money). Regardless of how well intentioned the district water department might have been, in areas where water was scarce farmers often had to stand guard over their water (often at night¹⁴) to fend off the occasional thief. Where canals paralleled roads, during the release of water groups would yell to the groups upstream on the road, “Don’t touch my water!”¹⁵

1.2.3 Institutional Changes in Water Management

After the breakup of the Soviet Union in 1991, the Governments of the Central Asian republics scaled down the republic Minvodkhozy and gave them drastically reduced funding from their shrinking state budgets. Expenditure on O&M in Kazakhstan dropped by a factor of 21 during the 1990s, and the new Committee for Water Resources is but a shadow of its former self. Only 31% of the required maintenance in the Kyrgyz Republic, now managed by the Ministry of Agriculture and Water Management (Minsel’vodka), actually receives funding. The figure for the much better-preserved and still-powerful Uzbekistan Minsel’vodka is a reported 50%, although even this is an optimistic

In some areas, soils were already saline before being irrigated. This was the case in many areas brought under irrigation in the 1970s-80s. However, in areas where irrigation has been practiced for centuries, the rate of salinization also increased.

¹³ Chalidze, “Aral Sea Crisis,” p. 31.

¹⁴ Irrigation was and is commonly done at night, to minimize evaporation losses in the hot and dry climate of Central Asia.

¹⁵ Field interviews by the author in Uzbekistan, 1992, 1995-96, and 1999-2000.

estimate.¹⁶ Thus, at the local level, district irrigation departments (rayvodkhozy) throughout Central Asia now have “very low salaries, small operational budgets, and very little equipment.”¹⁷ Moreover, owing to the dissolution of longstanding trade ties with other post Soviet countries and changes and/or drop-offs in industrial production within them, many materials such as hoses, pump motors, and stream gauges became harder to obtain.

In recognition that cost recovery was necessary and could possibly improve the efficiency of water use, Central Asian governments have increasingly taken steps to introduce payment for water, introduce cost accounting in repair by rayvodkhozy, and divest themselves of the responsibility of operations and maintenance of on-farm I&D systems.

Cost recovery measures were taken early on in Kyrgyzstan and Kazakhstan with the introduction of water charges in 1992. As one might expect, the farmers consulted for this study were unhappy about being charged for water, especially given the increasing unreliability of its supply in their areas (see below). Whereas previously their (minimal) payment was made in contributions to maintenance on the FSK and sometimes in individual or collectively given bribes, now farmers must pay for water from their own pockets, as well as shoulder the cost of O&M on an increasing number of family farms. Although the charges do not cover the cost of O&M, rates of collection (often taken in kind) increased steadily during the 1990s (in Kyrgyzstan from 19% in 1995 to 80% in 1997).¹⁸ Water charges in Uzbekistan are incorporated into a land tax. The charge is extremely low (slightly over one cent per cubic meter), often not paid, and not transparent to the user.

In Kyrgyzstan and Kazakhstan, the transfer of irrigation management to water users has gone much farther than in Uzbekistan. In August of 1994 the Government of Kyrgyzstan relinquished ownership of on-farm irrigation facilities, formerly the collective property of FSKs, to Village Councils within districts, which were already overburdened with other duties. Simultaneously, around 90 Water User Associations (WUAs) were created (as of 2000), “but almost all of them are in an embryonic stage with few financial resources to operate.” Such is the case in the WUA in Gulbaar village of Aravan District, which has “no money and equipment for cleaning [canals].” Presently there is “little consistency” in ownership of irrigation system. The problem of filling the vacuum in responsibility for O&M between individual farmers, the district irrigation department, the Village Council, and the WUAs is compounded by the “need to adapt the distribution systems and their water control facilities to the newly emerging structure of varied farm organizations,” in this case the growing number of small scale farms (2-15 ha).¹⁹

¹⁶ Tajikistan also claims 50%, yet, based on the state of the economy and field reports, this is a highly unrealistic estimate. WEMP, p. 21.

¹⁷ World Bank, *Project Appraisal Document: Kyrgyz Republic Irrigation Rehabilitation Project*, World Bank Report No. 17531-KG, March 30, 1998, pp. 3, 11.

¹⁸ World Bank, *Project Appraisal Document: Kyrgyz Republic Irrigation Rehabilitation Project*, p. 3.

¹⁹ World Bank, *Project Appraisal Document: Kyrgyz Republic On-Farm Irrigation Project*, p. 5.

A similar institutional mismatch exists in O&M in Kazakhstan. Here the ownership of local irrigation systems was transferred to district water departments, and more recently (in 2001) converted into “district communal property,” i.e. under the stewardship of the already-taxed district governments and/or district irrigation departments that have been converted into state enterprises that operate according to contract. A program of public tenders to offer bids “private associations of water users” to take over management responsibility of both inter- and on-farm I&D systems, launched in 1996, has produced minimal results, largely due to the decrepit condition and high price asked for I&D systems, as well as the inability of water users to pay for O&M. However, water users are stuck with *de facto* ownership of I&D systems, although institutions do not exist that can effectively organize O&M.²⁰

WUAs in Kazakhstan typically are responsible for distributary canals and drains serving an area of 500-2000 ha. In general, WUAs are nascent, under-funded, and their staff is poorly trained and has little authority among water users.²¹ Their position (or the lack thereof) is indicated in a Venn diagram drawn by the leaders of a FSK in Kazakhstan (Tokmaganbetov village, Syr Darya District) to describe decision-making in water allocation, which does not even include the local WUA among local level planning or management bodies. The same is true of local family farms. Thus, planning does not coincide with the operational units, which are unclear concerning their responsibilities vis-à-vis local governments and water users (FSKs and family farms).

In Uzbekistan, the organizational structure of water management is essentially the same as before, except that FSKs (“shirkats”) and/or rayvodkhozy must now deal with a small, yet growing contingent of “private” and “dehqan” family farms. FSKs and rayvodkhozy are unaccustomed to managing several small, independently operated units, and there is considerable tension between the new farms and shirkats. Moreover, the old institutions, owing to the lack of funding, are even more overextended and unable to fulfill their mandate than before 1991, and most farmers have little money to invest into O&M, largely due to artificially low farmgate prices paid by the state for cotton and wheat, which occupy 80-85% of the country’s sown area. WUAs in Uzbekistan are still in the experimental stage, and most analysis concerns the opinions of farmers concerning potential WUAs rather than ongoing efforts to create them. In the few WUAs that have

²⁰ Asian Development Bank, *Institutional Development and Policy Reforms for Improving Water Management, Government of Kazakhstan T.A. No 2946-KAZ, September 2000*; Richard Burger, “Water Users’ Association in Kazakhstan: An Institutional Analysis,” report for Harvard Institute for International Development, February 1998; World Bank, *Social Assessment of the Kazakhstan Irrigation and Drainage Improvement Project*, p. 40.

²¹ Asian Development Bank, *Institutional Development and Policy Reforms for Improving Water Management, Government of Kazakhstan T.A. No 2946-KAZ, September 2000*; ; Burger, “Water Users’ Association in Kazakhstan: An Institutional Analysis.”

An example of a successful WUA (which is not involved in maintenance) is analyzed in: Sydney Rosen and John Strickland, “After the State Farm: A Water User Association in Kazakhstan,” report for Central Asia Mission, US Agency for International Development, November 1998.

been created, the members often do not know the regulations, procedures, and responsibilities of the WUA, and in some cases even of its existence.²²

²² Kai Wegerich, "Water User Associations in Uzbekistan and Kyrgyzstan: Study on Conditions for Sustainable Development," Water Issues Study Group, School of African and Oriental Studies, University of London, *Occasional Paper*, no. 32 (August 2000).

2 THE DEGRADATION OF I&D SYSTEMS

2.1 Maintenance Of I&D Infrastructure

Because their incomes are lower, water users have not been able to compensate for the reduced state support of irrigation O&M on their farms. In all areas covered by this study, farmers mentioned that maintenance and repair of I&D systems, especially drainage, has declined in the last decade, and farmers in many of them claim that “no repairs have been done” in the last few years on significant portions of systems. For example, in Syr Darya District of Kazakhstan, teams were told, “repairs have not been made for over 10 years.” In Nishan District of Uzbekistan, farmers on the Pakhtaabad and Dostlik farms asserted that drainage had not been cleaned for 13 and 10 years, respectively.

These estimates given are occasionally exaggerated by the distress of water users over the problems involved—the authorities in Nishan mentioned that drains had not been cleaned since 1996, rather than over a decade ago. However, they indicate the farmers’ perception that the crisis in maintenance and repair is severe, which are confirmed by other estimates.²³ For example, only 6-7% of respondents to the RESP survey in Nishan District repaired or cleaned drains in the last three years, compared to 60-70% for canal systems. The corresponding figures for Ellikkala District are higher for drains (41-48%) and lower for canals (48-70%).

Farms attempt to keep I&D systems in working condition by pooling resources and using what little funds are available to hire equipment. Water users also employ traditional collective methods of labor mobilization, such as the *hashar* (or *ashar*), in which users of a canal allocate sections among themselves and remove silt and weeds. However, many of the required repairs can only be performed using expensive machinery, such as excavators to deepen collectors, which farms can no longer afford. A typical example is that of a FSK in Kazakhstan (Ilyasov village of Syr Darya District) that managed to hire 2 excavators to clean one side of 3 km of a main canal and to remove weeds and silt from another 1 km using its own laborers. However, on the remaining 45 km of this and other on-farm canals “cleaning has not been done due to the lack of specialized equipment and funds.” The local WUA in the field site studied in Aravan District of Kyrgyzstan succeeded in (manually) cleaning only 2 out of 15 km of drains that is in dire need of attention.

Only the few wealthy family farmers and those inside or connected with the administration of FSKs can afford to adequately maintain infrastructure. For instance, a private farmer in Nishan District of Uzbekistan, who, despite the fact that the authorities had already confiscated his land twice in the last decade and each time given him a piece of land in need of major drainage work, was able to sell 200 sheep in 2000 in order to install a drainage system on his third “private farm” of 60 ha. Others with connections to

²³ On other farms in the Nishan District interviewers for the RESP survey project were told that drainage had been neglected for 5-6 years, and the district water department claims that in the past 7-8 years cleaning of the system has been only 15% of what is required.

the resources of large farm enterprises are able to use tractors, fuel, and other equipment to improve I&D systems on their plots, but the resources available to be plundered are not nearly as rich as they were a decade ago. However, wealthy farmers tend to fit both categories, since they oftentimes obtained their superior resources from those of the large farm during privatization and/or by virtue of formerly holding a prominent position on a sovkhoz or kolkhoz.

Shortfalls in maintenance are also severe on inter-farm I&D systems, although not to the degree present on farms. Because of reduced funding, district water departments cannot afford to replace or adequately repair machinery such as excavators or pay qualified personnel enough to stay.²⁴ Moreover, materials are in short supply, as noted by the water management specialists in Uzbekistan District (Uzbekistan): “In the last few years there has been a deficit of metal reinforcement bars, cement, machinery, and fuel for normal repair.” In other areas, spare parts for machinery, pumps, and stream gauges are lacking. As an elder in Otrar District of Kazakhstan told the field team, “The akimat and Vodkhoz do not have the money for repair canals and pumps and for electricity [to run the pumps].” In areas where farmers pay for water, such as Talas District, they assume that lack of maintenance is due to the perfidy of the district irrigation department, although they pay 120-270 som per hectare (which probably only covers operations and very minor repairs): “the irrigators take money from the population, but produce no real improvements of the irrigation system.”

2.2 Irrigation Systems

Because neither farms nor district water departments possess the resources or management structure needed to maintain canal systems, they are in deplorable condition. This is particularly true of earthen canals, which predominate on farms in all districts except Nishan, which relies almost entirely on concrete flumes (in Kadamjan, Kara Bora, and Talas Districts of Kyrgyzstan and Uzbekistan Districts of Uzbekistan flumes are installed on part of the delivery network). For example, in Otrar District of Kazakhstan, “The technical condition of the canals is very poor. As a result, the flow capacity of the irrigation system is very low: the beds of canals are silted up, and in them grow bushes, reeds, and grass.” In other areas, such as Kara Bora District in Kyrgyzstan, even the canals maintained by the district water department are in bad shape:

Out of 160.1 km of inter-farm canals, 158.6 km (99% are earthen, and of these 61.6% (38%) are in unsatisfactory condition—they are choked with silt, sand, stones, and the rate of movement of water through the canal is minimal—under 1 meter per second. The delivery efficiency ranges from 40%-80%, which is very low. And the delivery efficiency of on-farm canals is even less.

²⁴ For example, the Nishan District raysel’vodkhoz cannot keep machinery operators. Work conditions are difficult, i.e. much traveling and dirty work without adequate living conditions is required. Pay is only 8,000-10,000 som per month, and arrears in payment extend to 7-8 months. Many machinery operators have left Nishan District and work in the temporary labor (*mardikar*) bazaar in the province capital of Karshi.

Areas downstream in the Aral Sea basin (Ellikkala District in Uzbekistan and Syr Darya District in Uzbekistan) receive a higher concentration of silt in river water, which is transferred from upstream areas (the same is also true of Uzbekistan and other downstream districts on the Sokh River, which has one of the highest siltation rates in the Ferghana Valley). Thus, in river basins, as well as within districts and communities, the maintenance requirement is higher for those downstream, a burden not often shared by those at the head of the canal. Earthen canals in these areas become incapable of delivering water effectively: “The banks are eroded away, the bed is silted up and reeds are growing [there], the transfer pipes are blocked up, and the flow regulation installations are out of commission” (Syr Darya District of Kazakhstan). In the farm studied in Ellikkala District (Uzbekistan), 85% of the length of earthen canal requires cleaning, and 70% of the drainage system is in poor condition. Moreover, a great deal of water is lost on the 45 km earthen canal that feeds the farm.

Even in areas with relatively modern concrete flumes installed, their condition is far from optimal. Flumes are predominant only in Nishan District of Uzbekistan, where they were installed in the 1980s. Even in this district, where the water delivery system is in far better shape than the others, 12% of the intra-farm canal system and 25% of the on-farm canal system length is in unsatisfactory condition. (These are the typically low estimates of the local raysel’vodkhoz, meaning that this probably the length of canals needing urgent repair.) In upstream areas of Kadamjan District (Kyrgyzstan), flumes have been broken apart in order to capture water, while those in Uzbekistan District are in decay.

The deterioration of canals has resulted in lower conveyance efficiency. In most of the field assessment sites, around half of the water is lost between the source and the farm intake; even worse than the average for Central Asia of around 30%. In the Kazakhstan field sites, the conveyance efficiency of the main channels has declined since 1996 by 7-24%. On-farm losses are even higher (for Central Asia, an average of 48% in conveyance and operational losses, although some of this is recouped through groundwater irrigation).²⁵

Water users on systems served by pumps are especially vulnerable when this key component their system breaks down, because when pumps go “off” (due to depreciation of the unit itself and/or low access to power) this part of their water supply disappears entirely, barring some other adaptation to move the water to a point where gravity will suffice for delivery. The case of the lower zone of Kara Bora District of Kyrgyzstan, where the flume delivery system is in good shape, is instructive:

Previously a pump station worked here. The pump pushed water from an artesian well (a spring) into a network of flumes, and around 76 families, or 60 ha, was supplied with irrigation water. Presently of the 60 ha of land, 50 ha is not cultivated. As long as there is no working pump station,

²⁵ WEMP, pp. 7-9.

water will not come through the canal to our land. Therefore, we look to the skies and wait for rain.

Only 500 ha of the 1,000 ha total command area of the pump station in Kara Bora is presently irrigated.

In the village of Otrar (Otrar District, Kazakstan) pumps were used to push water from the Arys River to supply the end of the Shauelder Canal. According to one of the elders in this locale,

Our village has the following 10-year history of water use: From 1990 to 1994, water was constant, because there were 8 pumps on the Arys River, which brought water to us. In 1995 the sovkhos broke up, and the pumps began to go out of commission. They weren't repaired, and water in the canal started to diminish. By 2000 there was almost no water.

The condition of stream gauges and headworks on main canals, which are needed to effectively account and divert water to tributary canals, leaves much to be desired. Thirty-seven percent of stream gauging stations in Nishan District require repair or replacement, and the figure is probably at least that high in Ellikkala District, while in these districts 21% and 34% of headworks, respectively, are in need of capital repairs. The problem is aggravated by the occasional destruction by upstream water users of headworks (to make it easier to steal water²⁶) and water metering devices (to make it more difficult to track theft of water). Thus, although diversions to farms are typically reported to the district irrigation department at 5-10-day intervals in terms of cubic meters, in reality these are general estimates. Where there are no stream gauges, water is measured using the level of water in the canal, a certain movement of a sluice gate ("a turn of the screw" opening it), or simply "by eye." Because water had to be measured by eye, the representative of the local WUA noted, "We have no means of accounting water [distribution]."

2.3 Drainage Systems

Drains are in even worse shape than canals. In most locales studied, stakeholders complained that large collectors are not of sufficient depth and are choked with weeds, closed drainage is blocked, and vertical drainage pumps have all too often burned up, resulting in systems that "do not work at all" (Otrar District of Kazakhstan). Even in Uzbekistan, where O&M is better funded than elsewhere in Central Asia, the effectiveness of drainage systems "has declined a good deal, a considerable number of vertical drains are out of commission (over 5,000), and a large portion of the horizontal drains, the average length of which is 30-32m/ha, are clogged and silted."²⁷

²⁶ For example, some on-farm irrigators in FSK in Uzbekistan complained to interviewers that even when they would weld a given intake shut to prevent further withdrawals through them, it was often destroyed shortly thereafter by water users seeking to continue illegal water withdrawals.

²⁷ *Natsional'naia programma*, p. 69.

In some cases, drainage systems were incorrectly built or not finished. In Otrar District, a major drainage initiative begun in 1987 was halted, and the area in which drainage water accumulates has no outlet for discharge. In Nishan District, drains that were supposed to be installed as part of the original construction plan were not, or else recent repairs have been of substandard quality.

3 THE EFFECTS OF I&D SYSTEM DEGRADATION ON AGRICULTURAL PRODUCTION

In all areas covered in this study, the breakdown of I&D systems makes it much more difficult for farmers to cultivate their crops successfully and earn a living. Table 3.1 indicates the main problems associated with the breakdown of I&D systems in these locales, such as unreliable water supply, salinization, and waterlogging. However, other factors work in conjunction with the dysfunction of canals and drains to produce and/or intensify water scarcity, most prominently illegal upstream capture of water (both among and within communities), which occasionally leads to hotly contested debates or even fights over the critical question of “who gets the water?” Although farmers seek to adapt agricultural production to changes in water supply and land degradation, most are unable to do so successfully for the same reasons that their canal and drainage systems are falling apart—they cannot afford the repairs or installations needed, which in most cases are beyond their individual and collective ability to muster the required labor and/or pay for materials and parts. The end result of the inability of most water users to adapt to the degradation of I&D systems is declining yields and incomes, which are also influenced by weather (most notably the droughts of 2000 and 2001), farm production systems, as well as access to inputs, finance, and output markets.

Table 3.1 Irrigation and Drainage Problems In The Sites Studied							
District (Name of Village or Farm)	Condition of Canal System	Unreliable Water Supply?	Upstream Capture Within Area Studied?	Conflict?	Condition of Drainage System	Salinization?	Waterlogging?
Kazakstan							
Otrar (Shoymanov)	Poor	Yes*	No*	No	Poor	Yes	Yes
Otrar (Otrar)	Poor	Yes	No	No	Poor	Yes	Yes
Syr Darya (Ilyasov)	Poor	Yes*	No*	No	Poor	Yes	Yes
Syr Darya (Tokmaganbetov)	Poor	Yes	No	No	Poor	Yes	Yes
Kyrgyzstan							
Talas	Poor	Yes*	No*	Tension	Poor	No	No
Kara Bora	Poor	Yes	Yes	Yes	OK	No	No
Aravan	Poor	Yes	Yes	Yes	Poor	No	Yes
Kadamjan	Poor	Yes*	Yes*	Tension	OK	No	No
Uzbekistan							
Uzbekistan	OK	Yes	Yes	Yes	Poor	Yes	Yes
Nishan (Pakhtaabad)	OK	No*	No*	No	Poor	Yes	Yes
Nishan (Turkmenistan)	OK	Yes	Yes	Tension	Poor	Yes	Yes
Ellikkala	Poor	Yes	Yes	Yes	Poor	Yes	Yes
* Denotes an area located upstream within the local river basin, canal, or district.							

3.1 Who Gets The Water?

The first and most noticeable effect of the deterioration of water delivery systems is lower supply due to reduced flow capacity and increased filtration. This is particularly true of downstream areas, which experience a disproportionate drop-off in flow capacities at the end of canals—systems tend to degrade more quickly at their ends, meaning that flow capacity is increasingly reduced and filtration losses become higher. Downstream areas also receive less water through the capture of water by upstream farmers. However, the latter phenomenon is present at both river basin and local levels, and must be analyzed as such.

3.1.1 Upstream-Downstream Dynamics in Water Allocation

The example of Talas District of Kyrgyzstan illustrates the local nature of upstream-downstream dynamics in Central Asia. In this mountain district, the downstream area has no water supply problem. However, because on-farm canals have deteriorated and filtration losses are high, farmers at the tail-end of canals in the upstream area experience a chronic water shortage, despite the fact that water is allocated equitably. In the district, 350 ha out of 4,407 ha of irrigated land have been re-categorized as “rainfed cropland.” Many of those whose land was transferred are former teachers, services workers, etc. that lack experience in irrigated agriculture. Slightly over 60% of the total command area of the canal system is actually irrigated.

Similarly, end users in Aravan District claim, “Every year we don’t have enough water.” In this case, lack of water is due to upstream seizure near to the area studied, as well as general water scarcity in the surrounding area. However, the latter only becomes a significant factor when *downstream* cotton-growing FSKs irrigate (probably in both the lower portion of Aravan District and neighboring Marhamat District of Uzbekistan, which share the Southern Ferghana Canal and a branch of the Aravan Say River).

In Uzbekistan District, upstream capture of water plays a more significant role than the degradation of canal systems, which the district authorities declare are in reasonably good condition. However, because of irrigation development in the foothill and mountain regions upstream in Batken Province of Kyrgyzstan, water from the Nursukh Canal has not reached the Ghafur Ghulam FSK in Uzbekistan District since 1984, when a pump was installed to draw water from the Great Ferghana Canal. The authorities will only allow the farm to operate one of the two aggregates of the pump station, and residents must irrigate with salt-laden drainage rather than the fresh water discharged upstream. As noted by the residents, “Ten years ago there was plenty of fresh water for irrigation, now there is almost none.”

Upstream of Uzbekistan District in the Sokh River basin, some residents of Kadamjan District in Kyrgyzstan have a similar complaint. Farmers in the upstream zone of the district have destroyed 2 km out of 5.5 km of concrete flumes on the Gorot Canal by knocking holes in them and installing pipes and hoses in order to illegally withdraw water, which they routinely use above the established limits. An old earthen canal with a

low flow capacity must be used to transfer water downstream in the ruined area of the canal, resulting in a 70% loss between the upper and lower portions. Moreover, makeshift installation of pipes on about 30 meters of the canal that were wiped out by a mudslide (*sel*) 4 years ago have further lowered the flow capacity of the canal.

Needless to say, farmers in the downstream zone of the district are less than thrilled with this situation. Elders from the village at the very end of the system noted,

We have no irrigation or drinking water. People live very poorly. Compare us with the upper zone. See, they live better than we do, because they have water. There is no order in water allocation. Those in the upper zone always take the water and tell us, ‘The water is ours. First we will irrigate, and if any is left, we will give it to you.’ We discussed this in the council of elders, but all the same there was no result. Because there is a lack of irrigation water, people can’t cultivate their land.

The head of the local rural council (*sel’skaya uprava*) concurs. Speaking of the frequency of irrigation, he noted,

While the lower zone irrigates once, the upper zone irrigates thrice. We walked around in the morning and saw that in 14 places unsanctioned withdrawal of water was occurring, and they had destroyed the diversion structures with a tractor. People don’t think about their future, [or] what is happening in the lower zone; they are just seizing water for themselves, and that is all.

However, like the downstream users in Uzbekistan District, those in Kadamjan District are unaware that not all upstream water users have an adequate supply of water. At the ends of canal in the upper zone of Kadamjan District, the water delivery system is ruined, and farmers have received no water for some time.

Because less water is available to them than before, the orchards and gardens in the lower zone of Kadamjan District are drying up, while fields are shrinking. Different farmers gave different estimates of the severity of the problem, probably depending upon conditions in the immediate area:

- “Right now we cannot irrigate even a third of the plots, and the quality of the irrigation leaves much to be desired.”
- “Seventy percent of our land is considered irrigated, though in fact we can’t irrigate even 40% of it. But we pay taxes on 70% of the land.”
- “Although 50% of the land is considered irrigated, in fact this became 15-20%.”

All of these estimates indicate that the majority of land cannot be irrigated, in part because system cannot carry water effectively and in part owing to the theft of water as it flows en route to tail-end farms.

3.1.2 “Even if your father is the mirab, may your land be located at the inlet.”

The proverb above, commonly encountered in lowland irrigated zones of Uzbekistan, speaks volumes about the nature of water allocation by *mirabs* (local level water managers; lit. “water masters”) within most of the communities studied. Owing to gradual erosion of the capacity of the on-farm irrigation units of FSKs and nascent character of WUAs or other institutions intended to replace them, the tendency of water users to illegally capture water and of irrigators to accept payments “on the side” have become noticeably stronger than before the breakup of the Soviet Union (see above). Although water allocation is to proceed according to plans set by province and district water authorities (which in Uzbekistan are also tightly linked with production plans), all too often these plans are subverted by water users located near the intake of the local canal.

In Kara Bora District of Kyrgyzstan, water authorities are not only overtaxed, they are also in collusion with local bosses and investors from Turkey in Iran to deny water to the “ordinary folk.” The flow of the river feeding the district has receded 30% in the past 5 years, owing to less melt from the nearby glacier, resulting in a 42% deficit of water in the district. However, “whoever is at the upper end of the canal system takes the water he wants at will,” and downstream users are disadvantaged—some still hadn’t irrigated as of June 16. Scarcity has become apparent in the last few years. As one farmer noted, both upstream water seizure and the deterioration of the canals feeding his land have placed him in an unenviable position:

Our water comes from the Bolk Canal. Until 1999 I had never seen the Bolk, because it wasn’t necessary to go there—there was always enough water. During the last year water scarcity forced me to go to the canal several times. At the intake the water flows at 50 liters per second, and by the time it gets to my [farm] (about 3 km) it reaches only 20 liters per second. Much water is lost, because of filtration—our canals are earthen.

Another water user in the same area, accustomed to receiving water in middle of spring, noted,

I can’t irrigate my garden. There is no water. For 10 days I went to the head of the canal Bolk every day, in order to stand in line and get water. Only yesterday (mid-June) I received water and applied the first irrigation on a 0.2 ha plot.

The shortfall in supply of the end users is especially owing to the role of the local and foreign elite upstream, which is able to obtain land in the upstream areas or else upgrade water supply on other land. To quote the field report,

Foreign investors [from Iran and Turkey] that lease land, local bosses, and wealthy leaseholders receive water more than the farmers, without waiting their turn...At present they have already irrigated their fields twice, while the ordinary farmers have still not irrigated once...Moreover, the

representatives of the province authorities obtain rainfed cropland on lease, connect this land with canals, and irrigate before everyone else, even though water is not supposed to be allocated to rainfed cropland.

These individuals have the means required to sell and lease fertile, well-irrigated land on the order of 50-200 ha, the water supply of which, in the case of the investors, is guarded from other farmers by the local police. The local elite comprise a small section of the population, usually former and present FSK directors, agronomists, etc., who usually work in conjunction with local officials that interpret the land law in their favor and to the disadvantage of the majority of water users.

In Uzbekistan, upstream seizure acquires a more complex dynamic than “rich versus poor,” owing to the limited reform of agriculture and water management. The conventional wisdom among farmers consulted for this study is that FSKs receive water first, followed by private and then dehqan farms. In a survey of household in the Karshi Steppe (which includes Nishan District), 75% of respondents claimed that “influential people” manage to obtain more than their share of irrigation water, while 67% believe that shirkat workers have an advantage in water allocation over private and dehqan farmers.²⁸ Several factors account for this. First, most private farmers are dependent on FSKs for irrigation and do not deal directly with district water departments; in other cases the latter is predisposed towards FSKs, because they have been dealing with them for decades. Moreover, FSKs plant more cotton and wheat (around 80% of sown area), which receive priority in water allocation, than other farms. Private farms also plant a good deal of cotton and wheat, but the keep much more of the latter for their own disposal. Dehqan farms and the garden plots of private and shirkat workers²⁹ typically receive water after the planned crops.

For the most part, the generalizations above apply to the areas covered in this study. For example, in 2001 the FSK in Ellikkala District irrigated its own land first, and then garden plots, in spite of the fact that the hakim had issued instructions to give plots priority in irrigation over FSKs. This played a “decisive role during the vegetative period, when there wasn’t enough irrigation [water].” However, there are important nuances in water allocation in Uzbekistan that must be recognized. First, garden plots of less than one-half hectare (which are held by all farmers) require far less irrigation than the much larger expanses of FSK and private farm fields (which range from 5-50 ha). Probably owing to this factor, farmers in both Ellikkala and Nishan Districts told the RESP Survey that a higher percentage of their garden plots than private farm and shirkat fields had been irrigated sufficiently in 2000 (see Tables 3.2 and 3.3 below).

²⁸ World Bank, *Karshi Pumping Cascade Rehabilitation Project: A Social Assessment* (Draft, 2001), p. 8.8.

²⁹ All categories of farmers have a garden plot, which is typically the piece of land on which the house and other buildings are located. While private farmers and those on FSKs work a large field besides their garden plot for their respective enterprises, in addition to a garden plot, dehqan farms have no other land.

Table 3.2 Percent Of The Number Of Garden Plots Surveyed On Which Farmers Claimed Irrigation Was Sufficient			
	Private Farmers	Dehqan Farmers	Shirkat Farmers
Nishan	46.20%	26.00%	35.80%
Ellikkala	48.30%	30.00%	45.20%

Table 3.3 Percent Of The Number Of Fields On Which Farmers Claimed Irrigation Was Sufficient		
	Private Farm Fields	Shirkat Fields
Nishan	10.20%	25.90%
Ellikkala	14.30%	16.90%

Source: RESP Survey 2000.

irrigate their fields 5-6 times, while those with land at the end of the canal irrigate once.” One of the latter asserted that the local FSK has no qualms about “cooking the books” when it comes to reporting his irrigation to the district water department:

The local large farm enterprise [that supplies my fields] reported to the raysel’vodkhoz that they had irrigated my fields 5 times, when in fact it was 1.5. During the irrigation season we don’t sleep for 6 days straight, we guard the water, but this is not always successful.

The factor of location in the relative status of private farms is critical. Because land use rights in Uzbekistan are strictly circumscribed, local commissions and governors must approve all leases to private and dehqan farms. During the former transaction, in which large plots of land are involved (typically 10-20 ha, but up to over 100 ha), the “elite factor” plays a decisive role, although most private farms, especially those created since 1998, are given land that shirkats cannot maintain in satisfactory ameliorative condition.³⁰ As noted by a villager on the Turkmenistan FSK in Nishan District,

The rich [private farmers] are those that have land at the beginning of the irrigation system, at the point of withdrawal. These are usually former directors sovkhozy, policemen, farm agronomists, brigade leaders, entrepreneurs, and also Tajiks from Surkhandarya [Province], who have a lot of money and connections...The wealthy farmers have the possibility of irrigating their land 5 times...There was a decree of the district hakim to the

³⁰ A similar situation is prevalent in Uzbekistan District, where “whoever lives at the head of the canal has the advantage.” Sometimes these are former farm directors, etc. that were able to get land in upstream areas, while other private farmers have problems obtaining enough water, because, in their words, they aren’t the “born sons of the kolkhoz [sic].”

effect that private farmers at the head of the irrigation system were to use water economically, but none of them listen to anybody.

The relative advantage of shirkats in water allocation must also be qualified. The tables on the preceding page indicate that, although shirkats also received a poor water supply in 2000 (although it was better than that of private farms). Furthermore, it must be emphasized that the benefits from the relative advantage that shirkats have in water allocation go mostly to the Government, not the farmers. Pudrats within shirkats are allocated land on a yearly basis, a process in which connections with the farm administration, especially the director, are critical. Land and water rights are linked with an ambitious production plan, and good land and a plentiful water supply (and often much more than that) is needed to meet the target. Those that cannot meet the plan (and many that do meet production targets) are not paid, yet the plan for the next year is not adjusted to account for the farmers' low income from the year before. Instead, production targets remain overly optimistic and highly standardized, often failing to account for local conditions, resulting in loss-making FSKs and (to a lesser extent) private farms.

Some of the more wealthy farmers pay bribes for irrigation water, although this is beyond the capabilities of most water users. For example, in Uzbekistan District, "according to the residents of the village, they can't give much money [by way of a bribe], and therefore many cannot do this; it is most often private farmers." Similarly, most shirkat workers in Pakhtaabad village in Nishan District are paid so little for planned production that they cannot bribe mirabs in kind or cash: "We never make agreements [to pay for an illegal allocation], with the result that [our] fields are poorly irrigated." Nevertheless, bribery in water allocation is widespread enough to be problematic. A recent household survey taken in the Karshi Steppe reveals that while 58% of respondents disagree that they have to make high unofficial payments to obtain irrigation water, 17% agree with this statement and 24% somewhat agree.³¹

The prominent role that illegal water capture at the local level plays in water deficits is evident when one compares the foregoing portrayal of water scarcity in farms in Nishan District with official data on their withdrawals between 1991 and 1999 (shown in Table 3.4). A comparison of the aggregate withdrawals per hectare reveals that they have been consistently higher on the downstream Turkmenistan FSK, where villagers commonly mentioned a lack of irrigation water and upstream farmers seize water, than on the upstream Pakhtaabad FSK, where complaints about water supply were far fewer. The problem cannot be attributed to the poor condition of canals, and, in the case of vegetative irrigations, seizure of water by the FSK above the planned allocation does not appear to have played a role (although one must be cautious when dealing with official data, due to poor accounting and the manipulations noted above). Thus, a significant part of the water supply problem on the Turkmenistan FSK probably lies in the organization of allocation and delivery *within* the farm—in cause and effect diagrams drawn by local villagers to describe the scarcity of irrigation water in their area, "no control over water allocation," i.e. the dysfunction of local management institutions, together with "low

³¹ World Bank, *Karshi Pumping Cascade Rehabilitation Project: A Social Assessment* (Draft, 2001), p. 8.9.

allocation limit,” occupies a prominent place. The end result of inequitable allocation was no yield on 430 ha planted in cereals and cotton at end of system in 2000, as well as the use of saline drainage water on 900 ha out of 4,777 ha of sown irrigated land.

Table 3.4 Water Withdrawals Per Hectare Of FSKs Studied In Nishan and Ellikkala Districts Of Uzbekistan, 1991-99 (Official Records)						
	Vegetative		Non-Vegetative		Total	
	1000 m³/Ha	Percent Of Limit Set By District Water Dept.	1000 m³/Ha	Percent Of Limit Set By District Water Dept.	1000 m³/Ha	Of Which, Percent Non- Vegetative
Pakhtaabad						
1991	6.98	82%	3.10	137%	10.08	31%
1995	8.21	93%	1.59	138%	9.80	16%
1998	6.13	99%	2.88	98%	9.01	32%
1999	6.98	97%	5.37	160%	12.35	43%
Turkmenistan						
1991	7.84	86%	3.06	144%	10.90	28%
1995	8.99	97%	1.62	164%	10.61	15%
1998	9.96	103%	3.59	112%	13.55	26%
1999	8.21	96%	7.16	266%	15.37	47%
Kirkkiz						
1991	11.69	100%	4.84	158%	16.53	29%
1995	8.80	106%	4.13	110%	12.93	32%
1998	9.85	110%	3.19	100%	13.03	24%
1999	7.94	100%	5.48	101%	13.42	41%
2000	3.90	n.a	6.20	n.a.	10.10	61%
Source: Mirob-A Directorate of MAWR.						

The sheer volume of water being withdrawn on the FSKs studied in Nishan and Ellikkala Districts indicates that in some cases complaints about water scarcity may be subjective opinions based on expectations of high water use. On the farms in which fieldwork was conducted, the amount of water used per hectare (9,000-15,000 m³/ha) remained at or above the levels of use of countries not known for efficient irrigation, such as India and Pakistan (9,000-10,000 m³/ha). While the FSKs in Nishan District apply water in greater quantity than before, in part owing to an increased leaching requirement, the farm in Ellikkala has withdrawn less and less, due to a reduction in the established allocation limit, which was nevertheless exceeded in half of the years for which data are available. These trends are also generally true of the remaining FSKs in these districts (for which similar data are available), with the exception that withdrawals above limit in Ellikkala District are more frequent in FSKs other than Kirkkiz.³² Excessive application of water for irrigation and leaching of salinized soils (see below) aggravates water

³² This analysis utilized data for all FSKs in these two districts, which were provided by district irrigation departments to the Mirob-A Directorate of the Ministry of Agriculture and Water Resources and then kindly made available to the RESP survey. Analysis of data for farms in Marhamat District in the Ferghana Valley (downstream from Aravan District in Kyrgyzstan) and Sherabad District in Surkhandarya Province (mid-stream on the Amu Darya River above the Karshi Steppe) leads to similar conclusions.

scarcity for those disadvantaged in its allocation and taxes I&D systems, thereby hastening their degradation.

“Non-vegetative water use” indicates off-season leaching of salt from fields and/or preparing them for plowing and sowing. The former, which accounts for the lion’s share of this type of water use, is necessary due to land salinization. Withdrawals for leaching and preparing fields comprise a substantial proportion of the total for the farms listed in the table above (and, on average, account for over 30% of the total in Nishan and Ellikkala Districts). In almost all cases, withdrawals are above the established limit (as in the other farms in these districts). In some sense, “non-vegetative” is a misnomer, since analysis of seasonal levels of groundwater in these districts, as well as the low frequency of irrigation (in many cases twice as low as FAO CROPWAT recommendations) make it evident that water left from “non-vegetative” withdrawals is often used by crops during the growing season. In areas of Central Asia with a water table of 2 meters or less, groundwater accounts for as much as 50% of the crop requirement.³³ However, as noted in the 1999 report of the ongoing TACIS Water Use and Farm Management Survey,

Subsurface irrigation is a costly process [and thus] considerable groundwater contribution should not be seen as a virtue. Improved water management with less discharge to the groundwater, if widely practised, would inevitably lead to [a] fall in the water table. The benefits would be in lower use and cost of water [delivery] and drainage, less salinity and improved yield.³⁴

The results of fieldwork concerning water allocation within villages in Kazakhstan are mixed. Although the field team noted that, along the length of inter-farm canals, those near the intake receive more water, within all of the villages covered they did not encounter any complaints that others had “any sort of advantage” in obtaining water, with one exception. The single case that emerged in Tokmaganbetov village (Syr Darya District) involves the FSK slighting family farms in the manner noted above. As the head of a family farm in the village noted,

The state needs to increase the authority of family farms. But it doesn’t do this, and we are abandoned to our own fate...In 2001 there was a prognosis that there would be less water than in 2000, when there was also a deficit of water. Therefore, the [FSK] closed the inlets of the on-farm canals, on which the land of three family farms was located.

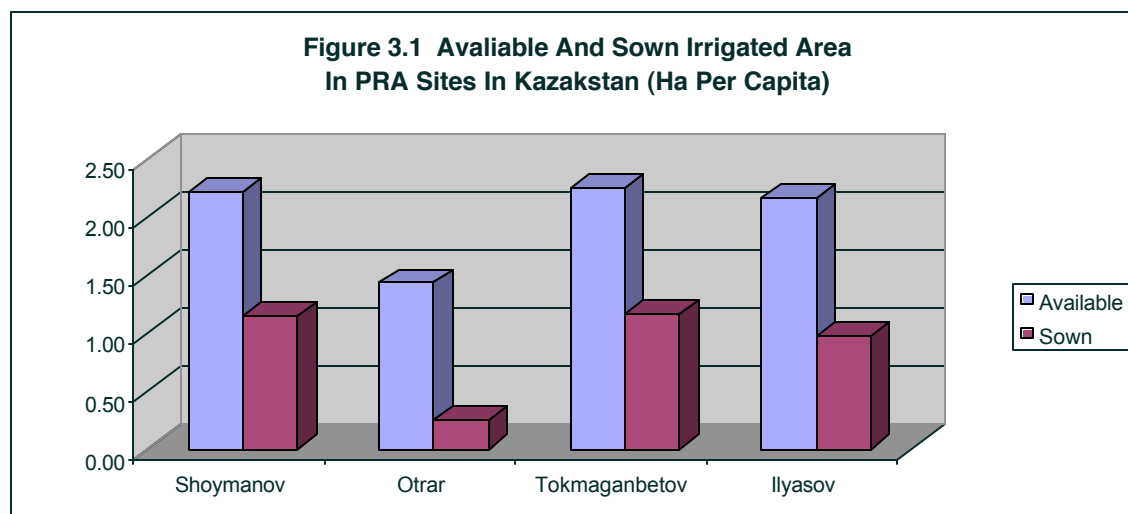
Although the Kazakhstan field team did not report it, some family farms probably receive more irrigation water and others less. First, farmers noted “great disparities” among

³³ GEF Agency of the IFAS, *Water and Environmental Management Project, Sub-component A1, National and Regional Water and Salt Management Plans, Regional Report No. 2, Phase III Report - Regional Needs and Constraints, Main Report* (Draft, 2001), p. 9.

³⁴ WUFMAS, *Improving the Productivity of Water in Central Asia: Annual Report for 1999* (Tashkent: WARMAP-2 and EC-IFAS, 2000), p. 9.

family farms, in particular between those of the former administration of FSKs that managed to acquire an inordinate share of livestock, equipment, etc. during privatization and the rest of the farmers. Moreover, in other nearby areas of Kazakhstan, illegal capture of water is relatively frequent—in a survey carried out by the Asian Development Bank in Maktaaral District of Kzyl Orda Province, 58% of the water users within WUAs claimed that the members' access to irrigation is unequal (25% claimed it was equal and 17% had difficulty answering).³⁵

Whatever the case in allocation within villages, the amount of land irrigated has greatly declined. In Kazakhstan this process occurred early in the decade, owing to a vacuum in O&M management and a deep crisis in agricultural production. By 1995, the percent of total command area sown in the Shoymanov and Otrar areas of Otrar District had declined to 45% and 33% of 1991 levels, respectively, and it dipped further to 34% and 23% by 2000. Command areas in the Tokmaganbetov and Ilyasov villages of Syr Darya District fell by 2000 to 73% and 82%, respectively, of their 1995 dimensions. Presently the amount of area actually sown is under half of the available command area in all sites (see Figure 3.1).



In concluding this section, it should be emphasized that the decline in irrigated areas in the areas covered in this study is due to a mix of technical and institutional factors. The contraction of irrigated areas in fieldwork sites, especially those in Kazakhstan and Kyrgyzstan, is due in part to reduced access to working capital and inputs and in part to I&D system degradation and reduced water supplies. Moreover, the latter problems are substantially worse than they might otherwise be, owing to the fact that water management institutions have inadequate capacity and, more significantly, often do not have a clear idea of their mandate and duties (which are changing as farms are restructured and WUAs established), thus resulting in an institutional vacuum. Within this vacuum, upstream and/or well-connected water users are able to capture more than

³⁵ Asian Development Bank, *Institutional Development and Policy Reforms for Improving Water Management, Government of Kazakhstan T.A. No 2946-KAZ, September 2000.*

their share of water, thereby substantially aggravating water scarcity and creating fertile ground for discord among water users.

3.1.3 *Conflict over Water Allocation*

All instances of conflict in irrigation management in sites covered in this study stem from disputes over water allocation and delivery (rather than maintenance responsibilities or other issues). The tension between water users is palpable in Aravan District of Kyrgyzstan—the field team commented, “We witnessed two family farmers that nearly fought each other in [the course of] a debate over who should get water.” Residents of Kara Bora District (Kyrgyzstan) noted that increasingly “People cuss and fight each other for water.”

In all areas studied in Uzbekistan, there is discord over water distribution, which occasionally leads to violent conflict between water users in upstream and downstream areas. A household survey conducted in the Karshi Steppe found that 62 percent of respondents believe there is conflict between upstream and downstream users over water allocation.³⁶ The situation appears to be worst in Uzbekistan District (Uzbekistan), where “People note that conflicts over water distribution constantly occur, which in some cases have ended in fatality.” In the Ellikkala District, a farmer on a downstream FSK remarked (in an interview for the RESP survey),

During irrigation, there is conflict with the neighboring [FSK named “Buston”], as well as within our shirkat. Buston receives water before we do, and when our turn comes, they often do not give us water. All of the scandals are the result of this. Sometimes the matter goes as far as fighting.

A shirkat irrigator on yet another downstream farm in Ellikkala District recalled a similar experience for RESP interviewers:

Our kolkhoz [sic] receives water last in the rotation, and therefore we have a problem with water supply. Last year our farm director had a tremendous problem with water allocation. Yangiyer [the upstream farm conglomerate] did not give us water, and in the end we didn’t have any. Water for garden plots is allocated for 3-4 days every 15 days. Whoever can get it, gets it. The matter goes as far as fighting...Within the farm, families nearest to the inlet get the water.”

Not surprisingly, in most areas residents perceive conflicts as increasing with water scarcity (especially during the drought years of 2000-01). However, it appears likely that, even when there is enough water available for the community, the seizure of an inordinate portion of it by certain water users provokes discord. Although data on the

³⁶ World Bank, *Karshi Pumping Cascade Rehabilitation Project: A Social Assessment* (Draft, 2001), p. 8.7.

dynamic of water conflicts is sketchy and difficult to collect,³⁷ local level conflicts over water have been present since at least the late 1980s, when they re-emerged from behind the smokescreen of power networks in local Soviet officialdom.³⁸ Teachers in Ellikkala District noted “that there were many conflicts and arguments over water even when there was enough water” (in reference to the years prior to the droughts of 2000-2001).

There does not appear to be a significant ethnic dimension to conflict within communities. Less than 20% of the respondents to the Karshi Steppe household survey claimed that being of a different ethnic origin aggravates water conflicts.³⁹ However, where border areas between republics separate upstream and downstream areas, there is resentment, often fed by misperception, concerning the titular nationality of the neighboring republic. For example, farmers in the Ferghana Valley district of Marhamat (Uzbekistan), which receives part of its water from Aravan District in Kyrgyzstan, assert that Kyrgyz upstream use too much water and force them to pay for it, when from all appearances fewer farms in Marhamat District suffer from water scarcity than in Aravan.⁴⁰ Similarly, stakeholders in Uzbekistan District of Uzbekistan attribute their water supply problems to upstream withdrawal in Kyrgyzstan.

In apparently rare instances, resentment over perceived slights in water allocation leads to localized conflicts between nationalities on the opposite sides of republic borders. Since 1991 sometimes-violent confrontations in border areas have occurred in the lower Amu Darya basin (between Uzbeks and Turkmens), the middle course of the Syr Darya (between Kazaks and Uzbeks), and the mountain areas of the Ferghana Valley (between Tajiks and Kyrgyz).⁴¹ Republic boundaries are presently the bone of contention in the Ferghana Valley district of Kadamjan in Kyrgyzstan, where Kyrgyz farmers are involved in a dispute with Uzbek soldiers on the republic border over a spring that yields 0.8 m³ per second. Uzbekistan claims that by agreement it owns 70% of the water and that the spring is on Uzbek territory. Despite the agreement, Uzbek troops do not permit the downstream Kyrgyz to draw water even 30% of the flow of the spring, which they claim is entirely theirs. (The fact that in 1999 and 2000 a mercenary group from Afghanistan made abortive attempts to invade Uzbekistan via Batken Province of Kyrgyzstan, in which Kadamjan District is located, provides a convenient pretext for Uzbekistan to close access to the spring.⁴²)

³⁷ Ideally one would consult with specialists in district irrigation departments. However, they are often reluctant to discuss delicate matters such as local discord.

³⁸ Fieldwork conducted by the author in the Ferghana Valley, 1992 and 1995-96.

³⁹ World Bank, *Karshi Pumping Cascade Rehabilitation Project: A Social Assessment* (Draft, 2001), p. 8.7.

⁴⁰ Among farmers in all of the districts covered in the RESP survey, those in Marhamat appear to have the best supply of irrigation water, possess the best-maintained I&D systems, and suffer the least from soil salinity.

⁴¹ David R. Smith, “Environmental Security and Shared Water Resources in Post-Soviet Central Asia,” *Post-Soviet Geography*, vol. 36 (1995), no. 6.

⁴² The leader of the group, Juma Namangani, is a native of the Ferghana Valley, who, using funding from Osama bin Laden, seeks to invade and proclaim an Islamic republic in Uzbekistan, despite the fact that local Muslims have little use for his brand of Islam.

In focus groups conducted for a social assessment of irrigation in the Karshi Steppe in Uzbekistan (which includes Nishan District), “Hardly anyone believes that increasing the water supply will eliminate stealing water,” i.e. the root of the conflicts noted above.⁴³ Given the failure noted above of FSK irrigation units district irrigation departments to service increasing numbers of smaller farms, this gloomy outlook on water allocation is to be expected. Moreover, many features of water allocation encourage rent-seeking and conflict, including a lack of transparency, the decline of social control within communities, a legacy of dependence of water users on FSKs and irrigation departments, the focus of conflict resolution focuses on punitive measures (largely to the exclusion of information-sharing and consultation), and the absence of rule of law.

There is little transparency in water allocation and distribution. Water users are unsure concerning the rights and responsibilities of farms, water departments, and WUAs (especially in areas with significant numbers of newly created family farms). It is also difficult to track who received how much water, owing to the imprecision of water measurement, and information concerning water allocations is not shared, creating an atmosphere of mistrust.

Within on-farm I&D systems, communities seek to prevent rent-seeking and conflict through social control. As noted above, farmers commonly band together to stand watch over water and patrol canals as it is being diverted to their land: in Kadamjan District of Kyrgyzstan, irrigation personnel of the local water user association “are not able to supervise every outlet, and therefore the people themselves must help in supervision.” Elders and other well-respected villagers are often called upon to control water allocation and mediate when conflict occurs. On the Kirkkiz FSK in Ellikkala District of Uzbekistan,

When a conflict occurs, there might be a fight, because people are afraid that the water won’t suffice for everyone. But usually a village elder with authority in the community stands watch over the inlet. He can calm the [water users], although, according to the elders, it is becoming ever harder to persuade the people [that there will be enough water].

Within FSKs, work units (former brigades) appeal to the farm administration to supply water and/or resolve disputes, emphasizing their anger through either a strong show of disapproval, or, in extreme cases, refusal to perform certain tasks until demands are met. In all systems, water users pressure local irrigation personnel, such as the mirabs and their subordinates within work units (former brigades), to obtain the maximum of water for the territory that they manage or keep order among farmers and/or work units, and sometimes the mirab must resort to force to accomplish the latter.⁴⁴

⁴³ World Bank, *Karshi Pumping Cascade Rehabilitation Project: A Social Assessment* (Draft, 2001), p. 5.20.

⁴⁴ For this reason, mirabs tend to be large, burly men with a local reputation for being able to break heads, as well as measure water. In areas such as the Ferghana Valley, where irrigation has been practiced for

However, a number of factors limit the effectiveness of social control over water allocation and officials. First, it is difficult to achieve when well-connected and/or wealthy members of the elite are able to circumvent it (with relative impunity) through influence-peddling and/or bribery. Second, in most areas neither the water users nor local irrigation personnel have experience in managing water outside of the FSK system, which weakens the effectiveness of informal arrangements for controlling water. Finally, in Uzbekistan social control is frequently overridden by the dictates of production plans. In all areas of Central Asia farmers are unaccustomed to taking the initiative, because most of them spent most of their life working within a system of internal tenancy and planned production in which (legal) initiatives outside of the structure of state institutions was strongly discouraged.

In the case of disputes on inter-farm canals, water users seek redress for violation of their water rights from the district irrigation department, and/or government, as well as other third parties, such as the local private/family farm association or the village council. Given the strong legacy in Central Asia of dependence on the state, it is a natural response to appeal to local representatives and farm authorities, while making little attempt to organize locally. This tendency is particularly strong in Uzbekistan, in part due to the more intense focus of past Minvodkhoz programs there and in part due to the fact that many villagers in Kazakhstan and Kyrgyzstan have already given up on the possibility that local officials will take action. In most cases farmers demand more water and/or punishment of those who divert it illegally. Occasionally water users make other related demands, such as the installation of water meters to track upstream withdrawals.

Typically, water users on a given canal system will appeal in groups to higher authorities such as the district governor, with the notable exception of influential and well-connected individuals. Sometimes these appeals are written, but more commonly are face-to-face encounters or even small demonstrations.⁴⁵ On the Turkmenistan FSK in Nishan District,

The residents said that when they go to the chairman of the rural council or the head of Association of [Dehqan and] Private Farmers concerning water problems, [the representatives of the latter] say, “There is no water.” But then the people raise a scandal and [officials] open up the water [inlets] by 10%.

Water users on the Kirkkiz FSK in Ellikkala District also appeal to the hakim, but in neither case can the authorities allocate enough water. In Nishan, “a representative will come from the district *hakimiyat* and close the water [inlet],” while in Ellikkala the water often will be lost to seepage on the 45-kilometer main canal before it reaches the farm. In other cases, such as in Uzbekistan District, “appealing to the neighborhood (*mahalla*)

centuries, the mirab is often one of a long line of such men from his family that have served in this capacity.

⁴⁵ Interviews conducted for the RESP Survey 2000; World Bank, *Karshi Pumping Cascade Rehabilitation Project: A Social Assessment* (Draft, 2001), pp. 5.10-11.

committee, the rural council, the kolkhoz [*sic*], the hakimiyat, and the raysel'vodka has no effect."

When local authorities punish violators of established allocation schedules, the most common action is for the district irrigation department to levy fines. However, these are minimal (especially in Uzbekistan⁴⁶), compared with the benefit of obtaining higher crop yields, and thus do little to discourage the theft of water. Moreover, given the general lack of rule of law in the Central Asian countryside, monetary penalties are easily circumvented by a bribe, if one has the means to pay. Thus, the raysel'vodka often resorts to additional measures, such as the Nishan District irrigation department's practice of conducting "raids" on farmers suspected of water seizure and threatening to cut off water supply (usually for 3-4 days, regardless of the condition of the crops on the farm under threat). Occasionally, the hakim tries to use his authority to threaten violators of the established order of allocation, e.g. the order noted above to give garden plots priority in irrigation in Ellikkala District (as well as divert more water to favorites). Local police are also called in occasionally to patrol canals and literally escort water downstream, which was also pursued in Ellikkala District. As noted by a representative of the local irrigation department in the district,

The hakimiyat resolves all problems [concerning water allocation]. Thus, for water allocation we have a headquarters (*shtab*), which partly consists of representatives from the hakimiyat. They help regulate conflicts between farms and individuals. The hakim exerts influence—everyone listens to him.

The mechanisms that local authorities employ to deal with illegal capture of water are less effective than they otherwise might be, owing to the way they are employed. First, penalties are substantially weakened by the absence of rule of law. Few water users are familiar with basic laws and legal procedures in water management. In part this is because rule of law does not prevail, and it is more profitable to expend energy on rent-seeking than legal procedures. In the single case in the areas studied where water users tried a legal remedy to illegal upstream water withdrawals, Kadamjan District of Kyrgyzstan, the inertia (and probable corruption) of the authorities defeated the initiative:

Last year 20 indictments were issued concerning certain people (in the upper zone) taking water over the limit and not observing rotations. These were given to the appropriate organs [the akim and district water department]. But they said that it is not within their competency to resolve these problems.

Moreover, during third-party mediation local authorities tend to overlook information sharing and consultation among water users to resolve the issues that caused the conflict

⁴⁶ Although irrigation specialists in some sites covered in Kyrgyzstan and Kazakhstan claimed that fines for stealing water are high enough to be effective, farmers in many of these areas complained that their water was regularly seized upstream.

in favor of issuing orders and decrees (as during the Soviet period) to simply suppress the conflict.

3.2 Who Gets The Salt?

One of the main effects of drainage systems going out of commission is salinity and waterlogging. In most of the areas studied, the high filtration from canals, high rates of water application per hectare, and the degradation of drainage systems have led to a rise in water tables from already dangerous levels in the Soviet period. For example, during the 1990s the percentage of irrigated area with a water table less than three meters from the surface rose from 76% to 93% on the Pakhtaabad FSK (Nishan District, Uzbekistan), from 36% to 82% on the Turkmenistan FSK (Nishan District, Uzbekistan), while on the Kirkkiz FSK (Ellikkala District, Uzbekistan) the percentage of cropland with a water table less than 1.5 meters rose from 93% to 100%. The situation in Kazakhstan is even worse: by 1995 the *average* level of groundwater of all sites was less than 2 meters from the surface, and by 2000 it had reached 1.5 meters in Shoymanov village (Otrar District), 1.2 meters in both sites covered in Syr Darya District, and 0.5 meters in Otrar village (Otrar District).

Most of the areas with rising in the water tables also have considerable amounts of salts already present in the soil substrata or groundwater. Therefore, groundwater mineralization intensified in the Pakhtaabad and Turkmenistan FSKs between 1991 and 1999, although it dropped slightly in the Kirkkiz FSK (see Table 3.5 below). In all fieldwork sites in Kazakhstan, groundwater became more mineralized, often exceeding 3 grams per liter of salts on expanding portions of cropland (in the case of Ilyasov in Syr Darya District, an *average* of 3.6 g/l).

Table 3.5 Groundwater Mineralization In Selected Fieldwork Sites of Uzbekistan (Percent Of Irrigated Land)					
	0-1 g/l	1-3 g/l	3-5 g/l	5-10 g/l	Over 10 g/l
Pakhtaabad					
1991	-	61.54	36.75	1.71	-
1995	0.45	82.14	8.93	4.46	4.02
1998	-	37.84	52.25	9.46	0.45
1999	-	45.37	54.63		-
Turkmenistan					
1991	-	18.86	75.45	4.65	1.04
1995	0.52	5.47	86.98	5.73	1.30
1998	-	0.52	71.28	26.37	1.83
1999	-	-	86.83	13.17	-
Kirkkiz					
1991	-	84	15	1	-
1995	-	97	3	-	-
1998	-	96	4	-	-
1999	-	93	5	2	-
Source: Mirob-A Directorate of MAWR.					

The result of rising water table and groundwater mineralization is land salinization. As in water scarcity, farmers with land downstream are more negatively affected than their neighbors upstream, because salt is transferred downstream in drainage systems and, in locales where downstream users suffer water scarcity, less water is available for leaching salts out of land at the end of the system. This is particularly true of river basins. For example, among the sites in Uzbekistan shown in the table below, salinization is a much greater problem in the Kirkkiz FSK in Ellikkala District (in the lower reaches of the Amu Darya River) than in either site in Nishan District (mid-stream on the Amu Darya). In the former area, salinized land has comprised around 95% of the total since 1991, which is slightly higher than the average for the district as a whole (93%). This corresponds to the general pattern within the Aral Sea basin. Similarly, salinization and waterlogging are not a problem in Kadamjan District, where soils drain naturally, while lower down the Sokh River basin on the Ghafur Ghulam farm in Uzbekistan District the percent of salinized land within total irrigated area rose rapidly with the demise of the local drainage system, from 27% in 1996 to 76% in 2000.

At the local level, salinization appears in a patchwork pattern, according to peculiarities in hydrogeology, land leveling, filtration from canals, and the configuration of I&D systems. Table 3.6 shows that on the Pakhtaabad and the Turkmenistan FSKs in Nishan District of Uzbekistan, the decline of drainage led to the increased salinization of land on both farms, in particular between 1991 and 1995, indicating (along with the Ellikkala data) that the crisis in drainage has been present for some time. Yet the overall percentage of salinized land is significantly higher in the upstream farm.

Table 3.6 Percent Of Salinized Land On Selected Sites In Uzbekistan, 1991-99				
	Non-Salinized	Salinized, Of Which...		
		Slightly	Moderately	Severely
Pakhtaabad				
1991	38	40	15	7
1995	15	60	16	9
1998	14	61	18	7
1999	14	60	19	7
Turkmenistan				
1991	66	16	17	1
1995	39	39	20	2
1998	41	40	16	3
1999	34	46	17	3
Kirkkiz				
1991	4	27	38	32
1995	5	54	34	7
1998	1	59	29	11
1999	5	80	13	2
Source: Mirob-A Directorate of MAWR.				

Within the Pakhtaabad FSK lackadaisical maintenance of drainage is only part of the salinity problem. In the opinion of local residents, the filtration of water from the Karshi Main Canal, which is not lined with concrete, contributes greatly to drainage problems, as well as over-irrigation and the lack of drainage in the central section of the main on-farm canal. A drainage map of the farm reveals that salinized land is generally distributed fairly evenly among the upstream and downstream areas, while areas on the bank of the Karshi Main Canal in the upstream zone contain the major portion of moderately and severely salinized land. Apparently the effect of the canal is not a recent one, since residents trace the main source of their troubles back to its construction in 1974, which, combined with recent decline in the maintenance of drainage, has resulted in land degradation.

Severely salinized and waterlogged cropland often will not produce a crop and must be taken out of cultivation. Three percent of irrigated cropland in Uzbekistan District has been abandoned for this reason, while in the Kirkkiz FSK of Ellikkala District this figure reaches 27%, owing to the greater severity of land salinization there. Salinized and waterlogged land taken out of commission in Tokmaganbetov (Syr Darya District) comprises ten and two percent of total irrigated command area, respectively. The corresponding figures for Ilyasov (Syr Darya District) are 4% and 14%.

Table 3.7 Percent By Which Farmers Estimate That Salinity Reduces Crops Yields				
	Nishan District		Ellikkala District	
	Percent Of Farmers Claiming Salinization Reduces Crop Yields	Mean Percent By Which Salinization Reduces Crop Yields On These Farms	Percent Of Farmers Claiming Salinization Reduces Crop Yields	Mean Percent By Which Salinization Reduces Crop Yields On These Farms
Private Farmers	79%	24.53	86%	33.75
Dehqan Farmers	66%	31.09	80%	22.05
Shirkat workers	73%	30.92	83%	27.12
Source: RESP Survey 2000.				

On land that is not taken out of production, salinization inhibits the growth of plants, thereby reducing yields. In the areas studied, yields have fallen to the degree that crop selection is changing in favor of salt-tolerant crops (see below). A significant percentage of respondents to the RESP survey in Nishan and especially Ellikkala Districts of Uzbekistan asserted that salinization reduces their crop yields (as presented in Table 3.7 above). The amount of damage done by salinization on these farms (22-34%) is a rough estimate, yet it is also one that is within the range of those given by many local experts. While the accuracy of these estimates is debatable, they underline the fact that farmers are aware of the threat posed by land salinization, yet unable to combat it.

Salinity and waterlogging also make field operations more expensive. In areas with high water tables, reeds and other grasses that usually grow in drainage collectors find their way into fields and can only be removed through fallowing or the application of

herbicides. When soils are excessively moist owing to high water tables, plowing and traction places a greater load on machinery, and the subsoil often becomes compacted, thereby limiting root growth.⁴⁷ Such is the case in most of the fieldwork sites in Kazakhstan.

The extremely local nature of the complex of factors leading to land salinization, i.e. drainage, hydrology, and soil qualities, makes it impossible to identify any upstream-downstream tendencies in the impact of land salinization within the communities studied. Yet the location of one's land is critical, because water users have little choice but to deal with the salt that flows to fields through drainage, as well as that already present in the soil. As noted above, the rural elite enjoy a substantial advantage over the common folk in acquiring the best plots of land.

Elites also have more of the money needed to forestall land salinization when salt is discharged to their land from upstream. For example, a private farmer in Nishan District, having taken care of the upkeep of the infrastructure on his 123 ha of irrigated land, offered to split with the neighboring shirkat the cost of correcting the slope of a drainage pipe that divided their fields. The shirkat could not match funds.⁴⁸ Yet this is an exceptional case, and oftentimes the problem exceeds the capability of any individual to address it—no water user in Pakhtaabad would undertake to line the Karshi Main Canal with concrete, and the community as a whole is too poor to afford it.

In Uzbekistan, overly ambitious production plans further intensify the effect of land degradation on farm incomes of those that must sell their harvest to the state. For instance, as noted by the field team working in the Pakhtaabad FSK of Nishan District,

The private farmers [situated at the head of the canal] spoke of the salinization problems of pudrats [downstream]. They cannot fulfill the production plan and state orders for chief crops [cotton and wheat]. Therefore, they don't receive wages, or processed cotton products...Owing to the deterioration of the I&D system, yields have fallen, but the production plan is not reduced. The shirkat workers complained that the leaders of the farm raise the plan for delivery of the harvest year after year.

It should be noted that, although shirkat workers are hurt by production plans, family farmers in sites covered in both Uzbekistan and Kazakhstan also suffer from land degradation, owing to the fact that when their farms are created they are often given land that is already in need of substantial amelioration. However, elite family farmers such as those quoted above are able to obtain good land by virtue of connections.

⁴⁷ WEMP, pp. 13-14.

⁴⁸ Interviews conducted by the author for the RESP Survey in January of 2001.

3.3 Responses In Crop Production

3.3.1 Adaptations in Irrigation Agriculture

Villagers try to adapt to the degradation of I&D systems in several creative ways, yet most lack the capital necessary for this or are inhibited by other constraints. Many would like to rig infrastructure to again carry water, yet few can afford this. One that can, a wealthy family farm owner in the lower zone of Kadamjan District of Kyrgyzstan, used his own money to install a pump capable of delivering 8 liters per second from a well 140 meters deep for the use of the local population. The latter only are charged for electricity used to run the pump (about 20 som per hour), and the repairs, etc. are free of charge (as is electricity in the case of drinking water). Around 40 families that can irrigate from this source obtain significantly higher crop yields than their neighbors. Nevertheless, one of these farmers noted, “due to lack of money, not all of the residents (even a majority) can use the pump.” In Ellikkala District of Uzbekistan, most farmers cannot even afford to install small hand pumps to water their garden plots.

Like repairs, new installations and rigs are of a stopgap nature. For instance, in another part of the lower zone of Kadamjan District, two pumps that were brought in during 2001 have gone out of commission, while a third “is still working.” However, the population had the same problem paying for pump services as in the case described above. Many resourceful backyard engineers use siphons or portable pumps to draw water where pumps or other infrastructure no longer delivers water. On household garden plots, farmers will often install a hand pump, yet the water obtained is sometimes saline and unfit even for irrigation. Others dig small reservoirs.

Drainage is harder to adapt. Collectors are often dug 3-4 m deep, and makeshift repairs such as the small ditches (*zawurs*) that villagers dredge from their fields (and homes) often cannot lower the water table of even a garden plot, owing to the waterlogging of the surrounding area.

The first change in agricultural practices resulting from the degradation of I&D systems is to alter water application. As already mentioned above, farmers plant less area in hopes of increasing water availability per hectare and farming more intensively. This tendency is strong in Kazakhstan and Kyrgyzstan, where farmers have been forced to cut back irrigated area substantially, due to the decline of agriculture, as well as the degradation of I&D systems. In Uzbekistan, traditional water-saving methods are employed such as *nawbat* (also called *avandaz*), which involves irrigating fields by turn, rather than all at once, to reduce evaporation and filtration losses (although the practice of *nawbat* is not widespread, i.e. most fields are irrigated simultaneously).

Many water users seek substitute sources. In Nishan and Ellikkala Districts of Uzbekistan, salinized water from collectors is used for irrigation, as well as for drinking water by some upstream. However, all too often they cannot or do not mix the saline collector water with fresh water, thus aggravating salinization problems. Farmers in Nishan and Ellikkala Districts also bring water to their land or a cistern using a donkey

or, if available, an automobile, which is expensive and thus beyond the capabilities of most water users.

In areas where supply is unreliable and/or salinity is a problem, farmers replace water-intensive and salt-sensitive crops such as stone fruits with lower value crops that consume less water and are salt-tolerant. For example, villagers in the Turkmenistan FSK (Nishan District of Uzbekistan) told the field team, “Among 15 types of fruits, vegetables, and nuts grown [under normal conditions], since 1996 potatoes, melons, almonds, and turnips, and by 2001 only pomegranates remained.” In Uzbekistan District, farmers have quit planting cherries, apricots, and peaches, opting for figs and pomegranates, “which still yield a harvest.” A similar situation is prevalent on the Pakhtaabad and Kirkkiz FSKs, where many stone fruits cannot be grown. In the latter area, farmers remarked that over the past 3-4 years yields of even salt-tolerant crops have declined—the yield of pomegranates in 2000 was one-third of 1996, while melon yields per hectare fell by over one-half.

The lands referred to above are garden plots—state production plans in Uzbekistan limit changes in crop selection, which is dominated by cotton and wheat (on around 80% of irrigated area). However, farm workers on FSKs in Uzbekistan rely heavily on garden plot production for both consumption and income, something that in areas like Pakhtaabad was not done until the farm quit paying wages to the farmers. Villagers emphasized to the field teams that fruits and vegetables in particular were lacking in their diets, due to the inability to produce them on local land or buy them elsewhere

Crop selection in Kyrgyzstan and Kazakhstan reflects both water scarcity and market changes. In mountain areas of Kyrgyzstan such as Talas and Kadamjan Districts, farmers have switched from wheat to less water-intensive fodder crops (hay), while in Aravan District they have begun to plant wheat and sunflowers instead of fruits and vegetables. However, in Talas and Kara Bora Districts, farmers are growing an increasing amount of beans for sale on the market (since credit and a marketing outlet are available for this crop), in Kara Bora to the extent that everyone is now trying to irrigate at the same time (early May). Kazak farmers in Syr Darya District have cut the area planted in rice, the most water-intensive crop of all, by more than a factor of two. Since credit is available for cotton cultivation, farmers in Otrar District of Kazakhstan have dramatically increased area devoted to this crop at the expense of corn, despite the fact that farmers are aware that there is less water than before and that cotton requires more water than corn.

Traditional methods of counteracting land salinization are increasingly employed, in part because they are labor-intensive and therefore more affordable for most of the population. For example, in Uzbekistan District organic fertilizer is worked into the ground to make it more fertile and permeable⁴⁹, or else the upper saline layer of soil is taken away altogether and replaced with more fertile soil from another location. On salinized land in Nishan District, farmers increasingly replace furrows in large fields with

⁴⁹ On Pakhtaabad farm a few apply mineral fertilizer, but for most “this is expensive.”

joyaks, quadrant-shaped beds surrounded by small ditches that drain better and help keep soil more permeable. However, the types of investments needed to address severe drainage problems are only possible for the few wealthy farmers, such as those described in the preceding section.

3.3.2 Constraints on the Water Users' Ability to Adapt

Villagers face numerous constraints in changing agricultural production, chief of which are the absence of effective institutions and lack of capital. In Uzbekistan, even most farmers outside of the shirkat system, who are typically better off than the workers within it, cannot afford to make substantial I&D investments: only 14% of private farmers and 2% of dehqan farmers surveyed for the RESP in Nishan District paid anything for I&D maintenance in 2000, while in Ellikkala these figures are 10% for both categories of farms. Moreover, the mean investment made by private and dehqan farmers—around \$3 per hectare on private farms and \$4-7 on dehqan farms—is a drop in the bucket, compared to what is needed for the upkeep of infrastructure. The discrepancy between the investments on private and dehqan farms is best explained by the much smaller area of the latter, which is much easier to maintain. However, the total incomes of dehqan farms are much smaller, and their owners must commonly augment their incomes with work off of the farm.

FSKs have more resources, as well as longstanding connections with district irrigation departments, with which to address problems on I&D systems. However, farm directors in Uzbekistan reported to the RESP survey that their *total* expenditures for O&M, which include staff salaries, operations costs, and (occasionally) a small payment for water, reach only \$15 per hectare in Nishan District and \$26 in Ellikkala District. Moreover, these amounts are not at the discretion of shirkat workers, who have little say in investments or tracking the flow of funds in I&D. The lack of transparency in this process permits and perpetuates rent-seeking, in which production units (*pudrats*) try to obtain as large a share of the farm's I&D resources as possible, by hook or crook, for their annual planned allocation of shirkat land and their household plot (in the latter case, as compensation for low incomes from planned production).

The amount of resources available, as well as the water users' ability to direct resources where they are most needed, is further limited by constraints on incomes, especially those derived from planned production. The state sets farmgate prices for all of the cotton and most of the wheat harvest at rates that are 2-3 times lower than what farmers would receive in free markets. Moreover, shirkat workers are commonly not paid at all for planned production: "people have become poor, because for three years now they haven't given wages" (Pakhtaabad FSK, Nishan District). Production of these crops is obligatory for shirkat and private farmers, i.e. all farmers that cultivate sizable plots of land. Inputs are allocated within a state supply system in which their use for purposes other than those specified in plans is forbidden, although the amounts allocated often fall short of the amount and quality stipulated in plans for supply. Shirkats still receive priority in credit, although debt rollovers and other perks granted to them are less than before. Nevertheless, credit markets are nascent, and few farmers outside the FSKs take out loans.

Farmers attempt to overcome the constraints imposed upon their behavior by colluding with local officials and FSK personnel to circumvent them. Those of the former with money or connections are able to bribe or peddle influence with the latter in order to obtain inputs, higher grading of their output at state-run purchasing centers, reduced production targets, and the like “on the sly.” For scarce resources, such as credit, the bribes demanded by bank and other officials are prohibitively high (usually 10% of the value of the loan, which is often personally approved by the hakim). Connections are equally important. For example, the farmer in Nishan District mentioned above who offered to share costs with the neighboring shirkat to repair a large drainage pipe adjacent to his 123 ha of land is a former brigadir, whose father, the director of the local Association of Dehqan and Private Farmers, happens to be the former hakim of the district. In an interview conducted for the RESP survey, the private farmer was reluctant to discuss credit, and asserted that he doesn’t use it much, owing to high interest rates, despite the fact that his younger brother (also present during the interview) works in the local branch of the National Bank of Uzbekistan. However, in a separate interview, the manager of this bank claimed that the private farmer in question is his institution’s “best customer.”

Farmers in Kazakhstan and Kyrgyzstan face a different set of constraints than those in Uzbekistan. As noted above, water management institutions lack capacity and authority and thus only take palliative measures to repair systems. Moreover, the lack of clear delineation of rights and duties among farms and institutions gives some water users an incentive to “free ride” on maintenance of others farm or institutions, with the result that no one does the work. Although statistical data on expenditures per hectare for maintenance are unavailable, they are probably even lower than those offered above for Uzbekistan.

Inequitable privatization also constrains the ability of water users to adapt to the degradation of I&D systems. The lack of transparency in farm restructuring in Kazakhstan and Kyrgyzstan has provided a pretext for inequitable redistribution of farm resources in favor of the former farm bosses, much to the detriment of the ordinary farm workers, who are not shy about expressing their dissatisfaction with the process. An elder in Otrar village (Otrar District, Kazakhstan) recalled,

In 1991 the sovkhos had 67,000 sheep, 14,000 cattle, and 1,100 horses. [By] 1996 none of them were left. A good portion of the agricultural machinery also disappeared. Only a small portion of the equipment was privatized to individual [ordinary] farmers.

An elder in Shoymanov village of Otrar District (Kazakhstan) asserted that, due to the perfidy of the local bosses during privatization, “it turned out that farmers had no money to work the land.” Without exception, Kyrgyz farmers also castigated local officials for

absconding with the majority of the livestock, equipment, and other holdings of privatized FSKs.⁵⁰

Inequitable privatization, combined with the disruption of subsidized state input supply and I&D services, resulted a severe downturn in agricultural production from which rural areas still have not recovered. The field team's description of conditions Talas District (of Kyrgyzstan) is, unfortunately, characteristic of most areas in Kyrgyzstan and Kazakstan:

Farmers do not observe crop rotation [because they cannot afford to], and the land is exhausted, because the majority does not fertilize their land...Plowing of land is of low quality, since the machinery wore out a long time ago, and cultivation is done by hand.

Another increasing problem is that a number of family farmers are new to the game and, aside from not having experience in managing an independent farm, do not know agricultural practices, resulting in incorrect application of water, fertilizer, etc. and ultimately lower yields.

In addition to less farm resources, villagers must also contend with limitation on their endeavors that are imposed by corrupt officials. For example, to obtain a loan in Kyrgyzstan, one must pay a bribe of 10% of the amount of the credit (which is also the going rate in Uzbekistan). Extortion at highway and customs checkpoints and in bazaars limits access to output markets. Corrupt officials interpret the law to their own benefit: In Kara Bora District of Kyrgyzstan, they effectively imposed a monopoly on the purchase of the main crop, beans, through selective granting of licenses to "their" buyers, which resulted in farmgate prices 2-3 times lower than they should have been.

3.3.3 Yields per Hectare

I&D system degradation works in combination with the factors noted above to reduce overall agricultural productivity. Farmers, especially in the drought year of 2000, often see lower yields primarily as a function of water scarcity and land salinization. For example, on the Turkmenistan FSK in Nishan District, "The farmers noted that the plan is not fulfilled; 50% of the yield is lost because of failure to irrigate." Historical data bear this out: in Uzbekistan District, cotton yields dropped from a very high 3.5 tons per hectare in 1985 to 2.7 in 2000. The decline in cotton yields shown in the table below for other sites covered in this study is more extreme, especially in the case of the two end-user farms in Nishan and Ellikkala Districts. Although wheat yields climbed in all districts, the low baseline yields reflect the fact that Uzbek farmers are still learning how to grow wheat (given proper technology and practices, yields should be 4-5 tons).

⁵⁰ In many areas, local officials claimed that assets were sold to cover the debts of the farm that was restructured.

Table 3.8 Cotton And Wheat Yields On Selected Sites In Uzbekistan, 1991-2000 (Tons Per Hectare)						
	Pakhtaabad		Turkmenistan		Kirkkiz	
	Cotton	Wheat	Cotton	Wheat	Cotton	Wheat
1991	2.5	2.	1.9	1.3	1.8	0.5
1995	2.9	3.1	1.6	1.0	1.5	1.5
1998	2.6	1.6	1.0	1.6	0.9	1.4
1999	2.6	2.3	0.8	1.9	0.9	2.4
2000	2.4	2.4	n.a.	n.a.	0.4	n.a.
Source: Mirob-A Directorate of MAWR.						

Owing to a greater decline in input availability, yields per hectare have dropped more precipitously in Kyrgyzstan and Kazakhstan, to half or less of what they were during the Soviet period. In areas such as Gulbaar village of Aravan District the effects of poor drainage and lack of water on yields are apparent. The water table in Gulbaar peaks in August, which kills the crop of wheat that farmers try to plant on the often-waterlogged land. Yields are 1.5-2 times higher in upstream than in downstream areas. Even here the standard of living is low. In the opinion of the field team, “The farmers obtain a good and constant yield, but based on the discussion with them, one could also say that people here also live poorly.”

3.4 De-Emphasizing Crop Production

Another option that farmers have in adjusting to I&D system degradation is to de-emphasize crop production and augment income through increased livestock production. Attempts to emphasize livestock breeding are more prevalent in areas where substantial areas of land are not sown, where livestock breeding is traditional, and/or substantial areas of natural pasture area available. For example, in Tokmaganbetov village in Syr Darya District of Kazakhstan,

Livestock breeding is a more stable way of supporting the population’s well being. Moreover, while sown area is contracting, the area of pasture and hay meadows is expanding. Therefore, the more active households become wealthy on account of raising livestock. In the opinion of many participants, those with over 30 head are wealthy.

Similarly, on the Kirkkiz FSK in Ellikkala District of Uzbekistan,

By the end of the 1990s and beginning of 2000...land salinization and lack of water led people to pay a lot of attention to livestock breeding in order to enhance their family’s well-being. The availability of unsown land on farm conglomerates and the population’s garden plots, which resulted from the lack of irrigation water, contributed to the expansion of pastures.

In general, the “more powerful families” in Tokmaganbetov village obtain the greatest benefit from the recent surge in livestock production, while 10% of families have no livestock whatsoever. Poorer families attempt to obtain what pasture and fodder they can, in addition to making mats from reeds and selling wood obtained from bushes that grow on abandoned land. In Ellikkala District, private farmers, i.e. those with enough land at their own disposal to grow fodder and/or money to buy it, are most active in changing the profile of their farms.

However, in other areas the degradation of I&D systems, coupled with a lack of natural pasture, limits how much farmers can emphasize livestock production and even reduces their ability to maintain present levels of livestock production. Residents of the densely populated Uzbekistan District (of Uzbekistan) “raise livestock, but this is ineffective, because the land is salinized, there is no pasture suitable for grazing stock, and buying feed is prohibitively expensive.” The condition of pastures in Shoymanova village (Otrar District, Kazakstan) is even worse. According to the Kazakstan field team,

In connection with the lack of irrigation water and high groundwater levels, the removal of pastures from production has intensified, and plants have changed. Weeds that are more tolerant of salinization and lack of water are displacing the grass. The population is forced to move to raising less delicate livestock, such as goats and camels.

In Otrar village (Otrar District, Kazakstan), where livestock comprises “the main source of income” for the population, livestock breeding is limited by the lack of family farms’ access to pasture owing to their location. However, it is likely that some areas family farmers have ties to the FSK that permit to obtain fodder from it (when it is available). Yet I&D degradation also harms livestock production: in Otrar, “the fields devoted to hay and fodder have declined, due to the salinization of hay meadows and pastures.” Another farmer mentioned that livestock “drink water from the drainage system,” as a result of which there are “many sick cows; herds decline.”

In Kyrgyzstan, where less land has been abandoned and fewer pastures are available (outside of the high mountain areas during summertime), the tendency to emphasize livestock growing is not as high. For example, in Kadamjan District, lack of fodder and limited pasture areas they cannot do this. Some poor farmers have actually sold livestock to cover their debts, such as a young man in Kara Bora District, who noted,

In 1999 I sold my cow in order to cultivate crops, but it was an unlucky year and I didn’t make a profit. Last year I sold the sheep, and this year, the last hope—the horse. Because of lack of water I have made no profit in 5 years. The harvest barely (sometimes will not) covers the cost of production.

3.5 Pursuing Another Line Of Work

The labor market in rural areas of Central Asia has been saturated since the late 1980s, owing to rapid population increase (on the order of 2-3% per year), the lack of job

options outside of agriculture in rural areas, and the weak development of industry and training for non-agricultural jobs.⁵¹ This situation was particularly acute in densely populated irrigated areas such as the Ferghana Valley, where the availability of irrigated land per capita was often as low as .10 ha (compared to .50-.60 ha in newly irrigated areas such as the Karshi Steppe).

With the downturn in agricultural production in the 1990s, the number of farmers looking for other work to augment their meager incomes has increased dramatically. Yet in rural areas, especially those where I&D systems can no longer support agriculture, the jobs available outside of one's own farm are few and far between and/or pay very little compared to work elsewhere, such as provincial and major cities. Non-agricultural jobs are usually in the building and artisan trades (which is well-developed in Tokmaganbetov village in Syr Darya District of Kazakhstan), as well as in education and services. Yet most jobs are scarce and the requisite skills often take years to acquire.

Available agricultural work in villages consists of weeding the fields and harvesting crops on prosperous farms, but wages are extremely low, to the degree that most men will not accept them—women in Nishan District of Uzbekistan noted in discussions that it was “difficult for their men to find even seasonal labor” (suitable to them). Therefore, (as during the Soviet period) women most commonly are hired for menial tasks, a pattern of local auxiliary employment that is reinforced by the substantial burden of their household tasks (such as carrying water) and (especially in oasis areas) the general preference of their husbands to stay as near home, hearth, and family as possible. More so than in the middle of the 1990s, villages contain a group of desperate young men, who see little future in agriculture and do not want to work for nothing, occasionally performing menial tasks in the village and working on the household plot, but all too often being underemployed.⁵²

3.5.1 Local Options for Alternative Employment

The general lack of profitable employment in the countryside forces farmers to seek work in other areas—where *perestroika* era policies to resettle Central Asians in other parts of their region and the USSR failed,⁵³ poverty has succeeded. The first and most convenient resort is the district or province center city, all of which have a *mardikar* (“day laborer”) bazaar, in which (often large) groups of young men descend upon employers that stop by in hopes of obtaining a job for a day, a week, or even a month. In some areas, such as Kara Bora District, children 8-10 years of age are also hired in the

⁵¹ Leslie Diesnes, *Soviet Asia: Economic Development and National Policy Choices* (Boulder: Westview Press, 1987), Chapter 5, “Manpower and Economic Policy for the Soviet “Middle East;” L.P. Maksakova, *Demograficheskie problemy zaniatosti v Uzbekskoi SSR* (Tashkent: Uzbekistan, 1989); Ann Sheehy, “Central Asian Republics Under Pressure to Improve Use of Labor Resources,” *RFE/RL Research Report*, RL287/86, July 25, 1986.

⁵² In some cases, the parents of these youth also do not want their children to stay on the farms. However, in interviews for the RESP survey some middle-aged and senior farmers, although they understand the reluctance of youth to work for low wages, also view the local youth who do not want to engage in agricultural production as “soft” and simply indisposed to hard labor.

⁵³ For a critique of Soviet era migration policies, see: Joint Publications Research Service, *JPRS-USS-90-003*, March 26, 1990, pp. 28-32; *JPRS-USS-91-005*, March 6, 1991, pp. 34-37.

“slave market” (the local parlance in Kara Bora). Men “sell some type of goods in the bazaar or work as carriers in bazaars and train stations” (Syr Darya District), perform other physically demanding tasks, or for those with income and/or connections enough to obtain a vehicle, receive fares as a taxi driver. In some provincial cities, such as Kokand (near Uzbekistan District), women also participate in a separate mardikar bazaar, which appeared in the late 1990s. They offer their services as housekeepers and midwives and sell medicine.⁵⁴

Increasingly women venture outside the household to sell agricultural products from household plots (most often vegetables and herbs), clothing or silk cloth, sell cigarettes and chewing gum (in bazaars, and in the latter case also on the street). Increasingly the wife sells the products of the household instead of the husband, because, in deference to the extreme separation of the genders in rural areas, local police (the *militsiya*), road checkpoint personnel (the State Automobile Inspectorate, or *GAI*), and bazaar authorities are less prone to extort from women than men. Wives that succeed in making more than their husbands occasionally encounter jealousy and conflict within the household.

3.5.2 *Leaving Home*

Villagers in irrigated areas of Central Asia have traditionally maintained strong ties to their birthplace, which most abandon unwillingly for work elsewhere.⁵⁵ Recalling good yields obtained in 1980 in the area, a farmer in Uzbekistan District (of the Uzbekistan portion of the Ferghana Valley) told the field team, “If we had a good, fertile plot of land by the house, I wouldn’t take step from home.” This outlook is widespread among middle-aged and elder villagers, who are more “set in their ways” and less prone to adapt to unexpected changes. By contrast, (as noted above) many youth in poverty-stricken areas do not want to work in agriculture and would prefer to work elsewhere for more income than the former brings. In Ellikkala District of Uzbekistan, a ranking of cards showed that students want to pursue careers in education, medicine, engineering, and the like. “Farmer” was not even mentioned as a preferred occupation.

Moreover, 40% of students consulted in the Pakhtaabad FSK (Nishan District, Uzbekistan) want to live and work in cities, where, in comparison to those available in district and provincial centers, incomes are large and lifestyles more “modern.” Thus, more and more villagers travel to cities in Central Asia or Russia in search of

⁵⁴ The desperation of a small but increasing contingent of women in the mardikar bazaar is belied by the unfortunate fact that many of them, who reside in villages with a generally strong belief in Islam, also engage in prostitution.

⁵⁵ “Central Asians” in this case refers to indigenous nationalities, which comprise the overwhelming majority of residents of rural areas, with exception of a small contingent of Koreans and other deported nationalities, as well as Russians and Ukrainian Cossacks in northern Kazakhstan. In formerly nomadic areas, many of which became livestock sovkhozy in Kazakhstan and Kyrgyzstan, the ties to a specific area are probably weaker, i.e. herders would often travel far afield (as much as 200-300 km), before returning to their families and the sovkhoz center. The generally strong ties of rural Central Asians to their birthplace was a source of intense frustration for Soviet planners and during the late 1980s became the subject of a hot debate that often touched on nationality policy. See: *Current Digest of the Soviet Press*, vol. XXXV, no. 8, March 23, 1983, pp. 1-5; Joint Publications Research Service, *JPRS-USS-90-003*, March 26, 1990, pp. 28-32; *JPRS-USS-91-005*, March 6, 1991, pp. 34-37.

employment. In areas where “the land almost doesn’t yield a harvest, and the expenses associated with a plot of land exceed the income,” such as the village of Bekabad in Uzbekistan District, this phenomenon is increasingly common. Residents of Bekabad estimated that 1-5 members of each (extended) family had left for work elsewhere to Russia to labor in construction and factories, to Kazakhstan and other areas of Uzbekistan (such as Nishan District), where more irrigated land is available, and work on the cotton fields of large farm enterprises can be exchanged for access to personal garden plots. Women in Bekabad estimated that as much as 80% of the incomes earned by their husband was acquired through working in other areas (followed by 15% from pensions and benefits, 4% from livestock, and 1% from garden plot production).

In most areas in which fieldwork was conducted, emigration has accelerated in the last 5 years, although the causes of the phenomenon vary greatly, depending on local conditions. In Otrar village (Otrar District of Kazakhstan) the number of *families* leaving has grown annually from 3 in 1997 to 10 in 2000, while the number coming to the village has also increased, from 2 in 1999 to 3 in 2000 (out of a total of 219 households, 18 less than in 1991). However, in other areas studied, emigration has slowed for one group in a village and accelerated for another more sensitive to the acceleration of the decline of I&D systems. In Tokmaganbetov village of Syr Darya District of Kazakhstan, “the wealthy” left for the closest provincial cities in 1994 owing to the failure of electricity and heating in 1994, while the poor in the village are now leaving out of desperation. In nearby Ilyasov village, “the people that are bright and show initiative have already left.”

When ethnic minorities leave, they tend to seek work in the republic in which their nationality is the majority. Among the field sites covered, this is true of Kazaks in Ellikkala District of Uzbekistan, Kyrgyz in Nishan District of Uzbekistan, and Russians in Talas District of Kyrgyzstan. In the latter area, the emigration of Russians and Germans was predominant in the last decade, probably owing to both economic and ethnic factors, while that of Kyrgyz has just begun.

Other general patterns can be discerned in migration for work. Men under 50 years in age, who are not subject to social restrictions like women their age, are more likely than others to leave the village for work. Work is typically seasonal, peaking in summer and early fall along with the availability of construction and other menial jobs, and ebbing to a low in winter, when many try to be home for holidays. “If the job proceeds successfully, the working member of the family brings money home once a month, or else takes his wife and children [from the countryside to the city], where they live in temporary housing.” (Nishan District of Uzbekistan). Those who can afford it travel home as often as possible, but many “leave in the spring and return in the fall” (Uzbekistan District of Uzbekistan) due the prohibitive expense of traveling. Workers find housing with people from the same province or (if possible) district, make do with temporary quarters at construction sites or schools, or sleep on the streets. Villagers visiting the cities commonly try to find jobs for other family members, friends, or residents of their village that want to travel elsewhere, and they occasionally reside together, especially in temporary housing.

Given the prominent place of I&D system degradation within the complex of factors contributing to the decline of incomes in the areas studied, it is little wonder that farmers themselves commonly linked emigration with I&D system degradation and/or lack of irrigation water. Nevertheless, this phenomenon to some degree is caused by factors other than the degradation of I&D systems that influence farmers' incomes, such as scarcity of inputs and machinery, low farmgate prices and fickle markets, and drought in 2000. Other factors are also influential—for example, those in Uzbekistan District of Uzbekistan are more likely to leave owing to the high population density and low per capita availability of irrigated land (usually in the range of .10-.20 ha) in lowland irrigated areas of the Ferghana Valley, as well as the fact that “the measures taken against the degradation of land and lack of irrigation water have been ineffective.” Indeed, some from Uzbekistan District travel to Nishan District (also in Uzbekistan), where in many areas fertile irrigated land is available (per capita irrigated land is .61 ha), while many from the sites studied in latter district leave elsewhere for work. In Nishan, this is in part owing to the fact that much of the oasis was settled in the 1980s and “everyone is in the mood to go back to where they were born” (as noted by the field team that visited the Turkmenistan FSK). Other areas like Gulbaar village in Aravan District of Kyrgyzstan are already close to major cities (in this case Osh, the largest in southern Kyrgyzstan), and many work elsewhere, but none have permanently emigrated.

There are several impediments to successfully working and especially permanently settling elsewhere. First, job creation in the Central Asian republics is limited, especially when compared with population growth, labor markets are tight, and savings for emigration are normally low—“Many are in the mood to leave [the village], but there is nowhere to go, and, moreover, no money for moving.” Many villagers lack the technical training required for more profitable trades, and often qualifications of this nature are no guarantee of a job that matches the training.⁵⁶ Expenses are also higher in cities, and the overall income gained from menial labor that most engage in is low, meaning that a relatively few of those that want to permanently settle their families can actually do so. As noted by a resident of Kadamjan District, “Some people have gone to work in [the capital city of] Bishkek, but no one has returned with any [real] money.” In Uzbekistan migrant workers must obtain internal registration in major cities (in particular Tashkent) under false pretenses and/or through bribery, which can be a time consuming and expensive process, seldom requiring less than 10 trips to a district police (*militsiya*) post for the “illegal” immigrant worker. A few that leave to distant areas like Russia begin new families and abandon their Central Asian families entirely, yet the opposite phenomenon has also been observed.⁵⁷ Thus, owing to the constraints noted above, the increasing tendency of rural stakeholders to seek work elsewhere can generally be regarded as unsuccessful.

⁵⁶ “Zaniat’ rabotoi,” *Sel’skoe khoziaistvo Uzbekistana*, 1995, no. 5, pp. 58-59.

⁵⁷ In some cases, Russians from Uzbekistan moved to rural areas of Russia and prospered, yet faced resentment from their “fellow countrymen.” In interviews with the “Expert” Sociological Research Center in Tashkent, some of the returned Russians actually referred to themselves as “us Uzbeks.”

4 THE EFFECTS OF I&D SYSTEM DEGRADATION ON DRINKING WATER AND HOUSING

4.1 Drinking Water Supply Before 1991

Before the USSR dissolved in 1991 the need of villagers in Central Asia for centralized drinking water systems was rising. Prior to the 1970s rivers, springs and wells provided adequate drinking water in most areas (when boiled first, in accordance with local practice). With the increased application of agrochemicals beginning in the late 1960s⁵⁸, massive discharge of salt from drainage systems, and release of untreated waste from industrial and municipal facilities, pollution of rivers such as the Chirchik and Zerafshan⁵⁹ and the middle and lower reaches of the Amu Darya and Syr Darya⁶⁰ became such that the development of alternatives sources and/or treatment facilities became necessary.

Yet even after construction of piped delivery systems in the countryside was accelerated in the late 1980s, coverage remained inadequate. In 1993 the percentage of rural households with access to piped water (usually a standpipe within walking distance of the home) was 52% in Kazakstan, 49% in Uzbekistan, and 30% in Kyrgyzstan, (in Kyrgyzstan, owing to an abundance of clean groundwater and pure glacial runoff in high mountain areas, there was less of a need for piped systems).⁶¹ Typically, women and children filled buckets of water from a standpipe or a well located in an area within walking distance of the house. Owing to the inadequate coverage of piped systems, villagers commonly augmented their household water supply from easily accessible, yet unsafe sources, such as shallow wells, canals, and reservoirs. By contrast, in urban areas 75-80% of households in these republics had tap water, most often inside the home. Coverage for sewerage and sanitation in rural areas was considerably lower than for

⁵⁸ By the late 1980s, the average application of toxic agro-chemicals per hectare in Uzbekistan was follows: 22 kg of herbicides, 16.2 kg of defoliant, and 36 kg of insecticides. The substances used include DDT, Aldrin, and a highly toxic defoliant called *butifos*. These substances were banned in 1983, yet application continued in areas with a low population density until stocks ran out. The average concentration of DDT in soils in Uzbekistan in the mid-1990s was 0.321 mg/kg, over three times above acceptable limits. See: Ziyaviddin Akramov and Abdihakim Qyumov, "Qishlaq wa tabiat," *Sharq yulduzi*, 1988, no. 2, p. 183; Patricia M. Carley, "The Price of the Plan: Perceptions of Cotton and Health in Uzbekistan and Turkmenistan," *Central Asian Survey*, vol. 8 (1989), no. 4; Arzimurad Rahmatullaev, "Zuryadimiz taqdiri," *Fan wa turmush*, 1995, no. 3.

⁵⁹ In many locales, industrial installations posed a threat to nearby drinking water supplies, as in the case of chemical fertilizer plant in the city of Kokand (in the Uzbekistan portion of the Ferghana Valley), which had been built almost directly over one of the largest remaining pure aquifers in the region. After protests from the local population in 1989, the plant was closed down, after only three years of operation. In areas downstream of the city of Ferghana, petroleum product releases severely polluted drinking water. See: Joint Publications Research Service, *JPRS-UPA-90-071*, December 18, 1990, pp. 87-88; *Pravda vostoka*, June 30, 1989; *Soviet Ozbekistani*, March 1, 1989.

⁶⁰ Joint Publications Research Service, *JRPS-UEA-90-010*, March 21, 1990, pp. 51-52. Shallow groundwater and aquifers in the lower reaches of the Aral Sea basin are hydraulically linked to rivers and irrigation canals. Deep aquifer water is often too saline to be used (20-130 grams per liter).

⁶¹ Chander Badloe, "The Water and Environmental Situation in the Central Asian Republics and Kazakhstan," 24th WEDC Conference: Sanitation and Water for All, Islamabad, Pakistan, 1998.

water supply. Most households used an unlined latrine located 20-30 meters from the home.

Part of the reason for inadequate coverage was the focus of rural investment on irrigation, which held priority over those planning and construction for community needs (the latter usually received only residual budgetary allocations). In part this is due to the fact that Minvodkhoz, which was responsible for installing drinking water (and other) infrastructure in rural areas, viewed irrigation work, especially earth moving, as more profitable than installing drinking water systems.⁶² Thus, such work was often late or not done at all. In 1990 the leading daily in Kazakhstan severely castigated builders (and local authorities) in Kzyl Orda Province for the fact that during the latter half of the previous decade only three out of nine main pipe systems designated in construction plans had actually been installed. Because quality control was absent, construction was often shoddy. Owing to this factor, the primary project of the late 1980s in Kzyl Orda Province that did go into operation, the main pipe from Aralsk to Sarybulak, did not perform as planned.⁶³ Similarly, the first stage of the Tuyamuyun-Urgench pipeline in Khorezm Province of Uzbekistan went online in 1990 “after great delays” and with significant defects in construction and design.⁶⁴

Because maintenance of drinking water systems was not a priority of Vodokanal, the services in charge of operating drinking water systems (in urban areas under the Ministry of Housing and Public Services and in the countryside under Minvodkhoz), pipes fell into decay quickly. This especially true of areas (such as those downstream in the Aral Sea basin) where highly salinized groundwater hastened the corrosion of pipes, which were usually made of unlined steel (with a service life of about eight years). In some areas, such as in Karakalpakstan and Khorezm Province of Uzbekistan, pipes and other infrastructure on kolkhozy and sovkhozy were in “highly unsatisfactory condition” by the end of the Soviet period.⁶⁵

In areas with piped systems, the operation of drinking water systems was highly inefficient. Systems often leaked in excess of 40%, resulting in seepage out of and into drinking water systems. Water commonly ran uninterrupted from standpipes (in some cases this was done to get water when pressure was available, i.e. to leave the tap on, in others to prevent pipes from freezing, owing to insufficient insulation). Moreover, villagers sometimes used drinking water from pipes for irrigation of garden plots, as well as for livestock. In a World Bank survey conducted in Kzyl Orda Province of Kazakhstan

⁶² Chamkin, *Sotsial'noe upravlenie*, p. 28; E.S. Tukhtaev, *Sotsial'no-ekonomicheskoe problemy povysheniia urovnia zhizni sel'skogo naseleniia Uzbekskoi SSR*, (Tashkent: Fan, 1989), p. 20.

This tendency was noted in a 1990 survey on rural infrastructure in Central Asia by over 80% of those in the sample, which consisted of local Party and ministerial officials and scientists. See: Joint Research Publications Service, *JRPS-USS-91-009*, August 2, 199, p. 52;

⁶³ *Kazakhstanskaia pravda*, June 20, 1990.

⁶⁴ *Pravda vostoka*, September 13, 1991.

⁶⁵ *Ibid.*

in the mid-1990s, 12% of respondents that had access to tap water irrigated with it and 39% watered their livestock with it.⁶⁶

The quality of water produced by the drinking water systems sometimes did not meet Soviet standards (which were, admittedly, more stringent than those in the West). The situation was particularly acute in areas affected by effluents from industrial and mining sites, as well as downstream areas of the Aral Sea (which received a concentrated mix of agricultural and industrial pollution from upstream). Half of the samples of water taken by a team of researchers in 1989-90 in Karakalpakstan, Kzyl Orda Province (Kazakhstan), and Tashawuz Province (Turkmenistan) did not meet standards for chemical content, and one-fourth failed tests for bacteria content (the averages for Uzbekistan in 1985 were 22% and 18%, respectively; they include tap water in cities and towns). Medical specialists commonly linked poor drinking water to growing rates of waterborne diseases such as typhoid, as well as gastro-intestinal maladies.⁶⁷

4.2 Drinking Water Supply Since 1991

Access to safe drinking water is even more problematic for villagers in Central Asia than before the breakup of the USSR. The drinking water infrastructure in Kazakhstan and Kyrgyzstan has deteriorated substantially since 1991, while this is less true of Uzbekistan. Although statistically the coverage of drinking water systems in the former two republics is largely unchanged, recent studies repeatedly emphasize that, due to the frequently unstable operation of water-supply projects, coverage has in fact declined. For example, in Kyrgyzstan “service interruptions have become the norm, rather than the exception, particularly in the summer months,” i.e. when the need for disinfected drinking water is most acute.⁶⁸ In both fieldwork sites in Talas Province, pipes are rusted, resulting in massive leakage and insufficient pressure (especially in the gravity-fed system in Talas District). Water pressure in Kara Bora District fell when one of the two pumps went out of commission. Treatment plants in these locales are often out of commission, largely owing to lack of chemicals. In other fieldwork sites in Kyrgyzstan, there is no infrastructure devoted to drinking water supply, and the population boils water drawn from canals. In some areas, such as the upper reaches of Kadamjan District, the water is relatively pure glacier melt. Yet in the downstream areas of this district and in Gulbaar village of Aravan District water picks up bacteria and pollution (in the latter case from the city of Osh) before it reaches its destination. Storage consists of ponds and canals, in which water becomes unfit for consumption after 3-4 days.

The situation in Kazakhstan as a whole is similar to that of Kyrgyzstan. For example, none of the boreholes drilled in the mid-1970s in Shoymanov village (Otrar District) is still in commission. Eight of the original 20 standpipes in Tokmaganbetov

⁶⁶ Ibid, pp. 152-53.

⁶⁷ *National Environmental Health Action Plan of the Republic of Uzbekistan* (Tashkent: UNEP, 1999), p. 42; *Pravda vostoka*, September 13, 1991.

⁶⁸ *National Environmental Health Action Plan of the Republic of Kazakhstan* (Almaty: UNEP, 1999), p. 3; *National Environmental Health Action Plan of the Kyrgyz Republic* (Bishkek: UNEP, 1997), p. 3; World Bank, *Kyrgyz Republic Water Supply and Wastewater Note*, World Bank Report No. 19487-KG, June 28, 1999, p.4.

village of Syr Darya District (Kzyl Orda Province) are working. Boreholes drilled five kilometers away from the village in 1985-86 were linked to village by pipe, but “due to low-quality [construction and repair] work, the pipes were broken and now they don’t work,” despite efforts by a local FSK to replace some sections. In both villages in Syr Darya District, due to frequent interruptions in the power supply, the pumps used for the wells required replacement, in one case four times in the first six months of 2001.

In Uzbekistan, by contrast, substantial investments into piping systems increased their coverage from 50% of households to a reported 64% between 1993 and 1997.⁶⁹ Yet some areas that need a safe, centralized water supply still do not have it, and maintenance of the both new and old systems leaves much to be desired. In the Kirkkiz FSK of Ellikkala District of Uzbekistan, only one village has a system of pipes, supplying 23% of the population. According to the field team, “The rest of the people use water from wells 10-12 meters in depth, the quality of which is practically unfit for drinking.”

As in irrigation, reduced funding, as well as institutional factors, played a role in the decline in O&M of drinking water systems. Cost-recovery, on which the rural water supply organizations depend, is still low, despite the removal of previous subsidies (particularly in Kazakhstan and Kyrgyzstan, where cross-subsidization with industry further distorts tariffs), while charges for electricity and other inputs have increased. Water charges are typically low and sporadically collected, which is sometimes due to the influence of the local government.

Local institutions are unable to cope with new requirements, and O&M in many areas is in a vacuum. Rural water departments and construction organizations (which are part of the chief irrigation authority, as before) lack experience in financial management and accounting, and use highly standardized norms in planning and operations that departments. Moreover, it is unclear who is in charge of O&M, especially where FSKs have been converted into family farms. In Kyrgyzstan, the rural water supply department was supposed to operate some 5,000 installations in 1998. However, it “could only actively manage a fraction of them. The remaining installations under its responsibility are either abandoned or being operated by the villagers themselves,” usually with the village council playing a leading role.⁷⁰

When institutions cannot guarantee control over it, drinking water becomes scarce for some, regardless of how much there is for the community as a whole. For example, in the Dostlik village on the Turkmenistan FSK (Nishan District, Uzbekistan), there are 4 neighborhoods that drinking water does not reach. Residents noted:

There is water at the source, but it is distributed inequitably. Quite often those that live adjacent to the source irrigate their garden plots with drinking water, but water does not reach our neighborhoods at all...We have lived here since 1985. Previously there was water in the canals and

⁶⁹ *National Environmental Health Action Plan of the Republic of Uzbekistan* (Tashkent: UNEP, 1999), p. 42.

⁷⁰ World Bank, *Kyrgyz Republic Water Supply and Wastewater Note*, pp. 7-9.

also drinking water in the pipes. For 3-4 years there has been no water at all.

Most people in this village must stand in line for water. In the evening, large crowds (of women) wait their turn, wondering if the supply will hold up until they have obtained water for their family. Fights are common enough among those in line to fill their buckets that even the children of these women become enemies and throw rocks at each other. Some families prefer to forego the hassle of hauling water over long distances and instead use water from nearby canals and even drainage collectors.

The quality of water available to most villagers in Central Asia is poor. According to official statistics, 25% of tap water samples tested in (rural and urban areas of) Uzbekistan did not meet health standards for chemical content in 1998 (up from 22% in 1985) and 8% did not meet bacteriological standards (down from 18% in 1985).⁷¹ Figures given for both indicators in Kazakhstan and Kyrgyzstan are much lower, in the range of 3-12% percent. Yet, as admitted by the officials that generate these numbers, they do not reflect the drinking water situation in most rural locales, which leaves much to be desired. Drinking water supplies are of low quality in all research sites except some mountainous areas of Kadamjan District and Talas Province in Kyrgyzstan, which benefit from an abundance of pure glacial runoff into reservoirs and groundwater. Downstream and mid-stream areas in the Aral Sea basin suffer disproportionately. In surveys conducted by the World Bank in Karakalpakstan and Kzyl Orda Province of Kazakhstan (Aralsk and Kazaklinsk areas) in the mid-1990s, the quality of water, especially its mineralization and particulate matter (in the summertime), figured most prominently in the concerns of rural stakeholders about their drinking water. The studies also indicated that livestock suffered from drinking highly salinized water from open sources such as collectors, which was also noted in the field studies conducted in 2001.⁷²

The quality of drinking water available to most villagers declines when I&D systems deliver less, because many of the rural folk must use water from canals and even collectors. The decline of the flow in the Amu Darya during the droughts of 2000 and 2001 “resulted in poorer quality water remaining stagnant in canals for a long period of time.”⁷³ Such is the case in the areas covered in this study, due to the degradation of I&D systems and/or inequitable allocation of water, as well as drought. A number of drinking water problems in the fieldwork sites are also related to drainage, such as the seepage of groundwater in areas where drains no longer work into breaks in pipes or reservoirs (this was noted in all of the fieldwork sites in Kazakhstan and in Kadamjan District in Kyrgyzstan). Moreover, in areas where groundwater is saline, the corrosion of the unlined steel pipes is accelerated, a problem that has remained since the Soviet period.

⁷¹ *National Environmental Health Action Plan of the Republic of Uzbekistan*, p. 42.

⁷² World Bank, *Social Assessments for Better Development: Case Studies in Russia and Central Asia, Environmentally Sustainable Development Monographs Series No. 16* (Washington, DC: World Bank, 1997), pp. 120-21, 155-56.

⁷³ World Health Organization, “Health Aspects of the Drought in Uzbekistan, 2000-2001,” *Technical Field Report Series*, July 2001, p. 5.

Villagers try to adapt to the exhaustion and pollution of drinking water supplies by seeking to store water or find an alternative source. In Kadamjan District, for instance, the well that supplies drinking water is typically dry by May, and to compensate the residents often dig a reservoir. However (in the opinion of the field team) “the quality of water becomes very bad—it is greenish-gray in color, bugs are swimming on it, and it is located next to a well-traveled road.” Even in areas where reservoirs are better built and located, the water is often undrinkable after 3-4 days. Because well water in both field sites in Otrar District of Kazakhstan is unfit for drinking, water is brought from wells 7-8 km from the village and stored in cisterns, which reduces its quality. This is also done in Nishan District of Uzbekistan. Yet many villagers in both of these areas do not have money to meet all of their needs with this water and thus must get at least part of their water from canals.

In general, the drinking water supplies of areas where the population uses a significant amount of water from canals suffers the most when I&D systems fall into decay, especially downstream locales and/or those where allocation of water is inequitable. Within all communities, reduced and low quality drinking water supplies affect women and children in families that must haul water to their home, which in most areas is the overwhelming majority. By means of circle diagrams, it was established that children in middle school in both sites in Nishan District of Uzbekistan spend an average of 1-2 hours per day obtaining drinking water (3 hours in Uzbekistan District). Some children in mountain areas such as Kadamjan District in Kyrgyzstan routinely travel distances of 1-3 km for a two-day supply of water. In Ellikkala District of Uzbekistan, medical authorities mentioned that women experience a high rate of miscarriages due to the strain of constantly hauling water.

When alternative supplies of water must be sought, women and children must haul from even greater distances than the normal location of the source. For example, drinking water from canals ran out in Gulbaar in May. According to residents, “For 10 days the reserve of [canal] water was exhausted and we were forced to bring water from the village of Kenes in Kara Suu District, which is located 5-7 km away from us, or else drink the water left in the puddles in the canal.” In mountain areas, the search for alternative water sources often ranges up to 10 km (as in Kadamjan District). Those that can carry water home on a horse-drawn cart, but most walk on foot.

Among rural stakeholders, those in the medical profession were consistently more concerned about drinking water than others, probably because they recognize the detrimental effects of it on the health of their community. Healthcare workers most commonly linked the poor quality of drinking water with intestinal diseases, gastritis (Ellikkala District of Uzbekistan), viral hepatitis (Talas District of Kyrgyzstan), and typhoid fever (Aravan District of Kyrgyzstan), which appeared despite the fact that households routinely boil water before drinking it. In districts afflicted by drought in 2000 and 2001, such as Ellikkala, the rate of diseases associated with poor drinking water has increased over the last two years. Women and children are the most susceptible to

these maladies.⁷⁴ Medical specialists in Ellikkala District also noted the deleterious effect of poor drinking water upon local livestock—“in every household almost 1-2 head died.”

Villagers respond to bad health as best they can. Although there are health facilities in most areas, the majority of potential patients cannot afford their services: “People go there unwillingly, because you must pay for treatment and buy your own medicine. Therefore, they prefer to cure themselves at home using what is available in the household.” (Otrar District). In Kadamjan and Kara Bora Districts of Kyrgyzstan, as elsewhere in Central Asia, the sick are increasingly turning to folk remedies and healers (*tabibs*), because this is much cheaper than hospital care.

4.3 Housing

In areas with severe drainage problems, groundwater often seeps into the foundations of buildings and rots them. As noted by a respondent in the Shoymanov village of Otrar District (Kazakstan), this is nothing new:

Before 1987, when [the authorities] still had not installed drainage, houses began to decay...This process stopped after drainage was introduced. Now drainage doesn't work, and this threat is awaiting us again.

However, the phenomenon appears to be more frequent than before, owing to the degradation of I&D systems. In some areas groundwater harms as many as 10% of houses. In Gulbaar village of Aravan District (Kyrgyzstan) the problem is severe to the degree that two houses were abandoned. The foundations of schoolhouses in some of areas are also affected, such as the one in Uzbekistan District, which has a foundation so damp that documents cannot be stored in the building without becoming rotten. The foundation of the schoolhouse has settled half a meter in the last 5 years.

People who live in these buildings (or in the case of schoolchildren, study in them) are exposed to damp conditions that are unhygienic and conducive to sickness. The health of schoolchildren is most vulnerable under these conditions—teachers in Aravan District noted that in the winter cold [when temperatures in the rooms dip to +5-6 C°] pupils, particularly girls, often catch cold. The director of the local Government office noted, “I put my daughter in school in the [nearby] city of Osh and every day I take her to the city, because here [in the local school] she could fall sick with rheumatism, like the others.”

Damage to house foundations does not affect any specific socioeconomic group; it simply affects those with homes located near high levels of groundwater. Dangerously high groundwater (referred to as *zakh* or *zak* in Central Asia) does not differentiate between rich and poor. Unless one cares to drain the entire neighborhood and surrounding fields, there is little that can be done to forestall it.

⁷⁴ In areas near the Aral Sea (Ellikkala and Kzyl Orda), salt is present not only in groundwater, but also in winds that carry it from the dried bed of the Aral, which further harms health. In Kzyl Orda, residents also noted the negative health effects of the Baykonur cosmodrome.

Not much can be done about damage to homes by groundwater, short of single-handedly fixing drainage systems in one's village. Farmers attempt to dig small ditches from their homes, and in one case the main collector for the village was deepened to improve drainage for the whole village. However, neither of these measures helped alleviate the situation, the former because this type of measure cannot be effective against groundwater that covers an area much larger than one's home, and the latter because the collector was not dredged deep enough. In Gulbaar village of Aravan District, two families had to abandon their homes. After complaining to the akim, they received land in a better location, but do not have enough money to build a new residence.

5 PERCEPTIONS OF POVERTY

5.1 *The History Of Poverty*

Residents of all of the areas studied noted that their standard of living is much worse than before, especially in the last 2-3 years. For example, villagers in Talas District of Kyrgyzstan estimated that the percentage of residents in poverty has increased by a factor of 8 since 1995. A group of men in Ilyasov village (Syr Darya District) claimed that their poverty had increased by 70% since 1993. The time line below, drawn up by a group of women to express the drop in their living standards, illustrates the dynamic of poverty in Otrar village since 1993, when the population claims their troubles began. The prevalence of problems related to inflation, farm restructuring, and reduced input supply in the early section of the timeline reflects many of the fundamental reasons why the population was unable to care for I&D systems, which by the latter part of the decade have deteriorated to the point of severe dysfunction. This pattern is characteristic of most areas in Kazakhstan and Kyrgyzstan, although the timing varies in all instances.

Timeline Of Poverty In Otrar Village, Otrar District (6 Women)	
1993	Breakup of the sovkhos and pilfering of the community's livestock
1994	Youth become unemployed. Flour and clothing become expensive.
1995	Fuel becomes more expensive. Farm equipment isn't replaced. The central system ceases to deliver drinking water, and the population begins to buy it.
1996	Residents are required to pay for irrigation water.
1997	Irrigation water ceases to reach the sown areas via the canals.
1998	Water for livestock becomes unavailable.
1999	General unemployment in the village spreads.
2000	Livestock begin to fall ill.
2001	Continued decline in standard of living, because the aforementioned problems have not been solved.

Because farms have been only cosmetically restructured and “the plan” remains in effect in Uzbekistan, villagers there emphasized falling water supplies and land degradation in the 1990s in their histories of poverty more than stakeholders consulted in Kazakhstan and Kyrgyzstan. They also noted the gradual worsening of conditions within FSKs, such as increasing failure to pay wages beginning in 1995, bottlenecks in input supply, etc., but not to same degree as elsewhere.

5.2 *The Extent And Nature Of Poverty*

The present extent of poverty in areas with degraded I&D systems is tremendous, as is the differentiation in its impact on the population. Villagers in all of the sites covered frequently estimated that 70%-90% of the population is in poverty, 5-25% lives at an “average” standard, and 2-10% is “wealthy.” Occasionally a minority of the poor were categorized as “extremely poor.”

In assessing what characterizes poor families, villagers in Kyrgyzstan and Kazakhstan commonly referred to people that do not hold livestock, lack capital, inputs, and labor needed to cultivate land, and cannot adequately feed, clothe, and provide healthcare for themselves. The prominence given to livestock is due to the fact that many farmers prefer livestock to a bank account—animals can be sold easily, provide food and possibly a profit, and raising them is often a lower risk than dealing with banks, which many villagers are wary of owing to their unreliability and poor service orientation. The main source of income of poor farmers is their land, into which they must sink 60-70% of their income in order to plant a crop in the following year. Some of them must obtain flour on credit in order to have enough to eat between crops. The poor without land live on pensions and are perceived as being better off than other poor villagers.

“Middle class” villagers in Kazakhstan and Kyrgyzstan are those that are able to lease additional land, possess farm equipment and animals, can hire labor, and own a car, truck, or tractor (in Tokmaganbetov village of Syr Darya District, “some own a car, some don’t.”). They and the rich are identified with those able to successfully obtain these items in the course of privatization and bankruptcy proceedings. However, middle class farms often do not turn a profit and spend a high portion of their income on basic needs (Talas District). The rich are able to observe crop rotation, engage in entrepreneurial endeavors.

Villagers in Uzbekistan described poverty and wealth in different terms. The poor are more commonly described as belonging to certain occupational category, especially shirkat workers, owners of recently created private farms, and the unemployed. The middle class are teachers, doctors, artisans, pensioners, and those paid out of state budgets, while the wealthy are entrepreneurs, local bosses, and the elite class of private farmers. Because of state support for input supply and the excess of labor in rural areas, stakeholders did not emphasize these factors, with the exception of livestock ownership, to the extent of their counterparts in Kazakhstan and Kyrgyzstan.

Another unique aspect of perceptions of poverty in Uzbekistan is the importance of water in their estimation of what makes people wealthy. In all cases, the rich are identified with those living “near the source,” especially elite private farmers. This is most apparent in Turkmenistan FSK of Nishan District, where villagers participants delineated three zones: one near the source of the water, in which farmers are wealthy, another where there are “islands of trees” where some live well, and another “resembling a desert” (the downstream area) where everyone is poor. The superior ability of the rich to adapt to I&D system degradation is also stressed: “The rich can hook a pipe up to their land” (Pakhtaabad FSK, Nishan District).

5.3 *Ranking The Community’s Problems*

Although participants in the Kazakhstan and Kyrgyzstan field studies did not stress water issues to the same extent as those in Uzbekistan, they clearly linked the degradation of I&D systems with their current predicament when discussing the main causes of

poverty and the problems of the village in general. In the table below, in which responses are roughly grouped, the overwhelming majority of communities studied rate water scarcity, land salinization, or waterlogging of land as the main problem or cause of poverty. Moreover, the types of I&D-related causes of poverty that participants mentioned are those most prevalent in each area (as covered in the foregoing analysis). Stakeholders in Kazakhstan and Kyrgyzstan also gave a prominent place to unemployment and poor access to inputs and machinery, reflecting their greater concern with these issues.

District (Name Of Village Or FSK)	Main Causes Of Poverty Or Main Problems (Ranking Of Cards In Order Of Priority)
Kazakhstan	
Otrar (Shoymanov)	Irrigation water scarcity, poor access to inputs and machinery, drinking water scarcity, unemployment, poor condition of drainage system
Otrar (Otrar)	Irrigation water scarcity, lack of working capital, poor access to inputs and machinery
Syr Darya (Ilyasov)	Non-payment of wages, irrigation water scarcity, unemployment
Syr Darya (Tokmaganbetov)	Irrigation water scarcity, poor access to inputs and machinery, non-payment of wages
Kyrgyzstan	
Talas	Irrigation water scarcity, unemployment, poor access to inputs and machinery
Kara Bora	Irrigation water scarcity, unemployment, poor access to inputs and machinery
Aravan	Incorrect land use, unemployment, lack of plow land, low crop yields
Kadamjan	Unemployment, irrigation water scarcity, poor access to inputs and machinery
Uzbekistan	
Uzbekistan	Waterlogging of land, irrigation water scarcity, drinking water scarcity (Note: farmers ranked salinization of land in first place)
Nishan (Pakhtaabad)	Salinization of land, drinking water scarcity
Nishan (Turkmenistan)	Irrigation water scarcity, drinking water scarcity, (farmers) salinization of land
Ellikkala	Irrigation water scarcity, unemployment, non-payment of wages, salinization of land

5.4 The Role Of Local Authorities In Solving The Community's Problems

Villagers in the sites covered in this study are frustrated by the ineffectiveness and/or lack of concern about their problems on the part of authorities. Even in Ellikkala District of Uzbekistan, where the hakim and other officials are viewed as trying to help the population whenever possible, as well as Nishan District, where the population is taking a “wait and see” approach to the new hakim, the power of even high officials to control rent-seeking by powerful constituents is limited. As noted above, instructions issued by the hakims of both districts to grant priority in allocation of water to disadvantaged categories of land were ignored by FSKs and upstream water users.

The Ellikkala and Nishan examples should be viewed as “best case” scenarios for governance in local level water management. More commonly, hakims are thought of as colluding with other local officials in order to enrich themselves. This was emphasized in Uzbekistan and (concerning the past decade) Nishan District.⁷⁵ Speaking of the directors of the Turkmenistan FSK, a farmer remarked, “[They are] usually appointed by the hakim of the district, and therefore, they normally don’t solve our problems. Their thoughts are occupied with how to stuff their pockets.” Moreover, FSK directors are commonly replaced—the Turkmenistan FSK has seen 8 directors in the last decade—resulting in directors that are “not competent and incapable of managing people.”

Despite the frustration of the farmers in Uzbekistan with the inaction of officials, many “hope that the [upper echelon] authorities will pay attention to the situation that is developing, which will improve conditions” (Uzbekistan District). In keeping with the legacy of Minvodkhoz, water users hope that the state or a donor organization will step in and provide funding for repair and construction. Ninety percent of respondents to a recent household survey in the Karshi Steppe claimed that the Government should be responsible for investing into I&D repair, as well as maintenance, although relatively few (7%) believed that the state should make all of the improvements.⁷⁶ This is especially the case in locales where farmers perceive that dormant or uninitiated projects have a negative impact on irrigation and drainage.

Stakeholders in Kazakhstan and especially Kyrgyzstan appear to have abandoned any hope for a state-led solution to their difficulties. Indeed, in the latter case villagers assert that local officials are part of the problem instead of the solution. Villagers in Kara Bora District remarked, “The state bosses and respected deputies, beginning from the local to the republican [Supreme] council are not interested in how we live, that is, the people make it through on their own and the state bosses exist on their own.”

⁷⁵ The new hakim of Nishan replaced a man who is presently under criminal investigation for “cooking the books” when reporting fulfillment of various tasks required for cotton cultivation, i.e. falsifying *svodki*.

⁷⁶ World Bank, *Karshi Pumping Cascade Rehabilitation Project: A Social Assessment* (Draft, 2001), pp. 8.5-8.6.

6 CONCLUSION

The foregoing study is but a preliminary attempt to explore the degradation of I&D systems and its effect on communities, covering only 12 sites within three republics. Thus, the conclusions that follow must be accepted as heuristic. Nevertheless, some preliminary conclusions can be reached, based upon the fieldwork conducted to date and other data available about the areas in question.

Most villagers in the areas studied believe that the degradation of I&D systems is a pressing problem, yet in areas where the restructuring of farms has been largely cosmetic, farmers do not view themselves as part of the solution. In exercises to determine the villagers' perspectives concerning poverty, problems associated with irrigation and drainage held a prominent place in almost all fieldwork sites, especially Uzbekistan. Stakeholders in Uzbekistan frequently expressed a desire for the Government to step in and rectify matters for them, as it did before the demise of the Soviet Union. Villagers in the fieldwork sites in Kazakhstan and Kyrgyzstan have no such expectations, due to their disillusionment with the lack of state support and the frequently venal behavior of local officials during the course of farm restructuring and other reforms.

The I&D systems studied in Kazakhstan and Kyrgyzstan are in worse condition than those in Uzbekistan. This discrepancy is due to the more severe drop-off in state budgeting for O&M, as well as the fact that reforms to date have done little to improve local capacity to manage and maintain canals and drainage. Privatization was pursued in a halting and non-transparent manner, which, together with dislocations in input supply and distortions in output markets, reduced the agricultural incomes needed to maintain I&D systems. Moreover, the capacity of local institutions in irrigation management has declined substantially, and they are ill-suited to the newly privatized farms in many areas. Water User Associations are nascent.

By contrast, I&D systems in Uzbekistan, especially those maintained by district irrigation departments, appear to be in less degraded condition than in Kazakhstan and Kyrgyzstan, in part owing to higher, albeit significantly reduced, levels of funding of O&M than in the other republics. However, the command system of irrigation management, largely owing to its failure to include water users in the decision-making process, was unable to manage O&M effectively in the Soviet period, and in Uzbekistan it is presently even more overextended than before 1991. Moreover, the continued emphasis on planned agricultural production, for which the present system of irrigation management was designed, greatly limits the amount of income that shirkat and private farms have at their disposal to spend on O&M. Beneath the decaying veneer of the planned system is a great deal of skullduggery in water allocation and delivery, which substantially heightens tension and occasionally provokes conflict within and (less commonly) between communities. Moreover, the increasing contingent of private and dehqan farmers, most of whom are slighted in water allocation, will require a reconfiguration of existing institutions to match their needs.

Although the underlying causes of institutional failure vary among the republics, the rural elite is often able to manipulate and/or circumvent both old and new institutions to their own advantage, to the detriment of the common good. This is a legacy of the Soviet style of governance in rural areas. Decision-making was concentrated in the hands of local Party officials and farm administrators (many of which were also Party members with a political role to play), and initiative on the part of the population was reduced to either appealing to officials or beating the system “on the sly” (especially in cotton growing areas, where pressure to “meet the plan” was the greatest). Since 1991 this type of rent-seeking has become more prevalent in irrigation management and agriculture, as rule of law remains elusive and incomes have fallen drastically, making communities less cohesive and water managers more susceptible to influence peddling and/or bribery.

Throughout Central Asia, existing institutions need to be reformed in order to achieve effective management of I&D systems. In Kazakhstan and Kyrgyzstan, WUAs have been adopted as the institution that will eventually become prevalent within districts, while Uzbekistan appears to be leaning in this direction. The experience of ongoing efforts to establish WUAs in Central Asia, as well as consultations with water users about the possibility of forming WUAs (for the RESP and other projects), point to several conditions that must be met for these organizations to succeed. To facilitate stakeholder participation in decision-making, water users must be made aware of the rules, regulations, and procedures of the WUA and allowed to participate fully in open and fair elections of its staff. Local authorities (especially district governors and FSK administrations) must nurture, rather than interfere with WUA activities. Otherwise, water users, especially non-elite family farms outside the FSK system, will be incapable of taking the initiative in O&M.

Yet where WUAs have been established to date, all too often their rules and procedures are not well understood by their members, and the rural elite all too easily subverts and/or circumvents the WUA staff. Existing WUAs have little ability to curb illegal water withdrawals, especially by upstream and/or powerful members of the community. Since the success of WUAs will require a substantial improvement in governance in the Central Asian countryside, WUA projects must focus on issues of transparency and accountability. Improving governance in Central Asia will require several years (or even decades), meaning that WUA projects must focus on long term rather than short term goals. Informal aspects of water user cooperation, such as *hashar* in maintenance and *avandaz* in the delivery of water to fields, should be studied in greater detail in order to take advantage of any possible synergy with a proposed WUA in a given area.

WUAs in fieldwork sites in Kazakhstan and Kyrgyzstan have been only recently created and lack significant management components. Few WUA irrigators have been trained to deal with multiple, smaller farms (rather than FSKs and/or brigades in them) and have little capacity in accounting and internal management. The capacity of WUA personnel to fulfill their responsibilities could be increased through support units

of local irrigation departments (as envisioned in the World Bank's Kyrgyzstan On-Farm Irrigation Rehabilitation Project). Yet before such support units can become effective, district irrigation departments should adopt a service-oriented approach towards WUAs and non-FSK farms, which implies further restructuring and training.

Although cost recovery from WUA projects is desirable, it will be difficult, if not impossible, to achieve in the short term, owing to the great disparity between the task at hand and the local resources available to accomplish it. As noted above, I&D systems were in generally poor shape before the fall of the USSR, and the backlog of maintenance and repair of them has increased exponentially in the last decade. Farmers (and even district irrigation departments) do not possess adequate resources to perform annual maintenance duties, much less invest in repair. Therefore, cost recovery components should be designed cautiously. As noted in the Project Appraisal Document of the Kyrgyzstan On-Farm Irrigation Rehabilitation Project,

“Unrealistic [expectations of water user] contributions to the repayment of capital investments could result in minimum borrowing [of credits made available] under the project, which could lead to the continuing deterioration of on-farm systems.”⁷⁷

Of greater concern for cost recovery and efficient water use is the need to expand rural incomes and tighten the linkage between duties and benefits in irrigated agriculture, for which water is the most significant input in Central Asia. First and foremost, this entails a wide range of restructuring measures in all spheres of agriculture, several of which are presently being implemented with vary degrees of success. While it is encouraging that land legislation is gradually being liberalized and farm restructuring is taking place, especially in Kazakhstan and Kyrgyzstan, the inequitable allocation of land and farm assets emphasized by the farmers consulted requires that transparency and accountability be introduced into the process. Input and credit markets in Uzbekistan should be taken out of the hands of the state agencies, which provide a poor service and deliver low quality products, largely owing to their near-monopoly position within the system of supply for planned production.⁷⁸ Supply cooperatives and micro-credit projects in all areas of Central Asia would help support qualified farmers that lack basic inputs needed for crop production. Output markets in Uzbekistan must be liberalized, which would significantly increase farmgate prices for crops and thus raise incomes. In all areas of the region, informal constraints to the sale of agricultural (and other) products from villages, such as extortion on roads and in bazaars and manipulation markets of local markets by officials, must be combated.

Raising rural incomes entails not only the restructuring of agriculture, but also making more opportunities available for employment in other spheres of production. In areas where the desert or steppe has already reclaimed substantial areas

⁷⁷⁷ World Bank, *Kyrgyz Republic On-Farm Irrigation Rehabilitation Project: Project Appraisal Document*, p. 16.

⁷⁸ World Bank, *Agriculture in Uzbekistan: Private, Dehqan, and Shirkat Farms in the Pilot Districts of the Rural Enterprise Support Project (Draft)*, Chapter 5.

of I&D systems, this may be more economical than the repair of their more decrepit portions, which at present essentially amounts to constructing new networks—the desert and steppe of Central Asia reclaim their own rapidly. There is ample room for the development of agro-processing, which has been a significant weak point of rural development in the region ever since collectivization in the 1930s. Artisan crafts, such as carpet weaving and sewing and knitting, as well as repair shops, are among those endeavors recommended in a study for the Uzbekistan Water Supply, Sanitation and Health Project (to be implemented in Karakalpakstan and Khorezm Province). Furthermore, informal self-help networks in many areas of Central Asia, such as those covered in the project, “represent an important precondition to set up feasible group-credit mechanisms” for the development of processing and artisan activities, many of which could increase value-added in agriculture.⁷⁹

Because local resources to pay for investments are limited, the cost of donor-sponsored I&D projects should be as low as possible. Where appropriate, simple technology should be employed, and projects should intensively employ the labor that villagers are willing to invest (instead of money), both individually and in groups, into maintenance and repair of canals and (to a lesser extent) drains. Such projects can also provide additional employment for the unemployed poor in the countryside. When locally or Russian-manufactured irrigation equipment such as stream gauges or pumps is of adequate quality, it should be used, because of its relatively low cost, the familiarity of irrigation personnel with its operation and repair, and the potential to enhance local manufacturing capabilities such as machine-building, which are at present highly underdeveloped.

Among the components of I&D systems, drainage appears to have the most far-ranging economic and social impacts. Land salinization and waterlogging reduce crop yields, increase water withdrawals, and result in valuable irrigated land being taken out of commission. Moreover, the effects of poor drainage harm drinking water, housing, and health (of humans and livestock). Water metering devices also deserve especial attention, because of the impossibility of tracking water allocations to farms accurately without them.

Given the linkage between irrigation and drinking water in Central Asia, projects in both spheres should be coordinated in order to maximize the health benefit of investments within a given area. For example, an increased quantity of fresh water from a canal system, owing to rehabilitation and/or improved allocation of water, is likely to improve health, if hygiene is stressed (as presently envisioned in World Bank

⁷⁹ World Bank, *Uzbekistan Water Supply, Sanitation, and Health Project: Social and Economic Feasibility of Rural Credit Pilot Component (RCPC)*, July 1996, pp. 5, 29-38

Although some farmers have already begun to emphasize livestock over crop production, there is limited pasture and fodder available (and much of the latter is grown on irrigated land). Trade is another alternative to crop production, yet it is constrained in rural areas by weak demand and the fact that few in the villages have the resources or connections needed to conduct transactions involving a substantial volume of goods.

rural water supply and sanitation projects for Central Asia).⁸⁰ Similarly, rehabilitating drainage in some areas will reduce infiltration of saline groundwater into drinking water sources and systems.

⁸⁰ These projects are reviewed in World Bank, *Sanitation, Health, and Hygiene in World Bank Rural Water Supply Projects* (Washington, DC: World Bank, 2000).