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EXPLORATORY ASSESSMENT OF FACTORS THAT INFLUENCE QUALITY OF LOCAL IRRIGATION WATER GOVERNANCE IN UZBEKISTAN

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List of abbreviations

AIS	Administrative Irrigation System
BAIS	Basin Administration of Irrigation System
GoU	Government of Uzbekistan
IMT	Irrigation Management Transfer
ISF	Irrigation Service Fee
IWMI	International Water Management Institute
MAWR	Ministry of Agriculture and Water Resources
O&M	Operation and Maintenance
VAC	Village Assembly of Citizens
WCA	Water Consumer Association
WUA	Water User Association

Glossary

<i>dehkan farm</i>	small-scale household farm, usually up to 1 ha; the farm might be registered or not registered as a legal entity (Uzbek)
<i>hashars</i>	work parties (Uzbek)—community work activities done on voluntary basis
<i>Hokimiyat</i>	territorial public and administrative authority (Uzbek)
<i>Hokim</i>	the head of a <i>Hokimiyat</i> (Uzbek)
<i>kolkhoz</i>	collective farm enterprise (Russian composite word)
<i>mahalla</i>	informal self-governance body, neighborhood community (Uzbek)
<i>main crops</i>	state-mandated crops subject to state procurement quotas, usually wheat and cotton
<i>mirob</i>	person responsible for distributing irrigation water (Uzbek)
<i>oblast</i>	region (Russian)
<i>private farm</i>	large commercial entities that lease land of 50 ha or more from the state
<i>secondary crops</i>	crops that farmers grow on the land that is free from main crops, or the land where they grow wheat (second harvest); not subject to state procurement quotas
<i>shirkat</i>	collective/cooperative farm in post-Soviet Uzbekistan (Uzbek)
<i>tomorka</i>	household plots (Uzbek)
<i>Vodhoz (RDAWR)</i>	Regional Department of Agriculture and Water Resources (Vodhoz—used informally; Russian composite word—Water Management)
<i>Uzbekistani Soum</i>	currency of Uzbekistan, US\$1 = Soum 2,280 (state exchange rate for May 14, 2014)

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Executive summary

- 1. Agriculture in Uzbekistan is almost entirely dependent on irrigation. However, despite reforms to institutional arrangements, much of Uzbekistan's irrigation is reportedly caught in a vicious cycle of inadequate operation and maintenance,** low cost recovery, and agricultural productivity that is often moderate or low; in addition, many farmers earn low incomes (World Bank, 2013). Few incentives exist to save water because farmers do not see the direct cost of water provision. This study was undertaken with the aim of contributing to better irrigation water management in Central Asia, beginning in Uzbekistan. It identifies factors and conditions that positively affect the performance of local irrigation water management institutions.
- 2. The analytical framework for this assessment is formed by the eight design principles for the management of common-pool resources developed by Ostrom (1990).** These design principles are in essence factors that are associated with successful collective action in governing common-pool resources such as irrigation water, forests, and fishing areas. By determining why these principles are met in some cases and not in others, and what factors are behind this variation, we can identify measures that promote these factors/conditions in irrigation schemes.
- 3. The assessment utilized a case study approach that emphasizes detailed contextual analysis of a limited number of cases or situations.** Information was gathered about a range of factors, including the establishment and operational role of Water Consumer Associations (WCAs); strengths and weaknesses of the existing governance arrangements around water management; and accountability and information flows, among others. No technical measurements were taken.
- 4. Uzbekistan's agricultural and irrigation sector is characterized by strong state domination and geared toward meeting state quotas of cotton and wheat.** Each year, the WCA submits an application to the Administrative Irrigation System (AIS) that is based on the approved crop production plans and corresponding water amount and scheduling needs of each of its members. Farmers and WCA representatives that were interviewed for this study claimed that, typically, farmers only receive about 75 percent to 95 percent of the amount of water scheduled for delivery.
- 5. Farmers were asked what they think defines a good WCA and good local water management and governance. The following aspects were mentioned most often:**
 - The irrigation and drainage systems are adequately planned and maintained; paperwork is taken care of; and good relations are upheld with the AIS and the Basin Administrative Irrigation System (BAIS), which saves farmers time.
 - Conflicts and disputes are solved among WCA members so there is no need to involve other government bodies.
 - Farmers feel they are involved in the decision-making process, and build trust among themselves.
- 6. The WCA head's qualification appears to be associated with WCA performance.** Good directors were said to be able to engage farmers in WCA activities and build trust among members and government officials. External factors that are associated with the quality of local water management—in the sense that irrigation water is fairly and predictably distributed in the eyes of stakeholders—include (i) the proportion of the total irrigated area that depends on electrical pumps and the reliability of the electricity supply; and (ii) the suitability of the growing conditions (such as soil quality) for the crops the WCA farmers have been assigned to grow by the state.
- 7. Findings suggest that boundaries between legitimate and illegitimate consumers of canal irrigation water are not always clearly defined.** In most case study sites, *dehkans* and *tomorka* owners (also referred to as smallholders) depend on water in the WCA-managed canals to irrigate their crops. This makes them de facto users of the “common-pool” irrigation canal water. However, WCA officials claimed that since *tomorka* owners and most *dehkans* are not registered as legal

entities, they cannot officially join a WCA. Interviews revealed that legitimate irrigation needs of *dehkans* and *tomorka* owners are not always adequately taken into account by the WCA and AIS when water supply schedules are prepared, making them de facto illegitimate users.¹

8. **A number of WCAs—those that perform perhaps somewhat better than others—have explicitly recognized smallholders as legitimate users** by including their irrigation requirements in water delivery schedules, and sometimes even hiring a mirob to take care of their irrigation needs. Where this has happened, it has helped alleviate tensions between farmers and smallholders and prevented unpredictable water supply shortages.
9. **User payments for irrigation water are generally not linked to the actual amount of water used.** We find that in all of the WCAs we studied, irrigation fees are lowest for the crop that uses the most irrigation water—cotton, the main state-mandated crop. However, there are substantial differences in cotton irrigation fees across WCAs. They tend to be the lowest in the poorly performing WCAs, where farmers have low levels of satisfaction with irrigation services. Net returns to the volume of water used are 2–3 times lower for cotton than for wheat and other crops. In addition, the returns to the amount paid for obtaining the water are five times lower when cotton yields are low.
10. **The best-performing WCAs tend to be those that have been able to make water available to cultivate profitable secondary crops.** They also tend to be the ones that charge the highest irrigation fees for these secondary crops. Both of these actions make it possible for farmers and WCAs to generate sufficient resources to maintain and repair the irrigation system. Farmers in well-functioning WCAs already pay higher fees than farmers in poorly functioning ones, and the former are already active in maintaining and repairing the irrigation system.
11. **The findings suggest that farmers who grow secondary crops use water more cautiously and look for options to save water or irrigate their fields more efficiently.** The relatively low profitability of the state-mandated crops² undermines farmers' ability to sufficiently contribute to adequate maintenance of the local irrigation and drainage systems. Partly to avoid paying labor taxes that the WCA incurs for hiring employees, farmers claimed they also spend money directly on maintaining canals and repairing parts of the irrigation system that serves their area, without going through the WCA.
12. **Irrigation is traditionally a male responsibility, but the gender division of labor has changed due to the outmigration of Uzbek men.** This particularly affects *dehkans* and *tomorka* owners.
13. **The findings suggest that even though farmers sign water delivery contracts with the WCA, and the WCA is in principle accountable to water consumers, the AIS plays an important role in monitoring overall water use, even if it is not accountable to WCAs or water consumers.** The WCA is not in a position to enforce the contractual arrangement it has with the AIS, partly because the WCA does not pay for the irrigation water it receives from the AIS.
14. **The AIS's lack of accountability to WCAs appears to be an important reason why some WCAs are not keen on raising irrigation service fees.** This would suggest that the AIS's limited accountability prevents WCAs from mobilizing the resources needed to recover costs and pay for canal operation, maintenance, and repairs.
15. **Farmers stated they supported the interference of the AIS when the WCA is weak, as it will help them meet the state production quota.** WCAs are not allowed to fail, and the state will interfere if they collapse. However, in the medium term, this makes the WCA and its members dependent on the government, which undermines a number of design principles for the community management of common-pool resources and removes incentives to innovate and adopt more effective arrangements.

1. According to the Water Law, *Dehkans* and *Tomorka* owners can become members of a WCA. However many don't due to lack of awareness or for logistical reasons.

2. This study only looked at the farmers' perspective and did not assess the profitability of state-mandated crops for the state.

16. **WCAs are not allowed to sanction farmers or other water consumers that violate the irrigation schedule or excessively use water, such as through fines.** If there are any disputes among farmers over irrigation water, they are solved through discussion meetings or settled personally by the WCA head. This works particularly well when the WCA head enjoys the respect of the local community.
17. **There are number of informal practices that promote effective monitoring and improve the accountability of the AIS and the WCA.** Some WCAs—especially the better-performing ones—have found mechanisms to monitor water use and water users, and hold the WCA accountable through a committee of respected farmers. Other WCAs hold daily meetings with members of the WCA during the irrigation season. In some of the case study areas, the AIS meets with WCA directors on a regular basis (once every ten days), possibly ensuring some informal way to prevent disputes over water delivery. As mentioned by respondents, installing meters and controlling devices to track water use would go a long way toward improving monitoring and accountability for irrigation water.
18. **In each case study site, the WCA administration reports to a General Assembly that consists of farmers and WCA staff, but the General Assembly is also attended by officials of the AIS, BAIS, Vodhoz, the Village Assembly of Citizens (VAC), and by Hokimiyat and mahalla leaders.** In addition to the General Assembly, all WCAs have a supervisory board that consists of farmer and community representatives that oversee the WCA director. The WCAs appear to benefit from the hands-on monitoring and day-to-day problem solving these board members provide. This is particularly so in the high-performing WCAs.
19. **In the well-performing WCAs, farmers and staff claimed they were driven by a “shared vision,” and sometimes the most experienced and resourceful farmers help others with advice, machinery, and even small loans.** However, the overall state agricultural policy of giving priority to state-mandated crops (wheat and cotton) causes these crops to use most of the irrigation water, which reduces opportunities for farmers to innovate and allocate water to more lucrative crops.
20. **In many WCAs, farmers and smallholders make their own maintenance arrangements off the books of the WCA,** mainly to avoid paying labor tax. This is particularly common for farmers who have their own machines. While this flexibility certainly has advantages in the short term, over time this could undermine the role and viability of the WCA in its current form.
21. **The findings from this study can be used to design a diagnostic tool** for assessing whether the design principles for the sustainable management of common-pool irrigation water are being met. The tool consists of a set of questions that need to be answered in the field. In addition to drafting the diagnostic tool, this study makes a number of recommendations to improve the local management of irrigation water in Uzbekistan. These include:
- Adopt a new Water Law/Water Code and take legal measures that provide for a better financing aspects of WCA operations. These legal changes should better provide for the WCAs’ financial and operational sustainability and provide a stronger accountability mechanism for their governance structure. The water code should also provide a legal basis for a more contractual relationship between the AIS and the WCA, with clear monitorable agreements on water delivery. The new Water Code should provide a strong legal basis for the supervisory board of farmer and community representatives to oversee the WCA director.
 - Involve *dehkans* (especially women) more structurally in decision making pertaining to water allocation scheduling, and arrange for canal water intakes for them.
 - Make it clearer in the law that WCAs can sanction water consumers that break rules.
 - Improve the provision of support services to the WCAs and promote learning across them, using successful WCAs as schools and training sites.
 - Lower the labor tax for WCAs so they can generate more resources for operation and maintenance (O&M).

- Bring the water allocation policy in line with the land-use liberalization policy.
- Better track the performance of the irrigation system, including through sample surveys, using some of the questions from the diagnostic tool presented in this report.
- Install water meters at the level of the WCA canal intake to support water delivery agreements of the AIS to the WCA.
- Upgrade outdated irrigation pumps.

Overview

- I. **Irrigation Management Transfer (IMT) has been adopted worldwide to increase cost recovery and make more efficient use of scarce water resources.** It aims to make water users more responsible and active in the operation and maintenance (O&M) of local-level irrigation infrastructure. A review of the global IMT experience conducted by the Food and Agriculture Organization (FAO) and the International Water Management Institute (IWMI) revealed that constraints to further improving the performance of the irrigation system under IMT include: (i) a lack of political support; (ii) reluctance to change existing water laws; and (iii) the lack of managerial skills within Water User Associations (WUAs), leading to poor provision of water services (FAO and IWMI, 2007).
- II. **Uzbekistan is facing increasing challenges to satisfy future demand for irrigation water.** Agriculture in the country is almost entirely dependent on irrigation. Climate change is expected to amplify seasonal and annual variation, and forecasts suggest that most of the country will experience severe water shortages in the future. The main water resource problem, however, seems to be inefficient water management rather than water shortage per se. Despite reforms to institutional arrangements, much of Uzbekistan's irrigation appears to be caught in a vicious cycle of inadequate operation and maintenance, low cost recovery, low agricultural productivity, and low incomes for many farmers (World Bank, 2013). Few incentives exist to save water because farmers do not see the direct cost of water provision. The irrigation fees they pay function like a land tax, as these are not tied to actual use of water (World Bank, 2013). Available evidence suggests that the quality of local irrigation water management and governance varies across the country, yet it is not known why it works better in some areas than others.
- III. **This study was undertaken with the aim of contributing to better irrigation water management in Central Asia, beginning in Uzbekistan. It identifies factors and conditions that positively affect the performance of local irrigation water–management institutions.** The study also prepared an associated diagnostic tool that will help design measures and program interventions to strengthen these institutions in ongoing or future irrigation operations. Lastly, the work intends to contribute to an exchange of good practices and knowledge sharing among relevant stakeholders across the Central Asia region.
- IV. **The analytical framework for this assessment is formed by the eight design principles for the management of common-pool resources developed by Ostrom (1990) and modified by Cox, Arnold, and Tomás (2010).** These design principles are in essence factors that are associated with successful collective action in governing common-pool resources such as irrigation water, forests, and fishing areas. Their primary role is to explain under what conditions trust and reciprocity can be built, and how it can be maintained to sustain collective action in the face of the social dilemmas posed by common-pool resources. This collective action, in turn, helps prevent the deterioration of a managed common-pool resource. The eight principles are:
 1. **A. User boundaries:** Clear boundaries between legitimate and illegitimate users must be defined.
B. Resource boundaries: Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.
 2. **A. Congruence with local conditions:** Appropriation and provision rules are congruent with local social and environmental conditions.
B. Appropriation and provision: The benefits obtained by users from a common-pool resource, as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.
 3. **Collective-choice arrangements:** Most individuals affected by the operational rules can participate in modifying them.
 4. **A. Monitoring users:** Monitors who are accountable to the users track their appropriation and provision levels.
B. Monitoring the resource: Monitors who are accountable to the users observe the condition of the resource.

5. **Graduated sanctions:** Appropriators who violate operational rules are likely to be assessed using graduated sanctions (depending on the seriousness and the context of the offense) by other appropriators, officials accountable to the appropriators, or both.
6. **Conflict-resolution mechanisms:** Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7. **Minimal recognition of rights to organize:** The right of appropriators to devise their own institutions is not challenged by external governmental authorities.
8. **Nested enterprises:** Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Using the eight design principles as a guiding framework for our assessment, we assess the extent to which these are met in a range of different sites in the country and how they relate to performance. Then, by determining why these principles are met in some cases and not in others, and what factors are behind this variation, we can identify measures that promote these factors/conditions in irrigation schemes.

- V. **The study utilized a case study approach that emphasizes detailed contextual analysis of a limited number of cases or situations.** It is based on the premise that truth is relative and depends on one's perspective. One of the advantages of this approach is the close collaboration between researcher and participant, and the way in which it enables participants to tell their stories. Through these stories, participants are able to describe their views of reality, which enables the researcher to better understand the participants' actions. Case study research can be seen as an empirical inquiry that investigates a contemporary phenomenon when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used.
- VI. **Water Consumer Associations (WCAs), together with the irrigation authorities in the area in which they operate, form the unit of analysis for this study. Ten case study WCAs were selected to represent a wide range of circumstances thought to influence their performance.** A local research firm carried out the fieldwork and gathered data from a total of 145 people. Data were collected in two phases: from May to June 2014 and from December 2014 to February 2015. Information was gathered on a range of factors, including the establishment and operational role of WCAs; strengths and weaknesses of existing governance arrangements around water management; and accountability and information flows, among others. No technical measurements were taken, and all collected data are from existing WCA records or reflect the opinions, views, and experiences of the study respondents. Lack of access to official data on WCAs presented a challenge to putting together a comprehensive sampling frame and might have introduced bias in identifying WCAs for the case study. Uzbekistan served as the pilot country for developing and implementing the research approach. A number of valuable lessons were learned, which are presented in Appendix 3.

Background on the case study sites

- VII. **Uzbekistan's agricultural and irrigation sector is characterized by strong state domination and geared toward meeting state quotas of cotton and wheat.** The *Hokimiyat* (local government) assigns land plots to private farmers—who often cultivate 50 ha or more—and grants them the right to cultivate these. Every year farmers must submit a detailed crop production plan for approval, and representatives of government organizations often visit farmers' plots to verify adherence to the plan. Most private farmers are instructed to grow cotton and wheat, the state-mandated crops.³ Each farmer is assigned an annual quota for these crops. The *Hokimiyat* may terminate the land lease if the cotton or wheat quota is not met for three consecutive years, in which case they auction it off to another farmer. Other land users are *dehkans*, who are smallholders and typically have 0.3–1 ha, and *tomorka* owners, who have small kitchen gardens (less than 0.3 ha). They are free to grow crops of their choice. The Basin Administrative Irrigation System (BAIS) and the Administrative Irrigation System (AIS) coordinate operation, maintenance, and repairs of the primary and secondary canals. All local government organizations report to the *Hokim*, the powerful head of the local government.

3. It should be noted that in recent years the government has reduced the area on which farmers are instructed to grow cotton and the area under horticulture is expanding.

- VIII. All farmers in the case study sites belong to a WCA, which is regarded by many as a body that mediates between the AIS and farmers.** Each year, the WCA submits an application to the AIS that is based on the approved crop production plans and the corresponding water amount and scheduling needs of each of its members. The Village Assembly of Citizens (VAC) is an official body that covers several *mahallas* (villages). If *dehkans* or *tomorka* owners have any complaints regarding the irrigated water supply, they are expected to direct these to the leader of their *mahalla* or the head of the VAC. Nearly all farmers interviewed said they welcomed the creation of WUAs in response to the chaotic water management situation that began when the *shirkats* were dismantled.
- IX. Farmers and WCA representatives that were interviewed claimed that typically, farmers only receive about 75 percent to 95 percent of the water that is scheduled for delivery.** Primary reasons why farmers receive less water than they were originally allocated include: (i) droughts in upstream areas that lower water levels in the main canal; (ii) the AIS supplying less water than what was agreed, even when water seems to be sufficiently available; (iii) an alleged “excessive” use of water by *dehkans* and *tomorka* owners; and (iv) electricity outages that interrupt irrigation pump activity.
- X. As mentioned, and as can be expected from the selection process, the WCAs varied in size, water availability in the secondary canal, dependence on pumps, crop diversification, and so on.** The WCA director’s qualifications, as well as the number of full- and part-time staff members, varied widely across the case study WCAs. The number of WCA staff members ranged between 3 and 15, and the number of WCA staff per farmer between 2.1 and 9, suggesting large differences in staffing efficiency. The number of female farmers in the case study WCAs varied from 0 percent to 19 percent. Study respondents pointed out that female farmers tend to be more active and outspoken, and in general manage their farms better than male farmers.
- XI. Farmers were asked what they think defines a good WCA and good local water management and governance. The following qualities were mentioned most often:**
- The irrigation and drainage systems are adequately planned, operated, and maintained; paperwork is taken care of; and good relations are upheld with AIS and BAIS, which saves farmers time.
 - Conflicts and disputes are solved among WCA members so there is no need to involve other government bodies.
 - Farmers receive assistance to not only get water on time, but also to find machines, seeds, fuel, or other inputs.
 - Farmers feel they are involved in the decision-making process, and build trust among themselves.
 - The WCA is led by a capable person whom the community respects.
 - Members of the WCA treat the irrigation system as a common good for which everyone is responsible. Farmers work together with the WCA to meet quotas and increase profits.
 - The WCA has a financial buffer (in the form of an emergency fund) for emergency breakdowns in the irrigation system. This helps quickly repair breakdowns without being dependent on government organizations.
- XII. Farmers in the case study WCAs in Pap District, Namangan, and Dustlik District, Jizzakh, in particular, were unhappy with how their WCA functions.** Overall water availability (for main and secondary crops) in these areas is low, and few fees are paid on time. However, in other WCAs where water availability is low, farmer satisfaction is much higher (such as *Kuwa urta buz anori* WCA in Fergana Oblast), which suggests that other factors are at play. In addition, water scarcity can be an incentive for successful collective action.
- XIII. The qualification of the WCA head appears to be associated with WCA performance.** For example, the case study WCAs in Akhangaran, Tashkent Oblast, Denov, Surkhandarya Oblast, and *Kuwa urta buz anori* WCA in Kuwa, Fergana Oblast, have directors that have completed higher education and have extensive work experience in agriculture. These WCAs perform relatively well. Good directors were said to be able to engage farmers in WCA activities and build trust among members and with

government officials. They are also better equipped to hire educated and skilled staff members and find it easier to introduce innovations. Most of the well-managed WCAs appear able to attract qualified staff, while more poorly managed WCAs struggle in this regard. Attracting qualified staff is a larger problem for the WCAs in our sample that do not perform so well. They have trouble collecting irrigation fees, are indebted, and cannot pay salaries on time. They are also unable to offer the kind of working conditions that would attract qualified staff, which worsens the WCA's performance and thus perpetuates the vicious cycle.

- XIV. External factors that are associated with the quality of local water management**—in the sense that irrigation water is fairly and predictably distributed in the eyes of stakeholders—include:
- the proportion of the total irrigated area that depends on electrical pumps and the reliability of the electricity supply;
 - the suitability of the growing conditions (such as soil quality) for the crops the WCA farmers have been assigned to grow by the state; and
 - the WCA director's leadership skills.
- XV. Overall water availability (that is, the amount available to the WCA)** appears to have an ambiguous influence on the quality of water management and on farmer satisfaction.

Design principle 1: Well-defined boundaries

- XVI. Findings suggest that boundaries between legitimate users and illegitimate users of canal irrigation water are not always clearly defined.** In most case study sites, *dehkans* and *tomorka* owners depend on water in the WCA-managed canals to irrigate their crops. This makes them de facto users of the "common-pool" irrigation canal water. However, WCA officials claimed that since *tomorka* owners and most *dehkans* are not registered as legal entities, they cannot officially join a WCA.⁴ Interviews revealed that legitimate irrigation needs of *dehkans* and *tomorka* owners are not always adequately taken into account by the WCA and AIS when water supply schedules are prepared, making them de facto illegitimate users. Where this is the case, *dehkans* and *tomorka* owners erratically and unpredictably withdraw from irrigation canals, which undermines the proper management of irrigation canal water as a common-pool resource. Much also depends on where the *dehkans* and *tomorka* owners' fields are located vis-à-vis the main interfarm canal. Separate canal intakes for *dehkans* and *tomorka* owners exist in only two of the high-performing case study WCAs (those in Akhangaran, Tashkent Oblast, and Denov, Surkhandarya).
- XVII. In some cases the WCA water supply schedule takes into account the needs of *dehkans* and *tomorka* owners, or at least the VAC is consulted.** However, the VAC's involvement in making decisions regarding the distribution of canal water for irrigation varies across the case study WCAs. In the poorly performing case study WCA in Dustlik District, Jizzakh Oblast, for example, respondents suggested that even if the VAC head represents *dehkans* and *tomorka* owners in the WCA and collects irrigation fees from them, in reality there is no official contact between the VAC and the WCA. In contrast, in the high-performing WCA in Kyzyltep District, Navoi, the head of the VAC is a member of the WCA supervisory board, which helps ensure that the needs of *dehkans* and *tomorka* owners are met.
- XVIII. A number of WCAs— those that perform perhaps somewhat better than others—have explicitly recognized smallholders as legitimate water consumers** by including their irrigation requirements in water delivery schedules, and sometimes even hiring a mirob to take care of their irrigation needs. Where this has happened, it has helped alleviate tensions between farmers and smallholders and prevented unpredictable water supply shortages. In WCAs where there is a lack of clarity on this issue, however, the opposite happens. Clearly, including smallholder water needs in the WCA's day-to-day operations appears to be an important factor that determines the quality of local water management arrangements.

4. In fact, according to the Water Law, *Dehkans* and *Tomorka* owners can become members of a WCA. However many don't due to lack of awareness or for logistical reasons.

- XIX. A number of factors influence the extent to which legitimate users and illegitimate users are clearly defined, and thus whether the needs of *dehkans* and *tomorka* owners are included in the local management arrangements of irrigation water.** These include the following:
- **Separate canal intakes for the irrigation needs of *dehkans* and *tomorka* owners.** If there are special canal water intake structures for these smallholders' irrigation needs, chances are that their legitimate needs are met in a more reliable and predictable manner.
 - **WCA contracts for supplying water to *dehkans* and *tomorka* owners.** Concrete and well-developed water supply contracts between the WCA and the VAC that specify how the legitimate irrigation needs of these smallholders will be met are also an important factor in this regard.
 - **Distance between the VAC office and the WCA office.** We find that if the office of the VAC—which in principle represents *dehkans* and *tomorka* owners—is located far (say, 20 km or more) from the WCA office, it hampers effective communication between these two organizations. This makes it difficult to ensure that the irrigation needs of these smallholders are consistently met and that they pay their irrigation fees.
 - **Distance between the fields of *dehkans* and *tomorka* owners and the main interfarm canal.** If their fields are close to the main WCA interfarm canal, their unregulated water intake may interrupt the main irrigation supply schedule to farmers. If their fields are further away from the canal, they will depend on farmers' willingness and preparedness to let water pass onto their fields. This factor of distance works in both ways, and could either support or undermine legitimate use of irrigation water.
 - **Overall water scarcity.** If overall availability in the WCA area is low, there are stronger incentives to carefully plan water distribution and make sure every user's needs are incorporated into irrigation plans. However, whether this is the case also depends on production conditions and whether growers have the freedom to grow the crop that is most suitable for the area and most profitable.
 - **Mirobs for *dehkans* and *tomorka* owners.** If there are *mirobs* to specifically take care of the irrigation needs of *dehkans* and *tomorka* owners, it is more likely that their needs will be met.
 - **Active and effective VAC leaders and WCA directors.** All water consumers benefit when local leaders communicate effectively; when they adequately build trust between WCA members and also smallholders; and when they are active in decision making or supervisory bodies (such as the WCA board).

Design principle 2: Congruence between the benefits and costs of using irrigation water

- XX. The second design principle for the sustainable management of irrigation water as a common-pool resource is that the benefits of using the resource must be proportional to the inputs used or effort made to obtain it.** These inputs can be in the form of labor, materials, or money. This principle, for example, could imply that the costs households incur for obtaining irrigation water are proportional to their needs (for example, depending on land size or crop type in our case) and use, as well as availability.
- XXI. User payments for irrigation water are generally not linked to the actual amount of water used.** Water consumers in all ten WCAs incur three types of costs to obtain irrigation water: the irrigation service fee; additional costs to maintain canals or repair structures; and, in some cases, expenses to pump water to their fields. Of these three costs, only the expenses incurred for pumping are directly related to the amount of water consumed. The irrigation service fee consists of a low and fixed amount per ha (about Soum 10,000–60,000 per ha, or US\$3–24 per ha), depending on the crops grown. In some WCAs, farmers pay the same fixed fee per ha for all crop types. The irrigation fee accounts for only a small percentage of total production costs.
- XXII. We find that in all of the WCAs we studied, irrigation fees are lowest for the crop that uses the most irrigation water—cotton, the main state-mandated crop. However, there are substantial differences in cotton irrigation fees across WCAs.** They tend to be the lowest in the poorly

performing WCAs, where farmers' levels of satisfaction with irrigation services are low. Farmers' net returns to the volume of water used are 2–3 times lower for cotton than for wheat and other crops. In addition, farmers' returns to the amount paid for obtaining the water are five times lower than other crops when cotton yields are low (this is illustrated in Table O.1 in the second-to-last column). This could be because cotton is planted in areas that are not very suitable for growing it. In these areas, the amount paid for irrigation water is not proportional to the returns, compared to growing wheat or other crops. However, when cotton yields are high, net returns to the amount paid for water can be the same for cotton and wheat (see Table O.1, last column).

Table O.1. Farmers' net returns per volume of irrigation water and return per irrigation water fee, per crop, and for the lowest and highest yields and fees in the ten sample WCAs

	Water use (m ³ /ton) ^a	Net returns per ha (Soum/ha) (lowest) ^b	Net returns per ha (Soum/ha) (highest) ^c	Net returns per volume of irrigation water (Soum/m ³) (lowest)	Net returns per volume of irrigation water (Soum/m ³) (highest)	Net returns per m ³ water/irrigation fee per m ³ (lowest) ^d	Net returns per m ³ water/irrigation fee per m ³ (highest) ^e
Cotton	4,200	94,000	1,420,000	9	135	9	42
Wheat	1,400	464,000	1,224,000	110	291	46	41
Horticulture (onions)	350	1,000,000	4,000,000	95	381	100	33f (100)g

Source: Data collected for this study.

a Source: Water footprint of cotton, wheat, and rice production in Central Asia (Aldaya, Muñoz, and Hoekstra, 2010).

b Lowest yield in the ten sample WCAs.

c Highest yields in the ten sample WCAs.

d Lowest yields and lowest fees.

e Highest yields and highest fees, in the ten sample WCAs.

f Based on the high fee of Soum 120,000 per ha in *Kuwa urta buz anori* WCA, in Kuwa District, Fergana Oblast.

g Based on a more typical high irrigation fee of Soum 40,000 per ha in the sample WCAs.

XXIII. Charging lower fees to irrigate the state-mandated crops - that generate low profits for many producers - may make the costs of irrigation water proportional to the benefits of using it, but doing so undermines the ability of WCAs to allocate water to the crops that are most profitable for farmers. The best-performing WCAs tend to be those that are able to make water available to cultivate profitable secondary crops (neither wheat nor cotton). They also tend to be the ones that charge the highest irrigation fees for these secondary crops. Both actions make it possible for farmers and WCAs to generate sufficient resources to maintain and repair the irrigation system.

XXIV. Raising the irrigation fee might in theory help fund irrigation canal maintenance needs. However, this worries some WCA officials, who claimed that if farmers pay higher fees they will want to hold the WCA accountable for supplying the exact amount of water that is stated in the delivery contract they have with the WCA. But since the amount of water supplied to farmers depends in large part on how much water the AIS and BAIS supply to the WCA through the main canal, as well as weather conditions, the WCA administration is not confident they can honor the commitment. Moreover, WCA officials claimed it is impossible for the WCA to hold the AIS accountable for the water it has agreed to deliver to the WCA.

XXV. In well-functioning WCAs, farmers pay higher fees than those in poorly functioning WCAs, and are active in maintaining and repairing the irrigation system. In poorly functioning WCAs—such as the sampled WCAs in Pap District in Namangan and Dustlik District in Jizzakh—farmers have not agreed to higher fees. A significant number of farmers here are indebted. Some farmers fear that if water meters are installed they will have to pay for unlimited use by *dehkans* and *tomorka* owners, who withdraw water through the canals going to their farm, which is the case in Pap District, Namangan, and Kyzyltep District in Navoi. An important observation is that in well-functioning WCAs (for example, those sampled in Navoi oblast, Surkhandarya oblast and Kuwa district, Ferganaoblast) farmers not only pay higher irrigation fees, but they also tend to pay on time.

- XXVI. The findings suggest that farmers who grow secondary crops use water more cautiously and look for ways to save water or irrigate their fields more efficiently.** In particular, farmers who grow secondary crops often use drip irrigation, arrange for wells to be drilled, or mix water from drainage canals with water from the irrigation canal. This is the case in the sampled WCAs in Urgench District in Khorezm, Akaltyn District in Syrdaryo, Kyzyltep District in Navoi, and Kattakurgan District in Samarkand, where water availability for secondary crops is low or medium.
- XXVII. The relatively low profitability of the state-mandated crops from a farmers' point of view⁵ undermines farmers' ability to sufficiently contribute to the adequate maintenance of the local irrigation and drainage systems.** Somewhat inconsistently, the policy to give preference to state-mandated crops appears to be enforced even in areas where the state has allocated a substantial proportion of land to the much more profitable horticultural crops, making horticultural farmers vulnerable to late and insufficient irrigation services. There are signs that horticultural farmers are willing to pay much higher irrigation fees on the condition that their needs are given higher priority in local irrigation schedules.
- XXVIII. Farmers must pay irrigation fees by bank transfer instead of in cash, as this is required by national law for all financial transfers between legal entities.** This leads to substantial delays in payment. As a consequence, the WCAs have trouble paying staff salaries and taxes when they are due. Partly to avoid paying the labor taxes that the WCAs incur for hiring employees, farmers claimed they have not gone through the WCA but have spent money directly on canal maintenance and repairing the parts of the irrigation system that serve their area.
- XXIX. Irrigation is traditionally a male responsibility, but the gender division of labor is changing due to the growing outmigration of Uzbek men.** This particularly affects *dehkans* and *tomorka* owners. Following male outmigration, women in dehkan and tomorka-owning households have become more involved in agriculture and irrigation. Female *dehkans* or *tomorka* owners whose husband is absent often have trouble attending to nightly irrigation duties (farmers often only allow *dehkans* and *tomorka* owners to water their land at night). These intakes might be located far from their house, and if men are not around, women must perform this difficult task. Women feel unsafe at night. The burden to obtain irrigation water is clearly higher for women than for men.

Design principles 4, 5, and 6: Those who monitor water use(rs) and those that sanction violators are accountable to water users

- XXX. The findings suggest that even though farmers sign water delivery contracts with the WCA, and the WCA is in principle accountable to water consumers, the AIS plays an important role in monitoring overall water use, even if it is not accountable to WCAs or to water consumers.** The WCA is not in a position to enforce the contractual arrangement it has with the AIS, partly because the WCA does not pay for the irrigation water it receives from it. In fact, the AIS may deliver less water if it turns out the water level in the rivers and canals is lower than anticipated, or pumps or canals are broken and there are no funds for repairs. This has caused friction between farmers and WCAs. The AIS's lack of accountability to the WCA appears to be an important reason why some WCAs are not keen on raising irrigation service fees. This would suggest that the AIS's limited accountability prevents the WCAs from mobilizing the resources needed to recover costs and pay for canal operation, maintenance, and repairs.
- XXXI. WCA members interviewed in all case study sites—except those in Surkhandarya and Tashkent Oblasts—claimed that the WCA water supply schedule almost entirely focuses on meeting the production quota of the state-mandated crops.** Overall, the AIS and the *Hokimiyat* have an interest in making sure WCAs are able to maintain the WCA irrigation system, deliver sufficient water to

5. This study only looked at the farmers' perspective and did not assess the profitability of state-mandated crops for the state.

farmers in time to cultivate cotton and wheat, and prevent or settle disputes among farmers. Farmers stated they supported the interference of the AIS when the WCA is weak, as it will help them meet the state production quota. WCAs are not allowed to fail, and the state will interfere if they collapse. However, in the medium term, this makes the WCA and its members dependent on the government, which undermines a number of design principles for community management of common-pool resources and removes incentives to innovate and adopt more effective arrangements.

- XXXII. In areas where the WCA is weak and its staff are not respected by farmers—such as in the sampled WCAs in Namangan and Jizzakh—the AIS and other government organizations intervene and more or less take over WCA management.** However, given the continued weak performance of these WCAs and their farmers’ low satisfaction with water delivery, this seems to do little to improve the overall management of irrigation water as a common-pool resource.
- XXXIII. In contrast, in areas with strong WCAs (such as those sampled in Navoi, Surkhandarya, Syrdaryo, and Tashkent Oblasts), farmers suggested there is no need for the AIS and/or Vodhoz to intervene.** Their WCA was said to be able to solve all water management issues by itself, and sometimes negotiate issues directly with the BAIS. Farmers in the selected WCA in Tashkent Oblast, for example, claimed that as far as they are concerned, the AIS can be abolished and the WCA can work directly with the BAIS. A good practice was found in Kuwa district, where the AIS meets with all WCA directors in the district once every ten days.
- XXXIV. WCAs are not allowed to sanction farmers or other water consumers that violate the irrigation schedule or excessively use water, such as through fines.** If there are any disputes among farmers over irrigation water, they are solved through discussion meetings or settled personally by the WCA head. This works particularly well when the WCA head enjoys the respect of the local community. One WCA that is able to apply sanctions is the *Kuwa urta buz anori* WCA in Kuwa District, Fergana Oblast. Here, farmers’ water use is strictly monitored by the WCA in case farmers don’t abide by the agreed-upon water regulations. In this case, WCA authorities claim that the water will not be supplied to their farm for a period of time. Moreover, in this WCA, the eight *mirobs* who control the water supply to farm plots have a journal where farmers must sign for the water they receive. There is even a special journal for *tomorka* owners where they can write complaints to the WCA.
- XXXV. Many respondents indicated the need to install meters and controlling devices to monitor water use. They also indicated the need for *mirobs* to do good monitoring. However, it is a challenge for many WCAs to find qualified *mirobs*,** as it is difficult to find enough young and qualified specialists to work in rural areas. To do this challenging job, *mirobs* are low paid (Soum 200,000–400,000 or US\$65–120 per month) and often paid late.
- XXXVI. As mentioned, conflicts can arise when *dehkans* and *tomorka* owners make unplanned withdrawals from irrigation canals, which causes water shortages for farmers further down the canal.** In some WCAs, this has led to conflicts between farmers and the smallholders, and between farmers and the WCA administration. The WCA does not have any power or legal authority to impose penalties on *dehkans* and *tomorka* owners (as they are not members of the WCA).
- XXXVII. There are a number of informal practices that promote effective monitoring and improve the accountability of the AIS and the WCA.** Some WCAs—especially the better-performing ones—have found mechanisms to monitor water use and users, and hold the WCA accountable via a committee of respected farmers. Other WCAs have daily meetings with WCA members during the irrigation season. In some of the case study areas, the AIS meets with WCA directors on a regular basis (once every ten days), possibly ensuring some informal way to prevent disputes over water delivery. As mentioned, installing meters and controlling devices to track water use would go a long way toward improving monitoring and accountability.

Design principles 3, 7, and 8: Users can modify rules and have the right to devise their own institutions; these institutions are nested in a larger resource system

- XXXVIII. In each case study site, the WCA administration reports to a General Assembly that consists of WCA members (mostly farmers) and which is also attended by officials of the AIS, BAIS, Vodhoz, VAC, and by *Hokimiyat* and *mahalla* leaders.** In principle, the General Assembly oversees the WCA staff and its director. The agenda can include the election of the WCA head, board members, and sometimes the appointment of other key staff members. Also up for discussion are budget and irrigation fees for the coming year as well as planning maintenance activities for the WCA irrigation system. How frequently General Assembly meetings are held varies across WCAs, from no meetings in the poorly performing WCA in Dustlik District in Jizzakh to 20 in the high-performing WCA in Kyzyltep District in Navoi, with meetings typically taking place 2–6 times a year.
- XXXIX. In addition to the General Assembly, all WCAs have a supervisory board of farmer and community representatives that oversee the WCA director.** The WCAs appear to benefit from the hands-on monitoring and day-to-day problem solving these board members provide. This is particularly the case in the high-performing WCAs.
- XL. In many WCAs, farmers and smallholders make their own maintenance arrangements off the books of the WCA,** mainly to avoid paying labor tax. This is particularly common for farmers who have their own machines. While this flexibility certainly has advantages in the short term, over time this could undermine the role and viability of the WCA in its current form.
- XLI. In seven out of ten case studies, WCA members thought the WCA administration represented their interests, and regarded the WCA as “their” organization.** Farmers felt they were involved in the WCA’s decision-making process. Officials of these WCAs are to some extent able to negotiate irrigation regulations with government bodies, providing some flexibility to their implementation.
- XLII. In WCAs where farmers were not satisfied with the quality of water management, they feel helpless. They do not regard the WCA as “their” organization but rather as an additional government entity.** In particular, in the selected WCA in Pap District, Namangan, many farmers are frustrated by poor water management and the WCA’s inability to solve problems. Farmers at the tail end of the canal in this WCA receive insufficient amounts of water and many struggle to meet the production quota for cotton and wheat. Many refuse to pay their irrigation fees. In the poorly performing WCAs, both the WCA administration and farmers see no other solution but to have the government take over the financing of the WCA’s operations and the maintenance of the irrigation system.
- XLIII. In well-managed WCAs, farmers and the WCA administration help each other to maintain the irrigation system.** Farmers may provide the WCA with machinery and pay for fuel, spare parts, and labor when the WCA repairs interfarm canals. On the other hand, the WCA may help farmers repair on-farm canals, purchase fuel, or help farmers who lack equipment borrow what they need from the AIS or the *Hokimiyat*. In order to deal with sudden needs for repairs, the sampled WCA in Denov District, Surkhandarya has a fund for emergencies.
- XLIV. In the well-performing WCAs, farmers and staff claimed to be driven by a “shared vision,” and the most experienced and resourceful farmers sometimes help others with advice, machinery, and even small loans.** The drive to produce state-mandated crops creates a common goal for stakeholders, farmers, and local irrigation bureaucrats alike. This joint sense of purpose, combined with strong incentives for local government officials to ensure farmers meet production quotas, strengthens the overall commitment to deliver irrigation water to cotton and wheat crops in a timely manner.

XLV. However, the overall state policy of giving priority to state-mandated crops causes these crops to use up most of the irrigation water, which removes opportunities for farmers to innovate and allocate water to more lucrative crops. *Dehkans* and *tomorka* owners can only indirectly influence water allocation decisions, and whether their right to organize is recognized depends on the quality of the interaction between the *dehkans*, *tomorka* owners, the VAC, and the WCA.

Conclusions

XLVI. Overall, farmers state that the management of local irrigation water has much improved since WUAs/WCAs were established. These organizations appear to have played a role in bringing structure to the chaos that surrounded the local management of irrigation canal water after the *shirkats* were abandoned.

XLVII. In the eyes of stakeholders, a WCA's performance depends on three conditions. First, the proportion of the WCA area that depends on electrical pumps should be low, especially if the supply of electricity is unreliable. Second, growing conditions should be suitable for the crops the WCA farmers have been assigned to grow by the state. If this is not the case, yields will remain low, which will lead to low profits for farmers, limited resources, and few incentives to improve local water management. Third, the WCA director should have high-quality leadership skills that enable him or her to build trust among water consumers and the WCA; strengthen social capital; and establish good relations with farmers, officials, and all water consumers, including smallholders.

XLVIII. Our data suggest that the presence of these characteristics and conditions is highly variable across WCAs in Uzbekistan. Many WCAs are deeply in debt due to low irrigation fees, high salaries, and substantial operational costs. In some poorly functioning WCAs, farmers are demoralized and lack a reliable supply of irrigation canal water for their crops. However, in other WCAs where water is also scarce, farmers are more satisfied with irrigation water management, partly because they are allowed to grow the more lucrative horticultural crops.

XLIX. The Ostrom design principles for managing irrigation water as a common-pool resource are met in some WCAs but not in others. For example, the needs of *dehkans* and *tomorka* owners are not always included in local management arrangements, which can interrupt water supply to all users. In situations where male *dehkans* have migrated, their wives are left behind to take care of irrigation. This is difficult for them as they receive their irrigation water at night, when many women feel unsafe.

L. In all of the WCAs we studied, irrigation fees are lowest for the crop that uses the most irrigation water—cotton, the main state-mandated crop. This undermines the second Ostrom design principle. However, there are substantial differences in cotton irrigation fees across the WCAs. Fees tend to be the lowest in the poorly performing WCAs, where farmers' level of satisfaction with irrigation services is low. This would suggest that farmers are prepared and able to pay higher fees should irrigation service conditions improve.

LI. Farmers that grow cotton obtain much lower returns per unit of water used than wheat and horticultural crops when cotton yields are low (2 tons/ha). This implies that when growing conditions for cotton are poor there are enormous economic inefficiencies in using irrigation water to grow these crops anyway.

LII. WCAs are only willing to substantially raise irrigation fees (to better recover operation and maintenance costs) if they can hold the AIS more accountable for the amount of water it has agreed to deliver (given weather conditions in upstream areas). The AIS's current limited accountability to the WCAs puts them in a difficult position vis-à-vis their members and makes it hard for them to be accountable for delivering irrigation canal water to farmers and other water consumers.

- LIII. **The compulsory planting of cotton and wheat (even in areas less suitable for their cultivation) combined with low state purchase prices undermines farmers' ability to generate sufficient resources to pay for local operation and maintenance,** either through their own initiatives or through the irrigation fees they pay to the WCAs. Those WCAs that manage to make sufficient amounts of water available for profitable secondary crops perform better and are better able to recover operation and maintenance costs. They also tend to be the ones that charge the highest irrigation fees for secondary crops.
- LIV. **The AIS's involvement in managing "weaker" WCAs (those that are unable to adequately manage their irrigation canal water in the medium term) undermines "ownership" and the sense of responsibility water consumers have for the management of canal water, and makes them dependent on the state.** WCAs rarely sanction farmers or other water consumers and it is unclear whether they can do that or whether only the AIS can do this, which would undermine one of the design principles.
- LV. **However, there are a number of good practices that promote effective monitoring and improve the accountability of the AIS and the WCA.** These include establishing a committee of respected farmers to solve conflicts; holding daily meetings with members of the WCA during the irrigation season; and having the AIS meet with WCA directors on a regular basis.
- LVI. **The current lack of meters and controlling devices makes it difficult to monitor irrigation water use or establish accountability between water suppliers and consumers.** In many WCAs, farmers and smallholders make their own maintenance arrangements off the books of the WCA to avoid paying labor tax. This is particularly common for farmers who have their own machines. Over time this could undermine the role and viability of the WCA in its current form.
- LVII. **Even if in principle irrigation water consumers are able to devise their own institutions, meet, and make decisions,** this design principle is undermined by the nationwide effort to produce wheat and cotton. WCA rules can only be changed if they remain within the overall state agricultural policy, which gives priority to state-mandated crops. Also *dehkans* and *tomorka* owners can only indirectly influence water allocation decisions, and whether their right to organize is recognized depends on the quality of the interactions between the *dehkans*, *tomorka* owners, the VAC, and the WCA.

Diagnostic tool

- LVIII. **Based on the findings of this study, we designed a diagnostic tool that can be used in the field to assess, for example, whether a particular WCA meets the design principles for sustainable management of common-pool irrigation water.** This tool can affect the extent to which conditions for well-functioning local governance arrangements for managing irrigation water are present. It will also help in the design of priority interventions that improve local water management so it is more sustainable, reflects local conditions, and includes all water consumers.
- LIX. **The tool consists of a set of questions that need to be answered in the field.** The questions (presented in Chapter 7) are based on each of the Ostrom design principles for the sustainable management of irrigation water as a common-pool resource.

Recommendations

- LX. **In addition to drafting the diagnostic tool,** we make a number of recommendations for improving the local management of irrigation water in Uzbekistan. These are presented below.

Recommendations for institutions

- I. **Clarify the roles and responsibilities of stakeholders in the management of local irrigation water in order to strengthen operational functioning of the WCAs.** This includes the AIS, WCA staff, WCA members, other water consumers and local government officials of other organisations. The clarification could be provided through a new Water Law/ Code (see below).

- II. **Involve *dehkans* (especially women) more structurally in decision making that pertains to water allocation scheduling, and arrange for them to have canal water intakes. More awareness raising among them of how they should more actively engage with decision making and providing beter support services to make that happen is important.** As *dehkans* and *tomorka* owners are important consumers of the irrigation water that is managed by the WCAs, their water needs must be better addressed, and their involvement in decision making that pertains to water allocation schedules must be more structural. The VAC does not currently seem consistently able to adequately manage this.
- III. **Clarify in the Water Law/ Code whether WCAs are allowed to sanction water consumers that break the rules.** If WCA members establish rules and regulations for allocating irrigation water to all consumers, it is important that the WCA, under certain circumstances, be able to sanction water consumers that break those rules. This is an important condition for operating the irrigation system as a common-pool resource.
- IV. **Strengthen the provision of support services to the WCAs and promote learning across them, using successful WCAs as schools and training sites.** Many WCAs are in need of support services that better enable them to fulfill their role and better recover costs. Many of them confront similar challenges, but some appear better able to address them than others. There are significant learning opportunities to be had by exchanging experiences across WCAs, and in allowing poorly performing WCAs to learn from successful ones. Ultimately, such WCA-to-WCA learning could also be done across different countries in the region
- V. **Encourage and empower the WCA board.** The WCA board plays an important role in supervising WCA authorities, giving advice, overseeing its overall functioning, and solving conflicts. It is important that its role be further strengthened and not undermined by new government regulations.
- VI. **Better track the irrigation system’s performance through administrative data collection or sample surveys that feature some of the questions in the diagnostic tool.** In order to help policy makers understand whether water allocation systems are working and whether the BAIS, AIS, and WCA are adequately performing their functions, it is important that the WCA’s performance is more systematically monitored. In addition, sample surveys could be conducted that systematically collect data on water consumers’ satisfaction with the current irrigation system. Such feedback to policy makers and service providers is critical if they are to have a good overview of where things succeed and where they need improvement, and for addressing shortcomings in a timely manner.

Recommendations for policies

- VII. **Adopt a new Water Law/Water Code** and take legal measures that provide for a better financing aspects of WCA operations. These legal changes should better provide for the WCAs’ financial and operational sustainability and provide a stronger accountability mechanism for their governance structure. The water code should also provide a legal basis for a more contractual relationship between the AIS and the WCA, with clear monitorable agreements on water delivery. The new Water Code should provide a strong legal basis for the supervisory board of farmer and community representatives to oversee the WCA director, and should also provide a stronger, more structural, and direct role for *dehkans* and *tomorka* owners in decisions pertaining to water allocation.
- VIII. **Bring the water allocation policy in line with the land-use liberalization policy.** While the government has indicated its interest in allowing farmers to grow the crops that they prefer—usually horticultural crops—the water allocation policy at the local level often prevents the allocation of adequate irrigation water to these lucrative crops, which also provide much higher returns per volume of water used.

- IX. Lower the labor tax for WCAs to generate more resources for O&M.** A lower labor tax will improve WCAs' functioning by enabling them to more systematically contract laborers for maintenance work; farmers currently hire such laborers informally. This will make it possible for WCAs to better plan and implement canal repair and maintenance work.

Recommendations for investment

- X. Improve the water delivery contracts between AIS and WCA and install water meters at the level of the WCA canal intake.** Contracts that the AIS signs for the amount of water to be delivered to the WCA, and the amount actually delivered, need to be better monitored. The AIS needs to be held accountable for the volumes of water it actually delivers to the WCA (given weather conditions in upstream areas). Meters at the level of the WCAs' water intake will enable these amounts to be more accurately measured. This would allow WCAs to provide more reliable irrigation service to their members and will open opportunities to raise irrigation fees and improve cost recovery.
- XI. Upgrade outdated irrigation pumps.** Many WCAs and farmers depend on irrigation water that enters the canals through electric pumps or they use pumps themselves. For a reliable and predictable supply of local irrigation canal water, it is important that outdated irrigation pumps that are owned and/or managed by the AIS (and possibly the WCAs) be replaced with modern ones. However, this requires a reliable supply of electricity to all areas in Uzbekistan, and requires a financing model to be found that enables pumping stations to recover their costs.

1. Introduction

Background

- 1. During the past decade or so, government irrigation agencies in many developing countries were under pressure to become more financially sustainable, increase cost recovery, and make more efficient use of scarce water resources.** Government irrigation agencies were often constrained by slow bureaucratic procedures, dwindling budgets, rigid policies, and unmotivated personnel, all of which led to poor performance. Many attempted to collect irrigation service fees but few were successful. The time was ripe for a fundamental change in the irrigation subsector.
- 2. Irrigation Management Transfer (IMT) has since emerged around the world in an effort to not only increase cost recovery but to make water consumers more responsible and active in the operation and maintenance of local-level irrigation infrastructure.** It was believed that increased ownership and decision-making authority by water consumers themselves would provide greater incentives to recover costs and improve the irrigation system's performance. Such an approach—where decision making is driven by water consumers and Water User Associations (WUAs)—would also make the irrigation management system more accountable to farmers.
- 3. A review of the global IMT experience conducted by the FAO and IWMI revealed there have been substantial improvements along a number of performance indicators.** Cost recovery has increased and communication between system management and end users has improved. The closer involvement of WUAs in decision making around local water management has indeed resulted in increased accountability, transparency, and responsibility, as has been witnessed in China and Mexico, for example (FAO and IWMI, 2007). However, there has been a tendency to overstate the objectives and expectations of IMT programs, which creates expectations that have not always been fulfilled.
- 4. Major constraints to further improving the performance of the irrigation system under IMT were found to include:** (i) a lack of political support in some countries, leading to insufficient funding and a lack of support for the reform process; and (ii) reluctance to change existing water laws, which has resulted in reliance on ministerial decrees that have insufficient weight and authority. This has often led to an unclear and weak legal basis regarding the responsibilities and nature of WUAs. WUAs' water rights are often not well developed under the law. A third constraint has been the lack of managerial skills within WUAs, which leads to poor provision of water services (FAO and IWMI, 2007).
- 5. Irrigation canal water is essentially a common-pool resource.** Common-pool resources are a subset of "public goods." A characteristic of all public goods is that many people can use them at the same time, because exclusion is difficult. Common-pool resources, by contrast, are public goods with finite, or subtractive benefits. If one person uses more, less remains for others. Common-pool resources are therefore potentially subject to congestion, depletion, or degradation, or use that is pushed beyond the limits of sustainable yields (Wade, 1987). Canal water is a common-pool resource—it can be used jointly and its consumption is subtractive in the sense that water applied to A's land is not simultaneously available for B's. Therefore, when water is scarce, it increases the likelihood of congestion, which is manifested in conflict, hoarding, and yield reductions, where water arrives too late (Wade, 1987).
- 6. Across the world there is strong evidence that local communities can successfully manage common-pool resources.** Successful collective action in governing common-pool resources such as irrigation water, forests, and fishing areas takes place in many countries on all continents. Until the 1980s, many scholars had presumed that users of common-pool resources could not self-organize to manage them. Thus, scholars often recommended imposing government or private ownership based on the theories of Hardin (1968), among others. However, following North's (1990) conception

of institutions as mechanisms for reducing uncertainty in complex, uncertain environments, it was found that such institutions are often able to reduce uncertainty, build trust, and generate norms of reciprocity, which makes collective action possible. Ostrom (1990) subsequently defined the eight “design principles” for managing common-pool resources. We use these design principles to study irrigation water in Uzbekistan as a common-pool resource and assess to what extent local communities are successfully managing it and what conditions favor success.

7. **Uzbekistan is facing increasing challenges to satisfy future demand for irrigation water.** Agriculture in Uzbekistan is almost entirely dependent on irrigation, which covers about 4 million ha, or about 80 percent of cultivated land. At the current rate of population growth, annual renewable water availability is expected to fall below 1,700 m³ per capita by 2030, which is considered the threshold for water scarcity. Climate change is expected to amplify seasonal and annual variation, and forecasts suggest that most of the country will experience severe water shortages in the future.
8. **The main water resource problem, however, seems to be inefficient water management rather than water shortage per se.** Much water is said to be lost in conveyance to and within the on-farm systems, and water is poorly used by irrigators, who have had very little, if any, training in efficient water application methods (Burton, 2014). There is almost no proper measurement of water within the on-farm system, and the measuring structures that were provided at the interface of the off- and on-farm systems are generally not functioning (World Bank, 2013).
9. **Uzbekistan is characterized by a very strong state and there are strong vertical links between the state ideology, the water discourse, and practice.** Central to the official water discourse is the idea that water is supposed to be free and readily available (Kraak, 2012). The concept of water as a free good has its origin in the Soviet Union. Moreover, free water has taken on a pseudoreligious significance, and it is claimed that water pricing is impossible because “water comes from God” (Glantz, 1999).
10. **In Uzbekistan, IMT started in 1999 with the creation of WUAs.** The state created these in response to the chaotic water management situation that followed the dissolution of the *shirkats* (collective farms that had succeeded the Soviet-era *kolkhoz* and *sovkhoz*). The distribution of land among individual farmers led to an institutional vacuum, where no one was in charge of managing irrigation and drainage water. There was no mechanism to manage and allocate water among farmers, and conflicts over water use were common.
11. **The Law on Water and Water Use of 2009 governs the role of WUAs.** It enables WUAs to collect Irrigation Service Fees (ISFs), which are based on contracts signed with WUA members. According to the law, farmers that are legal entities and all other water consumers can be members of a WUA. Self-governing bodies can also be members. By 2013, the WUAs were reregistered as Water Consumer Associations (WCAs) and restructured following a new provision issued by the Ministry of Justice. Apart from the name change, this new provision intended to include all water consumers in any given territory, including *dehkans*, *tomorka* owners, and *mahallas* as members. It also involved a change from commercial to noncommercial and nongovernmental status and restructuring the board, which leads to less oversight of the WCA director.
12. **Efforts have been underway since 2010 to draft a new water law/water code and related legal measures; the goal is to improve the legislation that regulates the financial aspects of WCA operations** to make them more sustainable. The new code also intends to provide a stronger accountability mechanism for the WCA governance structure. In 2013, an interagency working group finalized a draft water code that embodied a change from supply management to demand management. On October 7, 2013, the Ministry of Agriculture and Water Resources (MAWR) submitted the document to the Cabinet of Ministers for review and feedback. Although no feedback was formally received from the Cabinet of Ministers, the Oliy Majlis (Parliament) has included the draft water code in their plan for the first quarter of 2016 for review and adoption.

13. **Despite these reforms, much of Uzbekistan’s irrigation allegedly continues to function poorly.** The system is said to be caught in a vicious cycle of inadequate repairs (see Picture 1) and operation and maintenance, low cost recovery, low agricultural productivity, and low incomes for many farmers (World Bank, 2013). Over the past twenty years, operation and maintenance (O&M) of the national irrigation and drainage infrastructure has suffered from substantial underfunding, with only about 15 percent to 25 percent of requirements provided by the MAWR’s recurrent budget (see Picture 2 for the conditions of pumps in one WCA in Khorezm). Overall system and on-farm water-use efficiency is by most accounts much lower than optimal; only about one-quarter of the distribution channels are equipped with anti-seepage lining (see Picture 3)(World Bank, 2013). It is estimated that some 50 percent of water supplied to farm boundaries does not reach the field. The drainage system has suffered more than the irrigation system and is in very poor condition (Burton, 2014).

Picture 1. Leaking cement irrigation canal, Kattakurgan District, Samarkand



Picture 2. Pumps owned by a WCA, Urgench District, Khorezm



Picture 3. Lined secondary irrigation canal in *Politemit-BKh* WCA Kattakurgan District, Samarkand



14. **There are few incentives to save water because farmers do not see the direct costs of water provision. The irrigation fees they pay function like a land tax, as these are not tied to actual water use** (World Bank, 2013). *Dehkans* (smallholders) and *tomorka* (kitchen garden) owners often pay a fixed fee per ha. The Government of Uzbekistan (GoU) more than recovers the cost of irrigation services by heavily taxing cotton and wheat production through low fixed procurement prices for these crops. However, these funds are not sufficiently used to improve the quality of irrigation and drainage. The net result is deteriorating irrigation services, declining farm output, and growing environmental problems. In addition, because water is provided more or less for free (marginal costs are zero for water consumers), there is a lack of interest in using water efficiently (World Bank, 2013).
15. **Available evidence suggests that the quality of local irrigation water management and governance varies across the country, yet it is not known why it works better in some areas than others.** The theory around the management of common-pool resources suggests that local-level water consumers must have developed a range of mechanisms to sustainably share canal water. Understanding the factors that cause some local irrigation management systems to work better than others can help design a diagnostic instrument that assesses whether these factors are met and identifies program interventions for putting these in place. Methods for undertaking such assessments should be underpinned by a solid analytical framework for the management of irrigation canal water as a common-pool resource.

Objectives

16. **The main objective of this study is to contribute to better irrigation water management in Central Asia, beginning in Uzbekistan,** by: (i) identifying factors and conditions that positively affect the performance of local irrigation water management institutions; (ii) preparing an associated diagnostic tool that will help design measures and program interventions to strengthen these institutions in ongoing or future irrigation operations; and (iii) facilitating the exchange of good practices and knowledge sharing among relevant stakeholders across the region. The aim was to pilot the approach in Uzbekistan before covering other Central Asian countries.
17. **By looking at irrigation water in Uzbekistan as a common-pool resource, we assess what local, social, economic, and biophysical conditions favor local communities' successful collective action to manage irrigation canal water in an optimal manner.** Irrigation and drainage programs and schemes can then define interventions that promote these conditions. These objectives are

pursued through a case study approach, which involved a systematic, in-depth assessment of local-level institutional arrangements to manage irrigation and drainage water in ten selected sites across the country.

18. **By adopting a case study approach, the assessment is able to assess the performance of local water management systems and analyze the extent to which preconditions for successful collective action are met.** It allows us to gather in-depth and relevant experiences and perspectives from irrigation water consumers and officials within the circumstances in which they operate.

Analytical framework

19. **The analytical framework for this assessment is formed by the eight design principles for the management of common-pool resources developed by Ostrom (1990) and modified by Cox, Arnold, and Tomás (2010).** These design principles are in essence factors that are associated with successful collective action in governing common-pool resources such as irrigation water, forests, and fishing areas. Their primary role is to explain under what conditions trust and reciprocity can be built and maintained to sustain collective action in the face of social dilemmas posed by common-pool resources. This collective action, in turn, helps prevent the deterioration of a managed common-pool resource (Cox, Arnold, and Tomás, 2010). The potential benefits from collective action have to be clear and substantial (see Box 1).

Box 1. The importance of scarcity and risk for collective action

Research has shown that in South India, scarcity and risk were particularly important in influencing collective action. When resources such as irrigation water are scarce, collective action was more likely to take place. Other factors that appeared to explain why some villages managed their common-pool resources better than others are the village's social structure, state presence, relationships with markets, and demographic composition (Wade, 1994).

20. **A recent review of the relevant literature on the Ostrom design principles (covering 92 studies) showed that the principles are empirically well supported (Cox, Arnold, and Tomás, 2010).** The principles provide a valuable framework for our assessment. We use the modified version of the design principles as proposed by Cox, Arnold, and Tomás (2010) to assess the extent to which local water governance arrangements fulfill them in each of the case study sites, and what factors determine that. However, these principles should not be regarded as a magic bullet or an institutional panacea, and thus should not be applied as a prescription for improving the governance of common-pool resources in particular settings. This concern pertains to possibly overgeneralizing the principles to a large diversity of cases. The eight principles are:
 1. **User boundaries:** Clear boundaries between legitimate and illegitimate users must be defined.
 - B. Resource boundaries:** Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.
 2. **A. Congruence with local conditions:** Appropriation and provision rules are congruent with local social and environmental conditions.
 - B. Appropriation and provision:** The benefits obtained by users from a common-pool resource, as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.
 3. **Collective-choice arrangements:** Most individuals affected by the operational rules can participate in modifying them.
 4. **A. Monitoring users:** Monitors who are accountable to the users track their appropriation and provision levels.
 - B. Monitoring the resource:** Monitors who are accountable to the users observe the condition of the resource.

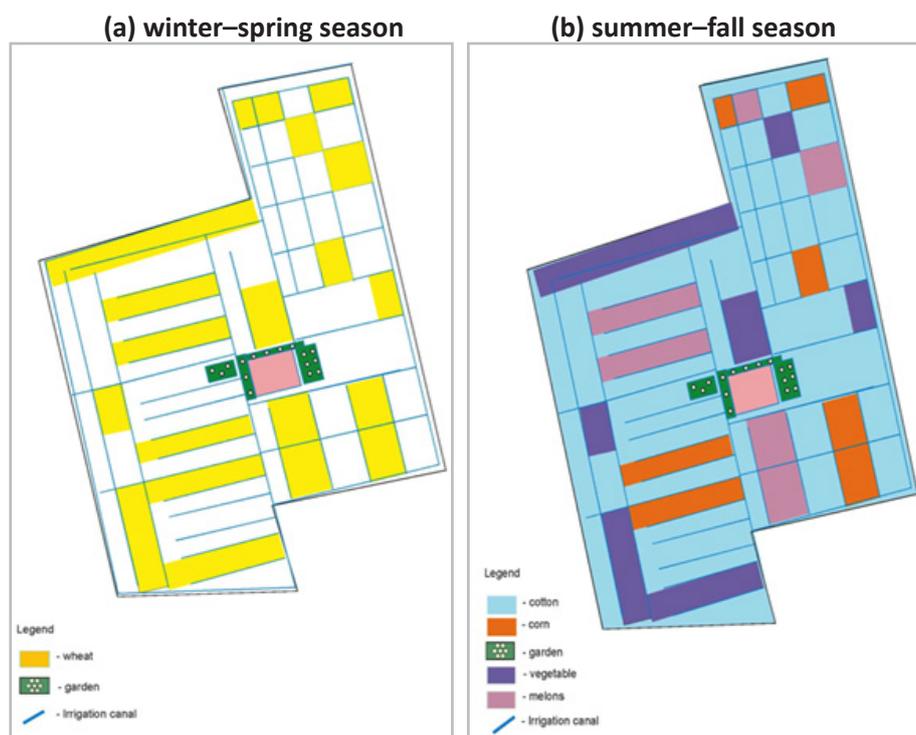
5. **Graduated sanctions:** Appropriators who violate operational rules are likely to be assessed using graduated sanctions (depending on the seriousness and the context of the offense) by other appropriators, by officials accountable to the appropriators, or by both.
 6. **Conflict-resolution mechanisms:** Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
 7. **Minimal recognition of rights to organize:** The right of appropriators to devise their own institutions is not challenged by external governmental authorities.
 8. **Nested enterprises:** Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.
21. **These design principles explain under what conditions trust and reciprocity can be built and maintained to sustain collective action. We use the eight principles as a guiding framework for our study** and assess the extent to which these are met in a range of different sites in the country, and how they relate to performance. Then, by determining why these principles are met in some cases and not in others, and what factors are behind this variation, we can identify measures that promote these factors/conditions in irrigation schemes.

Land-use and farming practices in Uzbekistan

22. **Uzbekistan's agricultural sector features three types of producers:** Private farmers, *dehkans*, and *tomorka* owners. Private farmers are commercial entities that lease large amounts of land from the state, often 50 ha or more (although horticultural farms can be much smaller). They are often referred to as farmers. They usually have to follow state directives on what crops to grow and where to sell the harvested produce. *Dehkans* are smallholders who own their land, often typically between 0.3 and 1 ha. *Tomorkas* are small kitchen gardens (often smaller than 0.3 ha). *Dehkans* and *tomorka* owners have full freedom to choose what crops they want to plant and whether and where to sell their harvests. *Tomorka* owners usually grow vegetables and a limited amount of fruit trees, while *dehkans* may grow all kinds of fruits and vegetables, but also crops such as rice.
23. **The local government authority, the *Hokimiyat*, assigns land plots to private farmers and grants them the right to cultivate these. Every year farmers have to submit a detailed crop production plan for the government to approve.** Representatives of government organizations often visit farmers' plots to verify adherence to the approved land-use plan and can penalize farmers if they do not follow it.
24. **Most private farmers are instructed to grow cotton and wheat, the state-mandated crops. Annually, each farmer is assigned a quota for these crops. This is the minimum amount they have to produce and sell to the state at prices that are fixed and well below the market price.** The quota is in principle based on the soil quality and water availability, as well as the yield of the respective crops during previous years. It is set on an annual basis. For the state-mandated crops, the state provides subsidized credits for inputs at the beginning of the year, and the costs of these are often subtracted when farmers are paid for their harvest (at a 3 percent interest rate). Unlike their cotton harvest, farmers are allowed to keep the amount of wheat that is produced in excess of the quota and sell it to buyers other than the state.
25. **The *Hokimiyat* may terminate the land lease if the cotton or wheat quota is not met for three consecutive years, in which case they auction it off to another farmer.** The state plays a central role in organizing the manual cotton harvest through annual cotton-picking campaigns.
26. **Farmers are interested in growing "secondary" crops, which are those they can choose and sell on the free market (typically fruits or vegetables); these can be lucrative.** However, secondary crops do not receive priority in farmers' state-mandated crop production and water delivery plans. Land can be allocated to secondary crops in three different ways. The first is where a farmer grows the

secondary crop at the same time as the state-mandated crop. In our case study, the WCAs were only allowed to do this on 5 percent to 10 percent of the land. The second way is to grow secondary crops on the land allocated for wheat cultivation after the wheat is harvested in early summer, if water is made available (see Map 1 for an example). The third way involves areas where it is not compulsory for farmers to grow a state-mandated crop; in this case, they are free to decide what to grow, provided there is enough water available. This situation occurred in only one of the case study WCAs, in Akhangaran District, Tashkent Oblast.

Map 1. Land use in the sampled WCA in Jizzakh, where secondary crops are grown on land allocated to wheat cultivation after the wheat is harvested



Source: Field work conducted for this study.

Note that cotton and wheat normally rotate. Wheat is often sown on cotton plots after the cotton is harvested. See Map A2.11 in Appendix 2 for an additional example of how secondary crops fit into the cropping pattern.

27. **Agricultural and water management development efforts in Uzbekistan mainly focus on farmers' state-mandated production of cotton and wheat. However, *dehkans* and *tomorka* owners contribute to more than 80 percent of agricultural production** in the country (excluding crops such as cotton, wheat, and rice) and ensure food security in rural and urban areas (Alimdjanova, 2009). The importance of their contribution is growing. In Fergana Oblast, for example, the irrigated area under kitchen gardens increased from about 5 percent in 1980 to 17 percent of all agricultural land in 2010 (Mukhamedova and Wegerich, 2014).

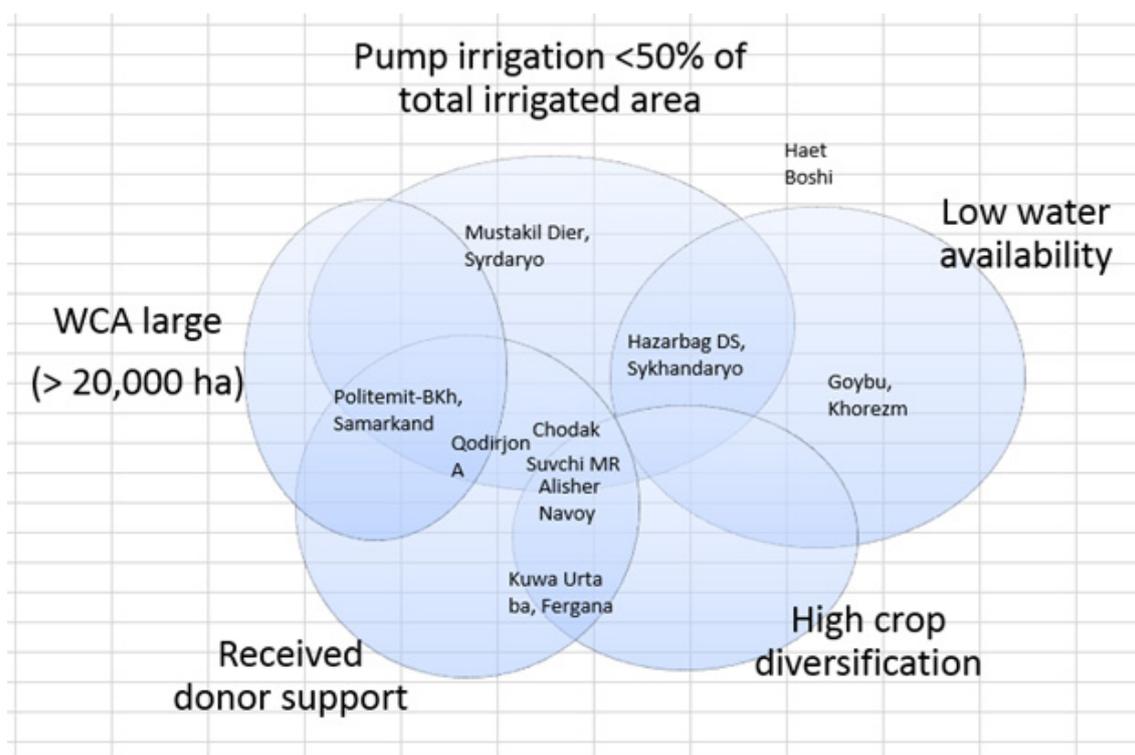
Methodology

28. **The study utilized a case study approach that involved a systematic, in-depth assessment of local-level institutional arrangements for managing irrigation and drainage water in ten selected sites across the country.** Case study research emphasizes detailed contextual analysis of a limited number of events or conditions and their relationships. It is based on the premise that truth is relative and dependent on one's perspective. Where the boundaries between the phenomenon of local irrigation water management and the context within which irrigation water is allocated and used are not clearly evident, case study research can offer a better understanding of the issue's

complexity. It makes use of multiple sources of evidence (Yin, 1984) and can add much to what is already known from previous research.

29. **A strength of this approach is the close collaboration between researcher and participant**, and the way in which it enables participants to tell their stories. Through these stories, participants are able to describe their views of reality, which enables the researcher to better understand participants' actions (Baxter and Jack, 2008). Social scientists have particularly made wide use of this qualitative research method to examine contemporary real-life situations (ibid).
30. **WCAs and the irrigation authorities in the area in which they operate form the unit of analysis for this study.** Exploratory interviews with key informants in Uzbekistan at the study's design stage revealed that at the lowest governance levels, WCAs and the local Administrative Irrigation System (AIS) are currently the key institutions for distributing water among farmers and for operating and managing local irrigation canals.
31. **The ten case study WCAs were selected to represent a wide range of circumstances thought to influence their performance.** The selection strategy was to maximize the diversity of cases. Out of the 1,510 WCAs registered in Uzbekistan,⁶ 32 were initially selected. These were chosen to cover different (i) agroecological conditions; (ii) WCA size; (iii) dependence on pump irrigation; (iv) overall water availability; (v) crop diversity; and (vi) extent of donor support. A final ten were then selected to ensure they would represent a wide range of situations, on the basis of the following additional criteria: land size; membership; type of crop; irrigation service fee (ISF) collection rate; size of debt; and performance (according to the government). Appendix 1 presents the sampling criteria and their scores for each of the selected WCAs. The selection was based on information provided by authorities in the selected regions. Figure 1 presents an overview of some of the key selection criteria and how each case WCA fits it. The ten case studies were selected from nine oblasts across the country.

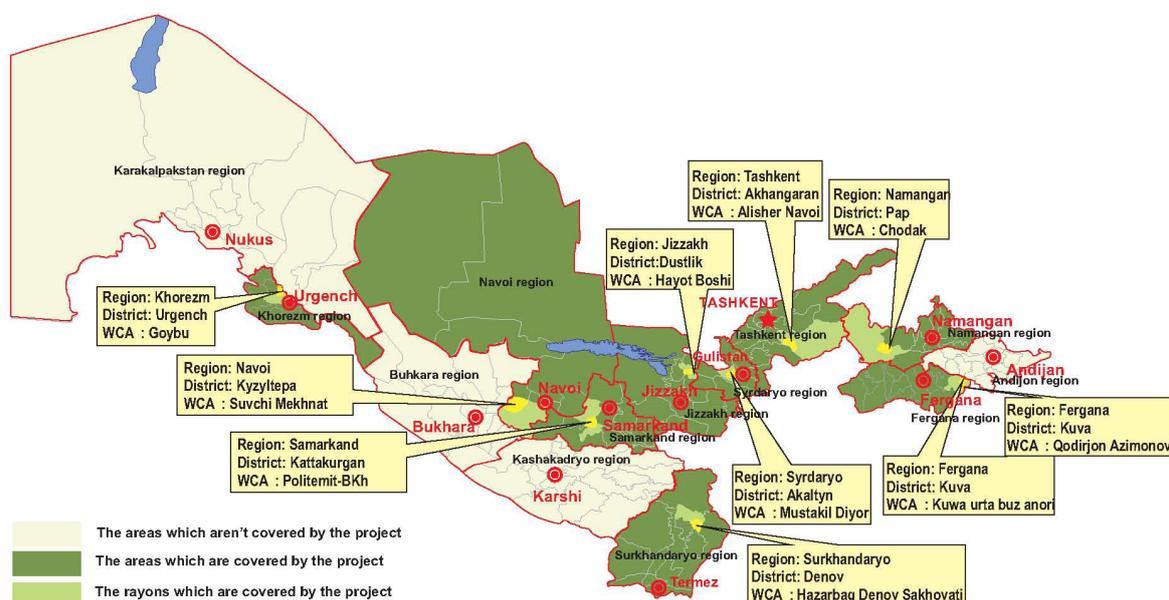
Figure 1. Key selection criteria and which ones are met by the case study WCAs



6. According to the Ministry of Agriculture and Water Resources (MAWR).

Map 2 presents the geographic location of the case study WCAs and the regions in which they are situated.

Map 2. Location of selected WCAs



32. **A local research firm carried out the fieldwork.** Data collection involved document review, observations, and individual and small group interviews. Interviews were conducted with (i) WCA staff; (ii) WCA members (primarily farmers); (iii) representatives of the *Hokimiyat*; and (iv) BAIS and AIS officials. Limited follow-up data collection took place in three WCAs to gather information on *dehkans'* and *tomorka* owners' access to water and the involvement of these groups in water management at the local level, among other issues.
33. **Information was gathered from a total of 145 people.** This included 30 representatives from local government, 23 WCA staff members (including two women), 71 farmers (including six women), and 21 *dehkans* and *tomorka* owners (including two women). There were two rounds; 91 respondents participated in the first round and 55 in the second (see Table 1).

Table 1. Number and type of respondents by WCA

Region	WCA name	Local government (<i>Hokimiyat</i> , AIS, BAIS, VAC)	Number of respondents			
			Representatives of WCAs (directors, accountants, mirobs)	Private farmers	Dehkans	Tomorka owners
Khorezm	«Goybu»	3	3	6	0	0
Samarkand	«Politemit-BKh»	3	3	6	0	0
Navoi	«Suvchi Mehnat- Rohat»	4	3	7	1	1
Namangan	«Chodak»	4	3	7	1	1

Surkhandarya	«Hazarbag-Denov Sakhovati»	3	2	7	0	0
Jizzakh	«Haet Boshi»	3	2	6	0	0
Syrdaryo	«Mustakil Dier»	3	2	6	0	0
Tashkent Oblast	«Alisher Navoiy»	4	3	7	1	1
Fergana Oblast	«Kuwa urta buz anori»	2	1	1	12	1
Fergana Oblast	«Qodirjon Azimonov»	1	1	18	1	1
Total		30	23	71	16	5
Total number of respondents		145				

- 34. Data were gathered in two phases.** The first phase was from May to June 2014 and covered eight case study sites. In the course of analyzing the data collected from this phase, a number of gaps emerged. These included a lack of information on (i) the situation of *dehkans* and *tomorka* owners in WCAs; and (ii) cases where WCAs include many horticultural farmers. To fill these gaps, an additional data collection phase was held from December 2014 to February 2015. We selected three WCAs out of the eight covered in phase 1 and revisited them for additional data collection. We also sampled two additional WCAs, in Kuwa District, Fergana Oblast. Data were gathered during three days in each of these two WCAs that were added to the sample.
- 35. Field researchers collected information on a range of factors, including the establishment and operational role of WCAs; strengths and weaknesses of the existing governance arrangements around water management; and accountability and information flows.** Additional information was collected about equality of irrigation services, infrastructure maintenance, irrigation service fee collection, WCA membership composition, qualifications of staff and leaders, returns to crop production, and the impact of water management quality. Data were also collected on exogenous factors, defined as those beyond the control of farmers and the WCA administration; these included the role of public agencies, overall water availability, and so on.
- 36. All information was collected in Uzbek and summary write-ups were prepared in Russian.** Data analysis and report writing was done by the World Bank task team. Detailed maps of the WCAs were produced together with local experts. These included a map with the location of the land of all water consumers within the WCA (farmers, *dehkans*, and *tomorka* owners) and the location of the main and internal canals; and a map with the main crops grown during the summer season and the secondary crops that farmers grow during the fall and spring. These are presented for each case study WCA in Appendix 2.

Limitations

- 37. Lack of access to official data on WCAs made it challenging to put together a comprehensive sampling frame⁷** and might have introduced bias in identifying WCAs for the case study. It meant that information on selection criteria for the research sites/WCAs was based on what was provided by government staff at the oblast and raion level. The research design attempted to address a bias toward well-performing WCAs in three ways: (i) by collecting information on WCAs in ten different regions under different conditions; (ii) by stressing to local government authorities the importance of researching poor performing WCAs; and (iii) by asking two stakeholders (*Hokims* and WCA directors) to rate WCA performance on a scale of 1–5. The study team then selected a cross-section of low- and high-rated WCAs. However, it is unclear how well this worked in practice.
- 38. No physical and technical measurements were taken** and all collected data are from existing WCA records, or reflect the opinions, views, and experiences of study respondents. While this provided

7. To date, the Ministry of Agriculture and Water Resources has been unable to provide the task team with a database of WCAs and key indicators.

insightful information, complementing these data with a number of technical measurements (such as irrigation efficiency, crop yields, or other performance indicators) would have helped improve data analysis.

Lessons learned

39. **This study is part of a regional assessment of local irrigation governance in Central Asia. Uzbekistan served as the pilot country for developing and implementing the research approach.** The methodology and research instruments were continually improved during the study's implementation and only fully developed during the second phase of data collection. A number of valuable lessons were learned that will help strengthen the approach and methodology—including sampling, data collection tools, techniques, and analysis—when the study is rolled out to other countries in Central Asia. These lessons are presented in detail in Appendix 3 and are briefly summarized here.
40. **Overall, the approach generated a wealth of information from a range of contexts and situations, and covered many different stakeholders.** Despite the sensitivity of the topic, the method provided us with detailed insights into many different aspects of the local management of irrigation water.
41. **The sampling would have been much improved if we had been able to obtain more background information Uzbekistan's WCAs.** This would have made it possible to assess where water is generally scarce and where it is relatively abundant, and would have enabled us to select areas from both groups and sample WCAs from among these. Subsequently, we could have conducted a quick survey of WCAs in selected areas to gather more detailed characteristics about them, and then could have chosen the case studies from among these, making sure a balanced range of characteristics were covered.
42. **The study could have more systematically covered all stakeholders if the team had drawn up a list of all water consumers and all "players" in a WCA after the field research pilot,** and then used this information to design lists of people to invite to participate in the study. As evidence came in from the first few case studies, it became apparent that the presence of *dehkans* and *tomorka* owners within the WCA irrigation system was an important factor for local water management. Yet this group of stakeholders was not included on our initial interview lists.
43. **Case study research requires the continuous field presence of a well-trained social scientist who can guide and supervise the data collection team,** and design follow-up data collection strategies in the field to clarify issues that arise. This involves more than simply facilitating discussions and conducting in-depth interviews with stakeholders. To this end, an irrigation specialist should possibly be added to the research team.
44. **After completing data collection in each case study site it is a good idea to discuss findings with the team so that moderators and interviewers involved in data analysis can share observations that might not be reflected in interview transcripts.** The study would have also benefited from more structured data collection, using pre-prepared sets of visual exercises, making more use of maps, pictures, and transects to gather data, and conducting group field visits that promote stakeholders' active participation in the case study area.
45. **For each case study WCA, it is important to gather technical background data that includes water-use and crop-production economics.** It appeared difficult to obtain reliable statistics on planned and actual water provided to the WCA, and to farmers and other water users. Similarly, hard information on crop production, prices, and crop water use were not available, making it difficult to assess incentives and economic inefficiencies in local water use.

46. **The rest of the report is structured as follows.** Chapter 2 describes Uzbekistan’s land-use policy and institutional context and provides an overview of each case study site. Chapters 3–6 present the findings within the framework of the design principles for the sustainable management of irrigation water as a common-pool resource. These chapters also discuss what factors seem to cause these principles to be more prominent in some WCAs than others. Chapter 7 then presents conclusions and recommendations, including the draft diagnostic tool.

2. Background on the research sites

Institutional arrangements and practices

47. **Each research site has a similar formal institutional setup. The BAIS and the AIS coordinate operation, maintenance, and repairs of the primary and secondary canals.** The BAIS is responsible for managing the primary canals while the AIS is in charge of the secondary ones. The BAIS deals with overall water allocation and the AIS is responsible for delivering water from the secondary canal to the WCA intake point of the interfarm canals. WCAs are responsible for delivering water from interfarm canals to farmers' on-farm canals. Farmers then ensure water is delivered to each part of their plots.
48. **All local government organizations report to the *Hokim*, the powerful head of the local government.** Representatives of the BAIS and AIS can participate in or set meetings with WCA members on water supply and consumption issues. They also help WCAs and farmers to prepare applications for water supply. In 2013 WCAs had to reregister as NGOs and pay a reregistration fee. Amounts are very low and vary between Soum 16,000 and 40,000 (US\$7–17).
49. **All farmers in the case study sites belong to a WCA, which many regard as an intermediary body between farmers and the AIS.** Nearly all farmers interviewed stated that they welcomed the creation of WUAs in response to the chaotic water management situation that started when the *shirkats* were dismantled. Most suggested they remember this transition period as a time marked by difficulties and conflicts over water distribution. Farmers are convinced that WUAs play an essential role, and farmers in Denov, Surkhandarya Oblast, said that without them they would expect to experience conflict, social unrest, and to sustain losses. Farmers in *Chodak* WCA in Pap District, Namangan Oblast, claimed that:
- “After the shirkat was disbanded, a situation arose in which there were now 13 farm enterprises on the shirkat territory. There used to be one chairman who decided all issues related to irrigation, and addressed water allocation issues. After the dissolution every farmer became his own director, and began to manage his water resources without the consent of neighboring farms. This led to conflicts over water resource distribution.”*
50. **Each year, the WCA submits an application for water supply to the AIS that is based on the approved crop production plans and corresponding water amount and scheduling needs of each of its members.** The AIS reviews the application and checks whether the schedule is realistic. The *Hokim's* office assesses whether the schedule is in line with the standard water needs of the main state-mandated crops. The plan is subsequently submitted to the BAIS, which reviews it in light of expected water availability. Once the plan is approved, a detailed water supply agreement is reached between the AIS and the WCA. Farmers often sign water supply contracts with the WCA at the beginning of a calendar year; such contracts stipulate the amount of water a farmer can expect throughout the year. According to the WCA staff interviewed for this study, the agreement between the AIS and the WCA may take the form of a contract, but this is not always the case. The overall focus of the water delivery schedule is making sure that farmers receive enough water to meet the quota for the state-mandated crops (cotton and wheat).
51. **The Village Assembly of Citizens (VAC) is an official body that is responsible for social development.** It covers several *mahallas*. If *dehkans* or *tomorka* owners have any complaints regarding irrigation water supply, they are expected to direct these to the leader of their *mahalla* or the head of the VAC. These persons are then expected to follow up with the WCA on behalf of the *dehkans* and *tomorka* owners.
52. **Farmers and WCA representatives that were interviewed claimed that typically, farmers only receive about 75 percent to 95 percent of the amount of water that is scheduled for delivery.** Primary reasons why farmers receive less water than originally allocated include: (i) droughts in upstream areas that lower water levels in the main canal; this was mentioned in the selected WCAs

in Kyzyltep District in Navoi Oblast, Pap District in Namangan, and Urgench District in Khorezm; (ii) the AIS supplying less water than what was agreed, even when water seems to be sufficiently available, which was allegedly the situation in the selected WCAs in Denov District, Surkhandarya, and Dustlik District, Jizzakh; (iii) excessive water use by *dehkans* and *tomorka* owners (as per case study WCAs in Navoi and Namangan); and (iv) electricity outages that interrupt irrigation pump activity, as was mentioned in the selected WCAs in Navoi and Jizzakh. Picture 4 shows one of the water pumps in the selected WCA in Jizzakh and Picture 5 displays irrigation pumps in Politemit-BKh WCA, Kattakurgan District, Samarkand.

Picture 4. Water pump in Haet Boshi WCA in Dustlik District, Jizzakh



Picture 5. Pumps for irrigating uphill plots Politemit-BKh WCA, Kattakurgan District, Samarkand



53. **In eight out of the ten case study WCAs, farmers said they have experienced a positive change in water availability during the last five years, and a decrease in conflicts over water.** Improvements were claimed to be due to WCA activities. It was suggested that before the WUAs/ WCAs were established five to six years ago, there were many water disputes among farmers. With the establishment of the WUAs/WCAs, however, water delivery schedules were agreed upon and farmers started to settle disputes among themselves via the WCA. This led to better water distribution and higher water availability for farmers. In the sampled WCAs in Dustlik, Jizzakh, and Pap, Namangan, however, water availability for farmers has not improved. Water consumers here claim they face many difficulties that have not yet been resolved. Overall water availability in the WCAs in Fergana and Namangan Oblasts is allegedly negatively affected by an increase in irrigation water use—such as for growing rice—in upper riparian countries.

Overview of the case study WCAs

54. As mentioned, and as can be expected from the selection process, the WCAs varied in size, water availability in the secondary canal, dependence on pumps, crop diversification, and so on. Table 2 presents the characteristics of each case study WCA. All WCAs were between 1,400 and 6,200 ha in size, except the selected WCA in Samarkand, which covers 23,000 ha. Dependence on pump irrigation (as opposed to gravity irrigation) ranged from 4 percent for the WCA in Denov, Surkhandarya, to 70 percent for WCAs in Urgench, Khorezm, and the *Kuwa urta buz anori* WCA in Kuwa district, Fergana Oblast. Cotton and wheat were the dominant crops, except in the *Kuwa urta buz anori* WCA where horticultural crops dominate. Six out of the ten WCAs have received donor support (see Table 2).

Table 2. Characteristics of the ten selected WCA sites

Oblast District	Khorezm Urgench	Samarkand Kattakurgan	Navoi Kyzyltep	Namangan Pap	Surkhandarya Denov	Jizzakh Dustlik	Syrdaryo Akaltyn	Tashkent Akhangaran	Fergana Kuwa	Fergana Kuwa
WCA	Goybu	Politemit-BKh	Suvchi Mehnat-Rohat	Chodak	Hazarbag-Denov Sakhovati	Haet Boshi	Mustakil Dier	Alisher Navoiy	<i>Kuwa urta buz anori</i>	Qodirjon Azimonov
Case study #	1	2	3	4	5	6	7	8	9	10
Length of canals (km)	92,6	1,097	113	150	213	155	216	25	41	26
Number of WCA members	43	202	15	10	84	83	44	37	135	50
% pump irrigation	70%	31%	3%*-30%**	30%	4%	50%	15%	20%	70%	0%
WCA area (total) (ha)	2,272	23,278	2,121	2,335	6,200	4,225	2,519	2,000	1,481	3,406
WCA area (irrigated) (ha)	1,811	23,278	1,859	2,335	6,200	4,225	2,519	1,780	1,325	3,406
Total area of main crops (ha) of private farmers	Wheat (407) and cotton (801)	Wheat (9,076) and cotton (14,202)	Wheat (494) and cotton (595)	Wheat (395) and cotton (459)	Wheat (1,532) and cotton (2,189)	Cotton (2,375) and wheat (1,740)	Cotton (1,254) and wheat (1,189)	Wheat (1,244)	Horticultural crops (1,006); cotton and wheat (273)	Cotton (481); wheat (409); horticultural crops (80)
Secondary crops (ha) of private farmers	Sunflowers (110), rice (47), vegetables (67), and melons (43)	Vegetables (113) and melons (21)	Vegetables (14), grapes (8), melons (5.7), and fruit trees (12)	Corn (269) and sunflowers (116)	Corn (300), sunflowers (40), vegetables (21), fruit trees (18), and melons (14)	Melons (4)	Corn (21), clover (21), melons (1.5), vegetables (1), and fruit trees (0.6)	Fruit trees (219), vegetables (618), melons (5), and mulberries (79)	Corn (30)	
Received donor support	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Overall water availability in main canal	Low	High	Medium	Low	Low	Medium	Medium	High	Medium	Medium
Extent of crop diversification	Medium	Medium	High	Low	Medium	Medium	Medium	High	High	Medium
Population density	High	High	Low	High	Low	Low	Medium	High	High	High
Gender representation in WCA	Medium	High	Medium	Low	High	Medium	Medium	High	High	Low

Source: Data collected for this study.

* WCA data.

** According to farmers interviewed for this study.

Staff and other WCA resources

55. The WCA director's qualifications, as well as the number of full- and part-time staff, varied widely across the case study WCAs (see Table 3). Some WCA directors had higher or vocational education, while others had only completed secondary school.
56. The number of WCA staff members varied between 3 and 15, and the number of WCA staff per farmer between 2.1 and 9, suggesting large differences in staffing efficiency. Full-time staff

members in our case study WCAs varied between 3 and 10, but when correcting for WCA size variation, the number is even larger. For example, *Chodak* WCA in Pap, Namangan, has only 1.7 farmers per full-time staff member, while this figure is 8.8 for Alisher Navoiy WCA in Akhangaran, Tashkent Oblast (see Table 3). Overstaffing however does not necessarily suggest poor performance. The WCA in Kyzyltep, Navoi, for example, seems overstaffed but was said to perform well.

Table 3. WCA staffing for each case study site

Oblast	Khorezm	Samarkand	Navoi	Namangan	Surkhandarya	Jizzakh	Syrdaryo	Tashkent	Fergana	Fergana
District	Urgench	Kattakurgan	Kyzyltep	Pap	Denov	Dustlik	Akaltyn	Akhangaran	Kuwa	Kuwa
WCA	Goybu	Politemit-BKh	Suvchi Mehnat-Rohat	<i>Chodak</i>	Hazarbag-Denov Sakhovati	Haet Boshi	Mustakil Dier	Alisher Navoiy	<i>Kuwa urta buz anori</i>	Qodirjon Azimonov
Case study #	1	2	3	4	5	6	7	8	9	10
Educational qualification of the WCA director	Vocational	Vocational	Vocational	Secondary school	Higher education	Secondary school	Vocational	Higher education	Higher education	Vocational
Full-time staff members	5	7	7	6	10	8	8	3	15	7
Number of qualified staff* who are full time	5	6	6	4	8	3	5	3	2	7
Part-time staff members	2	17	0	0	3	0	0	1	10	15
Total number of staff	7	24	7	6	13	8	8	4	25	22
Length of lined and unlined tertiary canals (km)	92,6	1097	113	150	213	155	216	20	41	26
Number of WCA members (private farmers)	40	202	15	10	73	63	44	35	135	50
Number of WCA members/number of staff	5,7	8,4	2,1	1,7	5,6	7,9	5,5	8,8	5,4	2,3
Number of staff members/number of WCA members	0,18	0,12	0,47	0,60	0,18	0,13	0,18	0,11	0,19	0,44
Length of lined and unlined tertiary canals/ total number of staff	13,2	45,7	16,1	25,0	16,4	19,4	27,0	5,0	1,64	1,18

* Those with more than secondary school.

An introduction to each of the case study sites is presented in Appendix 2.

- 57. All WCAs are affected by a shortage of qualified staff and high levels of staff turnover.** Farmers and WCA staff claimed that many well-qualified specialists who used to work on the *kolkhoz* and shirkat farms have left their jobs and were said to be no longer in the region/country. In seven out of the ten case studies, farmers and WCA staff claimed that weak technical skills of WCA staff was an issue. Only in the selected WCAs in Navoi and Tashkent Oblast was this not an issue.

Female farmers

- 58. Few of the private farmers in the selected study sites are women. The number of female farmers in the case study WCAs varies from 0 percent to 19 percent, and was on average 8 percent.** Interviews conducted with female farmers in Khorezm in Namangan and Akhangaran in Tashkent Oblast revealed that many of them started working at low positions in a *kolkhoz*. Because they performed well, they were promoted to a management position, where they obtained management skills, knowledge about agriculture, and made connections in the *Hokimiyat*. These skills and connections helped them to eventually lease farmland and successfully manage their own farms.
- 59. Study respondents pointed out that female farmers tend to be more active, outspoken, and in general manage their farms better than male farmers.** For example, there is only one female farmer in the WCA in Namangan, and she was the only farmer who managed to meet the state quota for wheat this year. Female farmers have equal rights and responsibilities, and study findings do not suggest any discrimination against female farmers by the WCA administration, government

organizations, or other farmers. Women nevertheless seem underrepresented in WCA decision-making bodies and positions.

Performance

60. Farmers were asked what they think defines a good WCA and good local water management and governance. The following qualities were mentioned most often:

- The irrigation and drainage systems are adequately operated and maintained; paperwork is taken care of; and good relations are upheld with AIS and BAIS, which saves farmers time.
- Conflicts and disputes are solved among WCA members so there is no need to involve other government bodies.
- Farmers receive assistance to not only get water on time, but also to find machines, seeds, fuel, or other inputs.
- Farmers feel they are involved in the decision-making process and build trust among themselves.
- The WCA is led by a capable person whom the community respects.
- Members of the WCA treat the irrigation system as a common good for which everyone is responsible. Farmers work together with the WCA to meet quotas and increase profits.
- The WCA has a financial buffer (in the form of an emergency fund) for emergency breakdowns in the irrigation system. This helps quickly repair breakdowns without being dependent on government organizations.

61. As can be seen in Table 4, farmers in the case study WCAs in Pap District, Namangan, and Dustlik District, Jizzakh, in particular, were unhappy with how their WCA functions. Overall water availability to main and secondary crops is low, and few fees are paid on time (in Dustlik). However, in other WCAs where water availability is low, farmer satisfaction is much higher (such as *Kuwa urta buz anori* WCA in Fergana Oblast) suggesting that other factors must be at play. In addition, water scarcity can be an incentive for successful collective action.

Table 4. Score of each of the ten WCAs along some performance criteria

Oblast	Khorezm	Samarkand	Navoi	Namangan	Surkhandarya	Jizzakh	Syrdaryo	Tashkent	Fergana	Fergana
District	Urgench	Kattakurgan	Kyzyltep	Pap	Denov	Dustlik	Akaltyn	Akhangaran	Kuwa	Kuwa
WCA	Goybu	Politemit-BKh	Suvchi Mehnat-Rohat	Chodak	Hazarbag-Denov Sakhovati	Haet Boshi	Mustakil Dier	Alisher Navoiy	<i>Kuwa urta buz anori</i>	Qodirjon Azimonov
Case study #	1	2	3	4	5	6	7	8	9	10
Water availability for main crops	Medium	High	High	Low	High	Low	High	High	Low	High
Water availability for secondary crops	Low	Medium	Medium	Low	High	Low	Medium	High	Low	High
Satisfaction of farmers with WCA activities*	High	High	High	Low	High	Low	High	High	High	High
Average annual WCA fee per farmer **	Low	High	High	No data	High	Medium	Medium	Low	High	High
Percentage of fee that is paid on time ***	High	Low	High	No data	High	Low	Medium	Low	Medium	Medium

WCA debt level ****	Medium	Low	Low	No data	Low	High	High	High	Low	Low
Overall WCA performance *****	Medium	High	High	Low	High	Low	Medium	Medium	Medium	High

* Criteria included farmers’ involvement in WCA activities; the WCA’s ability to solve irrigation-related issues; mediating conflicts among farmers, and so on.

** Less than Soum 0.5 million per farmer—low; more than 0.5, but less than Soum 1 million per farmer—medium; more than Soum 1 million per farmer—high.

*** Less than 50%—low; more than 50% but less than 70%—medium; more than 70%—high.

**** Less than 20% of the budget—low; more than 20% but less than 100% of the budget—medium; more than 100% of the budget—high.

***** Based on the first three table rows, and thus on farmers’ views.

62. Only one of the WCAs in our sample was run by a female director (*Kuwa urta buz anori* WCA in *Kuwa, Fergana Oblast*). Interviews revealed that, in addition to WCA staff, it is also mostly men who hold management positions in the government organizations responsible for water management (such as the AIS, BAIS, and *Hokimiyat*). While government agencies and WCAs do employ females, they mostly work as accountants or clerks and do not play an important role in decision-making processes.

63. Discussions with farmers and WCA staff revealed that performance is highly variable across the WCAs. Table 4 summarizes the performance of each case study WCA along a set of indicators on which (subjective) data were collected in the field, including overall satisfaction with WCA activities. The latter reflects the WCA’s ability to solve irrigation-related issues and mediate conflicts between farmers, as well as farmers’ involvement in WCA activities, among others. An overall WCA performance indicator is determined on the basis of the first three indicators—water availability for main crops, water availability for secondary crops, and overall farmer satisfaction, which all assume the values high, medium, or low.

64. *Chodak* WCA in Pap District, Namangan is one of the poorest-performing WCAs in our sample; irrigation water availability for main and secondary crops is unreliable and farmer satisfaction is low (see Table 4). The WCA is located in hilly terrain, and irrigation water is delivered to the WCA by two pump stations operated by the AIS. Farmers interviewed for this study said there are frequent interruptions in electricity supply and the pumping stations are often out of order. The AIS has no resources to install new equipment. Respondents claimed there are constant problems with water supply to the fields, which results in low agricultural yields. In addition, soil tends to be poor and not very suitable for cotton and wheat cultivation; soil salinity was also said to be high. Some farmers have not been able to meet their cotton and wheat quota and gave up or had to give up their land. 30 percent of the land relies on irrigation pumps to water their crops (see Picture 6).

Picture 6. Pump operated by Chodak WCA in Pap District, Namangan



65. **Farmers in the *Chodak* WCA do not want to pay for irrigation water since they claim the WCA does not deliver enough to them.** Many farmers claim the WCA administration has poor management skills and water management is weak. The WCA head and most of the WCA staff have less than secondary education and are less qualified than in the other case study WCAs. Respondents said the staff has poor record-keeping and long-term planning skills. *Dehkans* and *tomorka* owners use water from a separate mountain river and do not use water from the WCA-managed system. *Dehkans* also use wells and apply drip irrigation technology. Some claimed that in this WCA, given its water management difficulties, it is preferable to be a *dehkan*, as one can more easily choose the most suitable crops to grow and there is less land to manage.
66. ***Haet Boshi* WCA, in Dustlik District, Jizzakh Oblast, is the other WCA where farmers are unsatisfied with the irrigation water supply and regard the performance of their WCA as poor (see Table 4).** Dependency on pump irrigation here is also high (50 percent) due to the somewhat hilly terrain. There are frequent electricity outages, which interrupts the irrigation pumps. There are two pumps on the WCA's balance sheet; one of them was broken when the field research took place. Farmers own another 12 pumps and pay for pump electricity themselves. Soil salinity is high. The WCA head has only had ten years of schooling and was said to have limited planning skills. The WCA employs eight people, and only two of them have educational qualification above secondary school.
67. ***Hazarbag-Denov Sakhovati* WCA in Denov District, Surkhandarya Oblast, is among the better-performing WCAs with high farmer satisfaction (see Table 4)** despite low water availability in the main canal (see Table 2) and no donor support. Nearly all land (96 percent) is served through gravity irrigation. The head of the WCA is well respected by the members. He has completed higher education and has extensive experience in agriculture. He advises farmers on cultivation and water management matters. Even staff from the *Hokimiyat* come to him for advice. The WCA employs five *mirobs* who take care of water in the area. Unlike in some other WCAs, *dehkans* and *tomorka* owners are included in the water distribution schedule and receive water accordingly. They were said to receive sufficient water. There are separate canal off-takes for *dehkans/tomorka* owners' land. This allows the WCA to deliver water to their land according to certain schedule and control the amount of water supplied.
68. ***Suvchi Mehnat-Rohat* WCA in Kyzyltep District, Navoi Oblast, is also a high-performing WCA (see Table 4), even if overall water availability in the secondary canals is "medium" (see Table 2).** Farmers indicated that there usually is enough water for main and secondary crops, but there are water supply shortages due to droughts or unlimited water consumption by *dehkans* and *tomorka* owners. The WCA does not have any debts, and farmers pay their irrigation fees on time. The WCA's director is well educated and well off, and enjoys the respect of the farmers and members of the local community. However, *dehkans* and *tomorka* owners take water from the WCA interfarm canals whenever they can, and their unscheduled use causes frequent conflicts between farmers and the WCA administration. However, the WCA has no right to legally limit their water consumption. There are no canal intakes to *dehkans* and *tomorka* owners' lands.
69. ***Qodirjon Azimonov* WCA, Kuwa District, Fergana Oblast, also performs well. Farmers are satisfied with the way it functions, and water supply to both main and secondary crops is high (see Table 4).** All irrigation is by gravity. The WCA recently installed meters on interfarm canals in this WCA (with the help of a donor). The WCA director has secondary vocational education (in irrigation). *Dehkans* and *tomorka* owners pay the irrigation fee to the VAC and *mahalla* offices, which then transfer the funds to the WCA. *Dehkans* and *tomorka* owners are included in the irrigation schedule.

For a full description of all ten case study WCAs, see Appendix 2.

70. **Seven out of the ten case study WCAs lack equipment to maintain the irrigation system. These include low-, medium-, and high-performing WCAs.** This includes the poor-performing case study WCAs in Pap, Namangan, and Dustlik, Jizzakh, as well as for the medium-performing WCA in Urgench in Khorezm, Akaltyn in Syrdaryo, *Kuwa urta buz anori* WCA in Fergana Oblast, and the high-

performing ones in Kyzyltep in Navoi, and Denov in Surkhandarya. Tractors, bulldozers, and cranes are needed to maintain and repair canals. WCAs that do not have these machines borrow them from either the AIS or *Hokimiyat*, or from well-off farmers. This makes the WCA inflexible and less autonomous. WCAs that have these machines are able to conduct repairs more efficiently.

71. **Some relatively well-performing WCAs received equipment from donors, but not all well-performing WCAs received donor support.** Farmers have helped maintain the machines by paying for spare parts, fuel, and mechanics' labor costs. The selected WCA in Akhangaran, Tashkent Oblast had received a tractor and a bulldozer (now broken) from a donor-funded project. In Kuwa, the WCA had received some machines from the former shirkat, which has been well maintained and is used to maintain canals. In *Chodak* WCA, Pap, Namangan a tractor and bulldozer were provided to the WCA from a former shirkat. When these broke down several years ago, the WCA administration was unable to fund repairs, keeping the machines grounded. Handing over machines to these poorly performing WCAs has not appeared to solve the issue. Three out of the ten WCAs, including the poorly performing one in Pap, Namangan, and Dustlik, Jizzakh, as well as in Akaltyn, Syrdaryo, also lack office equipment, including personal computers. Clearly, owning good equipment helps but is not a prerequisite for good performance.
72. **The WCA head's qualification appears to be associated with WCA performance.** For example, the case study WCAs in Akhangaran, Tashkent Oblast, and Denov, Surkhandarya Oblast, and *Kuwa urta buz anori* WCA in Kuwa, Fergana Oblast, have a director that has completed higher education and also has extensive work experience in agriculture (see Table 3). These WCAs perform relatively well, except for the *Kuwa urta buz anori* (see Table 4). Good directors were said to be able to engage farmers in WCA activities and build trust among members as well as with government officials. They are more able to hire educated and skilled staff members, and also have an easier time introducing innovations and new technology such as drip irrigation, water meters, and pumps. In contrast, WCAs where the head has no additional training beyond secondary school and limited relevant management experience—such as in the selected WCAs in Dustlik, Jizzakh Oblast, and Pap, Namangan Oblast—performed among the worst. Here WCA members and government officials appear to have less respect for the decisions of WCA directors and the WCA has trouble arranging daily operations and collecting irrigation fees. However, many of these directors inherited a WCA that has significant problems such as debt, an irrigation system in poor condition, and broken equipment.
73. **Most of the well-managed WCAs appear able to attract qualified staff, while poorer WCAs struggle.** For example, in Suvchi Mehnat-Rohat WCA in Kyzyltep, Navoi, employees earn a good salary and are paid on time. The head of the WCA personally looks for the best candidates in the district to fill vacancies. Attracting qualified staff is a more significant issue for the WCAs in our sample that do not perform so well. They have difficulties collecting irrigation fees, are indebted, and are unable to pay salaries on time. They are unable to offer the kinds of working conditions that attract qualified staff, which worsens the WCA's performance and thus perpetuates the vicious cycle.
74. **The following "external" factors are associated with the quality of local water management.** Quality water management here implies that stakeholders view the distribution of irrigation water as fair and predictable.
- **Proportion of the total irrigated area that depends on electrical pumps and the reliability of the electricity supply.** The more the irrigation system relies on pumps, the worse the WCA performs. There are two reasons for this: (i) the pumps are usually on the government's balance sheet and are frequently broken; and (ii) frequent electricity outages interrupt the water supply schedule, causing shortages in irrigation water for farmers. The exception to this situation appears to be the sample WCA in Kattakurgan in Samarkand (see Table 5). Also, farmers that own pumps can face substantial electricity bills, which add to their overall input costs and thus increases production risk and vulnerability.

Table 5. Reliance on pump irrigation, quality of electricity, and overall WCA performance

Oblast District	Khorezm Urgench	Samarkand Kattakurgan	Navoi Kyzyltep Suvchi Mehnat-Rohat	Namangan Pap Chodak	Surkhandarya Denov Hazarbag-Denov Sakhovati	Jizzakh Dustlik Haet Boshi	Syrdaryo Akaltyn Mustakil Dier	Tashkent Akhangaran Alisher Navoiy	Fergana Kuwa <i>Kuwa urta buz anori</i>	Fergana Kuwa Qodirjon Azimonov
WCA	Goybu	Politemit-BKh								
Case study #	1	2	3	4	5	6	7	8	9	10
% pump irrigation	70%	31%	3%*-30%**	30%	4%	50%	15%	20%	70%	0%
Is the electricity supply for pumps reliable?	No	Yes	?	No	-	No	-	-	No	-
Overall WCA performance ***	Medium	High	High	Low	High	Low	Medium	Medium	Medium	High

* WCA data.

** According to farmers.

*** Based on water availability for main crops, water availability for secondary crops, and satisfaction of farmers with WCA activities (see Table 4).

- **Growing conditions, such as soil quality for the crops the state has assigned the WCA farmers to grow.** For example, in the sampled WCA in Pap, Namangan, soil salinity is high, and growing conditions are not favorable for cotton and wheat. Yields are therefore low and farmers have little incentives to improve local water management.
- **The WCA director's leadership skills.** All respondents pointed to this issue as very important. The WCA director should be able to build trust, strengthen social capital, establish good relations with farmers and officials, and include all water consumers (also the *dehkans* and *tomorka* owners) in water management. He/she should help ensure water is distributed in a fair way.

75. Overall water availability (the amount available to the WCA) appears to have an ambiguous influence on the quality of water management and on farmer satisfaction. In some WCAs where water is abundantly available, such as the case study WCA in Akhangaran in Tashkent Oblast, farmer satisfaction is high (although fee payment is low). However, even in WCAs where water is scarce, farmer satisfaction can be high, such as in the *Kuwa urta buz anori* WCA in Kuwa, Fergana Oblast. In this WCA, water is managed in a timely and fair way, even if water is scarce and its supply affected by frequent power outages that interrupt the operation of irrigation pumps.

3. Design principle 1: Well-defined boundaries

76. **Well-defined user boundaries and resource boundaries** is the first design principle for the management of common-pool resources. It refers to the importance of defining clear boundaries between legitimate and illegitimate users of the resource. It also emphasizes the need for well-defined resource boundaries that separate it from the larger biophysical environment. This chapter discusses the extent to which this principle is met in each of the case study areas, and what factors favor their presence.
77. **The resource system appears to be well defined in the case study WCAs—it is the irrigation water that is supplied to the WCA through the irrigation network run by the AIS and BAIS.** The irrigation resource boundaries are determined by the local hydrology, which in turn determines the layout of the canals and fields that can be irrigated from them. In some of the WCAs, *dehkan* and *tomorka* owners have their own separate water supply; for example, from a natural river or canal. This is the situation in the Pap, Namangan WCA, which has a fairly hilly terrain.
78. **The findings suggest that boundaries between legitimate and illegitimate users of canal irrigation water are not always clearly defined.** In most case study sites, *dehkans* and *tomorka* owners depend on water in the WCA-managed canals to irrigate their crops. This makes them de facto users of the common-pool irrigation canal water. However, WCA officials claimed that since *tomorka* owners and most *dehkans* are not registered as legal entities, they cannot officially join a WCA.⁸ As noted, even if the new regulation of 2013 allows for this, respondents were not aware.
79. **Discussions with *dehkans* and *tomorka* owners suggest that in some cases, very few of them have a good understanding of what a WCA is,** what it does, and what it could do for them—even if in nine out of the ten case studies they depend on water from WCA canals. This is illustrated by one *tomorka* owner in the following way:
- “I have never had any contact with our WCA. The WCA does not have any contracts with us, only with farmers. They do not even come to our mahalla. I also have not heard that any of our men participate in the WCA meetings. If there are any problems with the water supply we go to the head of our mahalla or VAC.”*
- Akhangan, *tomorka* owner, female, 66 years old
80. **Interviews revealed that the legitimate irrigation water needs of *dehkans* and *tomorka* owners are not always adequately taken into account by the WCA and AIS when water supply schedules are prepared, making them de facto illegitimate users.** Where this is the case, *dehkans* and *tomorka* owners erratically and unpredictably withdraw from irrigation canals, which undermines the proper management of irrigation canal water as a common-pool resource. In some cases the WCA water supply schedule takes into account the needs of *dehkans* and *tomorka* owners, or at least the VAC is consulted.
81. **Much also depends on where the *dehkans* and *tomorka* owners’ fields are located vis-à-vis the main interfarm canal.** In three of the sampled WCAs where their needs are not incorporated into the water supply schedule, irrigation water passes through *dehkans* and *tomorka* owners’ fields before it reaches the fields of private farmers. This is the case in the sampled WCAs in Pap in Namangan, Kyzyltep in Navoi, and Kattakurgan in Samarkand. The *dehkans* and *tomorka* owners withdraw water from these canals at will. As their water use is not included in the WCA delivery schedule, some farmers receive insufficient water, which can lead to conflict.

8. According to the Water Law, *Dehkans* and *Tomorka* owners can become members of a WCA. However many don’t either (i) due to lack of awareness among WCA staff, WCA members, local government officials and *Dehkans* and *Tomorka* owners, or (ii) for logistical reasons.

82. **When the fields of *dehkans* and *tomorka* owners that depend on WCA water are located toward the end of the interfarm canal, farmers need to allocate water to the *dehkan* and *tomorka* owners' land. This does not always happen.** In some cases (such as in our sampled WCA in Tashkent Oblast), the WCA water delivery schedule includes water for the *dehkans* and *tomorka* owners. In such a case, private farmers will let the water flow on to the *dehkans* and *tomorka* owners' land, provided they have enough to irrigate their own land. Our findings suggest that farmers may do this at night or on weekends. However, when there is a water shortage in the main canal, farmers are inclined to give priority to their own fields and ignore the needs of *dehkans* and *tomorka* owners.
83. **Some WCAs incorporate the irrigation water needs of *dehkans* and *tomorka* owners into their water delivery schedules. This happens in both high- and poor-performing WCAs.** (see Table 3). In two of the four high-performing WCAs, the needs of *dehkans* and *tomorka* owners are incorporated into the water delivery schedule, and they pay for irrigation water. In the selected WCAs in Surkhandarya, Tashkent Oblast, and Fergana Oblast, for example, the water delivery schedule takes the needs of this group into account. Farmers and WCA officials claimed that the schedule is adhered to and there are no conflicts between farmers and *dehkans/tomorka* owners. In five sites, WCAs have a contract with the VAC and/or the *mahalla* offices that represent *dehkans/tomorka* owners. This includes one of the poor-performing WCAs, the sampled WCA in Jizzakh (see Table 6).

Table 6. Incorporation of *dehkans* and *tomorka* owners in the WCA irrigation system in each case study WCA, and overall WCA performance

Oblast District	Khorezm Urgench	Samarkand Kattakurgan	Navoi Kyzyltep	Namangan Pap	Surkhandarya Denov	Jizzakh Dustlik	Syrdaryo Akaltyn	Tashkent Akhangaran	Fergana Kuwa	Fergana Kuwa
WCA	Goybu	Politemit-BKh	Suvchi Mehnat-Rohat	Chodak	Hazarbag-Denov Sakhovati	Haet Boshi	Mustakil Dier	Alisher Navoiy	<i>Kuwa urta buz anori</i>	Qodirjon Azimonov
Case study #	1	2	3	4	5	6	7	8	9	10
Water supply schedule for <i>dehkans</i> and <i>tomorka</i> owners and irrigation fee	No	No	No but VAC is consulted	No*	Yes	Yes	No* but VAC is consulted	Yes	Yes	Yes
Do <i>dehkans</i> and <i>tomorka</i> owners have their own water intake structures?	No	No	No	No*	Yes	Yes	No*	Yes	Yes	Yes
Overall WCA performance**	Medium	Medium	High	Low	High	Low	Medium	High	Medium	High

* Many *dehkans* and *tomorka* owners have their own separate irrigation system.

** Based on the reliability of water supply to farmers' main and secondary crops, as well as satisfaction of farmers with WCA activities.

84. **In some of the other case study WCAs (such as those in Khorezm and Namangan Oblast), no such contracts exist; *dehkans/tomorkas* have to rely on farmers to receive water from their interfarm canals.** In the poorly performing WCA in Pap, Namangan, the VAC and *mahalla* offices are located far from the WCA office (more than 25 km) and their representatives visit the WCA office only twice a year. The WCA here deals directly with *dehkans/tomorka* if needed. In some WCAs, *dehkans/tomorka* owners take water whenever they need it. This the case, for example, in the medium-performing WCA in Kattakurgan, Samarkand, where *dehkans/tomorka* owners are located near the main interfarm canal.
85. **Separate canal intakes for *dehkans/tomorka* owners exist only in two of the high-performing case study WCAs (those in Akhangaran, Tashkent Oblast, and Denov, Surkhandarya).** In one other high-performing and one other medium-performing case study WCA (in Navoi and Kuwa), there is a special mirob that was hired by the *mahalla* office who is in charge of water distribution among *dehkans* and *tomorka* owners. In the *Kuwa urta buz anori* WCA in Kuwa, Fergana Oblast, all *tomorka* owners have a contract with the VAC for the water supply, and the VAC has a contract with the WCA to supply water to *tomorka* owners' land (see Box 1).

Box 1. Contracting water supply between tomorka owners and a WCA in Kuwa, Fergana

In Kuwa urta buz anori WCA in Kuwa, Fergana Oblast, the money the VAC collects from tomorka owners is handed over in cash to the WCA. The WCA has nine mirobs, one of whom is responsible for supplying water to the tomorka owners' land. In addition, the VAC informally hires mirobs that are responsible for distributing water among tomorka owners. When the WCA is about to provide water to tomorka owners' land, the WCA mirob contacts the VAC, which asks their mirobs to inform the tomorka owners. The VAC collects money from the tomorka owners to pay the VAC mirobs (each family pays Soum 500–1,000 per month). All tomorka owners pay on time; there are no debts. If there are problems with water supply, the tomorka owners will contact the VAC mirobs or mahalla leaders, who, via the VAC, will contact the WCA mirob. The VAC head is also a member of the WCA supervisory board, which helps to negotiate better deals with the WCA. If there are significant water supply shortages, the VAC head can also talk directly to farmers and ask them to provide water to tomorka owners.

86. **In some cases, *dehkans* and *tomorka* owners receive irrigation water from mountain rivers and springs, and are not connected to WCA irrigation systems.** This is the case for the WCA in Akhangaran District, Tashkent Oblast, and parts of the selected WCA in Pap, Namangan. In such cases, *dehkans* and *tomorka* owners need to organize water rotation schedules among themselves. *Mahalla* leaders and the VAC can serve as intermediaries in these negotiations. However, research elsewhere in Uzbekistan suggests that such arrangements can be weak and lead to anarchy (Mukhamedova and Wegerich, 2014).
87. **As mentioned, in principle, the VAC represents the irrigation interests of *dehkans* and *tomorka* owners in the WCA. However, the VAC's involvement in decision making around the distribution of canal water for irrigation varies across the case study WCAs.** In the poorly performing case study WCA in Dustlik District, Jizzakh Oblast, respondents suggested that even if the VAC head represents *dehkans* and *tomorka* owners in the WCA and collects irrigation fees from them, in reality there is no official contact between the VAC and the WCA. In contrast, in the high-performing WCA in Kyzyltep District, Navoi, the head of the VAC is a member of the WCA supervisory board, which helps ensure the needs of *dehkans* and *tomorka* owners are met. In the medium-performing WCA in Akaltyn District, Syrdaryo Oblast, the WCA always consults the VAC when putting together the water delivery schedule to help make sure the needs of *dehkans* and *tomorka* owners are met.
88. **The new WCA regulation issued in 2013 makes it possible for *dehkans* and other water consumers to become members, even if they don't have a legal status.** However, in none of our sampled WCAs were *dehkans* or *tomorka* owners members of the WCA. Farmers reported that they had not yet noticed any significant changes in operating procedures following the re-registration and restructuring. WCA officials seemed unaware that *dehkans* and *tomorka* owners could now be WCA members.
89. **In this chapter, we discussed the extent to which there are clear boundaries between legitimate and illegitimate users of irrigation canal water, and also whether the irrigation system has well-defined boundaries.** The boundaries of the resource system are determined by the local hydrology, which in turn determines the layout of the canals and fields that can be irrigated from them. This makes the resource boundaries clear in all WCAs. Regarding boundaries between legitimate and illegitimate users, things are less clear. For example, it is not always clear whether it is legitimate for smallholders to use irrigation water from the WCA canal system. While *dehkans* and *tomorka* owners are de jure members of the WCA, in reality, not all members always recognize their needs. There is thus a de facto lack of clarity on their status, and water supply schedules do not always take their needs into account. This leads to friction and unpredictable water supply. However, a number of WCAs—those that perform perhaps somewhat better than others—have explicitly recognized smallholders as legitimate users by including their irrigation requirements in water delivery schedules, and sometimes even hiring a mirob to take care of their irrigation needs. Where this has happened, it has helped alleviate tensions between farmers and smallholders and

prevented unpredictable water supply shortages. In WCAs where there is a lack of clarity on this issue, however, the opposite happens. Clearly, including smallholder water needs in the WCA's day-to-day operations appears to be an important factor that determines the quality of local water management arrangements.

90. **A number of factors influence the extent to which legitimate and illegitimate users are clearly defined and thus whether the needs of *dehkans* and *tomorka* owners are included in the local management arrangements of irrigation water.** These include the following:

- **Separate canal intakes for *dehkans* and *tomorka* owners.** If there are special canal water intake structures for these smallholders' irrigation needs, chances are that their legitimate needs are met in a more reliable and predictable manner.
- **WCA contracts for supplying water to *dehkans* and *tomorka* owners.** Concrete and well-developed water supply contracts between the WCA and the VAC that specify how the legitimate irrigation needs of these smallholders will be met are also an important factor in this regard.
- **Distance between the VAC office and the WCA office.** We find that if the office of the VAC—which in principle represents *dehkans* and *tomorka* owners—is located far (say, 20 km or more) from the WCA office, it hampers effective communication between these two organizations. This makes it difficult to ensure that the irrigation needs of these smallholders are consistently met and that they pay their irrigation fees.
- **Distance between the fields of *dehkans* and *tomorka* owners and the main interfarm canal.** If their fields are close to the main WCA interfarm canal, their unregulated water intake may interrupt the main irrigation supply schedule to farmers. If their fields are further away from the canal, they will depend on farmers' willingness and preparedness to let water pass onto their fields. This factor of distance works in both ways, and could either support or undermine legitimate use of irrigation water.
- **Overall water scarcity.** If overall availability in the WCA area is low, there are stronger incentives to carefully plan water distribution and make sure every user's needs are incorporated in irrigation plans. However, whether this is the case also depends on production conditions and whether growers have the freedom to grow the crop that is most suitable for the area and most profitable.
- ***Mirobs* for *dehkans* and *tomorka* owners.** If there are *mirobs* to specifically take care of the irrigation needs of *dehkans* and *tomorka* owners, it is more likely that their needs will be met.
- **Active and effective VAC leaders and WCA directors.** All water consumers benefit when local leaders communicate effectively; when they adequately build trust between WCA members and also smallholders; and when they are active in decision making or supervisory bodies (such as the WCA board).

4. Design principle 2: Congruence between the benefits and costs of using irrigation water

91. **The second design principle for the sustainable management of irrigation water as a common-pool resource is that the benefits from using the resource must be proportional to the inputs used or effort made to obtain it.** These inputs can be in the form of labor, materials, or money. This principle also emphasizes that the appropriation and provision rules should be in line with local conditions and traditions. This principle, for example, could imply that the costs households incur for obtaining irrigation water are proportional to their needs (for example, depending on land size or crop type in our case) and use, as well as availability. This chapter discusses the extent to which this design principle is met in each of the case study areas, how this is related to WCA performance, and what factors are important for these principles to be met. We first look at the costs that water consumers incur for obtaining water, as well as the benefits of using the water; that is, the net returns from cultivating the irrigated crop. We will also look at the net returns to the amount of water used.
92. **User payments for irrigation water are generally not linked to the actual amount of water used.** Consumers in all ten WCAs incur three types of costs to obtain irrigation water: The irrigation service fee; additional costs to maintain canals or repair structures; and, in some cases, expenses to pump water to their fields. Of these three costs, only the expenses incurred for pumping⁹ are directly related to the amount of water consumed. The irrigation service fee consists of a low and fixed amount per ha (about Soum 10,000–60,000 per ha, or US\$3–24 per ha), depending on the crops grown. While these amounts differ across WCAs, in none of them is the fee directly linked to the actual amount of water used. Volumes of water supplied to farmers and other water consumers are generally not measured, and determining the level of the fee does not involve any field measurements. This is illustrated by an accountant from the selected WCA in Pap District, Namangan:

“I am an accountant and I do not know much on irrigation issues. For example, I do not know how to measure the amount of water that we supplied to farmers. We receive water according to a certain maximum. I am not able to check what percentage of the limit we actually received.”

—Namangan, accountant, male, 40 years old

Costs incurred for obtaining water

Irrigation service fees

93. **Farmers in many of the WCAs we studied consider the irrigation service fee to be a payment for the WCA’s operational costs only, and believe that the water itself should be provided for free. Others regard the fees as part of something they believe they have already paid for—the land tax.** Measuring and paying for actual volumes of water received is for many a new concept. Some farmers were worried that if water meters are installed, they will be charged for the actual amount of water supplied, which will increase their costs. However, this view was mostly common in the poorly performing sample WCAs in Pap District, Namangan, and Dustlik District, Jizzakh, where the quality of irrigation water delivery is unsatisfactory.
94. **Farmers who are not satisfied with the water supply refuse to pay the fee, or have not paid it for several years. In poorly performing WCAs such as the selected WCAs in Dustlik District, Jizzakh, and Pap District, Namangan, few farmers pay on time.** This makes it even more difficult for the WCA to operate and maintain the irrigation system, so it enters into a downward spiral of poor fee collection and poor repairs and maintenance (such as shown in Pictures 7 and 8).

9. Unfortunately, little information on pumping costs was available for this study. However, some WCAs lower the irrigation fees for those farmers that operate their own irrigation pumps.

Picture 7. Tertiary canal in Haet Boshi WCA in Dustlik District, Jizzakh



Picture 8. Water pipe for filling a tertiary canal in Haet Boshi WCA in Dustlik District, Jizzakh



95. In some WCAs, farmers pay the same fixed fee per ha for all crop types. This is the case in the medium-performing sample WCAs in Akhangaran, Tashkent Oblast, and Kattakurgan District, Samarkand (see Table 7). However, in other WCAs, the fee is lower for state-mandated crops than for the more lucrative secondary ones (for example, in the high-performing sample WCAs in Urgench District in Khorezm, Kyzyltep District in Navoi, and Kuwa District in Fergana Oblast), even if state-mandated crops use much more water. The irrigation fee for secondary crops can be the same for all secondary crops (such as in Navoi), or differ by crop type (such as in Khorezm). The WCA in Denov District, Surkhandaryya, is a unique case in that it is the only WCA in our study where the irrigation fee (in Soum per ha) for cotton is twice as high as for wheat and secondary crops. The alleged reason is that cotton is the most water-demanding crop in the area, and that the irrigation fee per ha for cotton cultivation should therefore be highest. It is interesting to note that overall water availability in the secondary canal here is low, which perhaps provides an incentive to the WCA to charge more per ha for the crop that uses the most water (cotton).

Table 7. Irrigation service fees (in thousand Soum/ha/year) for different crops

Oblast	Khorezm	Samarkand	Navoi	Namangan	Surkhandaryya	Jizzakh	Syrdaryo	Tashkent	Fergana	Fergana
District	Urgench	Kattakurgan	Kyzyltep	Pap	Denov	Dustlik	Akaltyn	Akhangaran	Kuwa	Kuwa
WCA	Goybu	Politemit-BKh	Suvchi Mehnat-Rohat	Chodak	Hazarbag-Denov Sakhovati	Haet Boshi	Mustakil Dier	Alisher Navoiy	Kuwa urta buz anori	Qodirjon Azimonov
Case study #	1	2	3	4	5	6	7	8	9	10
Cotton	10,6	10	30	11	20	10,7	13,5	10	34	25
Wheat	10,6	10	30	11	10	10,7	13,5	10	34	25
Secondary crops	Rice (30); other secondary crops (10.6)	10	60	45	10	Rice (30); other secondary crops (10.6)	13.5	10	120 (horticultural crops)	45 (horticultural crops)

Overall WCA performance **	Medium	Medium	High	Low	High	Low	Medium	High	Medium	High
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Source: Data collected from the ten case study WCAs.

* Based on the reliability of water supply to farmers' main and secondary crops, as well as satisfaction of farmers with WCA activities.

96. **As mentioned, and as seen in Table 7, the highest irrigation fees for cotton (Soum 20,000–30,000 per ha) are levied in three out of the four high-performing WCAs. In the other WCAs the fees vary between Soum 10,000 and 13,500 per ha.** Irrigation fees for wheat are the same as those for cotton except in one sampled WCA—the WCA in Denov, Surkhandarya, where irrigation fees for wheat are half those of cotton. The highest irrigation fees were levied in *Kuwa urta buz anori* WCA in Kuwa District, Fergana Oblast. Because of the scarcity of water, reliance on pumped irrigation water, and a relatively good return on their crops, horticultural farmers in this WCA as well as in the other selected WCA in Kuwa District have invested in drip irrigation technologies.¹⁰

97. **The two sampled WCAs in Kuwa District in Fergana Oblast charged higher fees per ha to grow horticultural crops (see Table 7), despite the fact that they receive less water with which to grow these crops than they do for others.** They were said to charge more because horticulture is more profitable. According to respondents in the two Kuwa WCAs, however, the fee payment rate is much higher among farmers that grow at least some horticultural crops. Focus groups with horticultural farmers and *dehkans* in this area revealed that they are ready to pay even higher fees, provided they receive better service. It would allow them to hire qualified *mirobs* and better maintain canals. This is illustrated by the following quote from one study respondent:

“We all are ready to pay even higher irrigation fees than Soum 143,000 per ha, if we get more water and will receive it on time. If we can water our trees eight times per season, as it is supposed to be, we will get higher income. If we have higher income, we can pay more money for irrigation. Our income depends primarily on the irrigation.”

—*Kuwa urta buz anori*, dehkan (horticultural crops), female, 49 years old

98. **Raising the irrigation fee might in theory help fund irrigation canal maintenance needs. However, this worries some WCA officials, who claimed that if farmers pay higher fees they will want to hold the WCA accountable for supplying the exact amount of water that is stated in the delivery contract** they have with the WCA. But since the amount of water supplied to farmers depends on how much the AIS and BAIS supply through the main canal, as well as weather conditions, the WCA administration is not confident they can honor the commitment. Moreover, WCA officials claimed it is impossible for the WCA to hold the AIS accountable for the water that it has agreed to deliver to the WCA. Also, fewer farmers might be able to pay the fee on time, and as a consequence the WCA will have more difficulty paying WCA staff salaries, which will cause tension. WCA officials also worry this will encourage farmers to leave the WCA and arrange for their own irrigation system; for example, by using tube wells.

99. **In well-functioning WCAs farmers already pay higher fees than in poorly functioning ones (see Table 7).** They are also already active in maintaining and repairing the irrigation system. This is the case in Kyzyltep District in Navoi, Denov District in Surkhandarya, and Kuwa District, Fergana Oblast. Moreover, farmers in the well-performing WCAs suggested that higher irrigation fees would be acceptable if it allows their WCAs to purchase/rent equipment or machines. The main reason farmers are motivated to pay a higher fee is that they see the results of the work their WCAs do, and they understand what they are paying for. They think that if a WCA functions well, they will get enough water and enjoy higher profits.

100. **In contrast, in poorly-functioning WCAs—such as the sampled WCAs in Pap District in Namangan and Dustlik District in Jizzakh—farmers do not agree to pay higher fees.** A significant number of

10. In Qodirjon Azimonov WCA in Kuwa, seven out of ten horticultural farmers recently installed drip irrigation. Six of them paid full price for the equipment themselves, and one took a loan from the bank.

farmers here are indebted. Some farmers fear that if water meters are installed they will have to pay for the unlimited use of water by *dehkans* and *tomorka* owners, who withdraw water through the canals going to their farm, which is said to be the case in Pap District, Namangan, and Kyzyltep District in Navoi.

- 101. The amount paid for the volume of irrigation water used (expressed in Soum/m3) is much lower for cotton than for wheat (and also than for horticultural crops, although this differed per WCA).** Expressed in m3 of water per harvested ton, cotton uses about three times more water than wheat and about 13 times as much as a horticultural crop like onions. However, when expressed in m3 per ha, cotton and onions are about equal in terms of water use, with each using about three times as much as wheat. In those WCAs where farmers pay much lower fees per ha for cotton than for horticultural crops, cotton growers pay much less for the irrigation water they use, compared to those that cultivate other crops (see Table 8).

Table 8. Irrigation fees per volume of water used, per crop type

	Irrigation fee (Soum/ha) (lowest)*	Irrigation fee (Soum/ha) (highest)**	Water use (m3/ton)***	Typical yield (ton/ha)	Water use (m3/ha)	Irrigation fee (Soum/m3) (lowest)	Irrigation fee (Soum/m3) (highest)
Cotton	10,000	34,000	4,200	2.5	10,500	0.95	3.24
Wheat	10,000	30,000	1,400	3	4,200	2.38	7.14
Horticulture (onions)	10,000	120,000	350	30****	10,500	0.95	11.43

Source: Field work conducted for this study.

* Lowest fee in the ten sample WCAs.

** Highest fee in the ten sample WCAs.

*** Source: Water footprint of cotton, wheat, and rice production in Central Asia, UNESCO-IHE (2010)

**** Knoema.com production statistics (Feb 2015).

- 102. An important observation is that in well-functioning WCAs (for example, the sampled WCAs in Navoi, Surkhandarya, and Kuwa), farmers not only pay higher irrigation fees; they also tend to pay on time.** In well-functioning WCAs, debt levels vary from 0 percent to 20 percent of the annual budget; while in poorly performing WCAs the amount owed by farmers to the WCA might be more than 100 percent of the annual WCA budget. An exemption is the WCA in Akhangaran District, Tashkent Oblast—this WCA was said to perform well and the fees are relatively low.
- 103. Farmers must pay irrigation fees WCA by bank transfer, as this is required by national law for all financial transfers between legal entities. This leads to substantial delays in payment.** As a consequence, the WCAs have trouble paying staff salaries and taxes when they are due. Such long payment delays have led WCA specialists to quit their jobs and search for other employment opportunities. These difficulties arise in two different ways.
- (i) Farmers sell their main crops to the government and receive payment for cotton (the dominant crop) in their bank accounts several months after the harvest. Therefore, in most WCAs they have trouble paying the irrigation fee on time. This was the case, for example, in the studied WCAs in Khorezm, Samarkand, Namangan, Jizzakh, Syrdaryo, and Tashkent Oblast.
 - (ii) In some WCAs (such as the one in Akhangaran District in Tashkent Oblast), many farmers grow horticultural crops, and many sell these for cash. They therefore do not always have money in their accounts to pay the irrigation fee. Here, farmers' total debt represents 111 percent of the WCA annual budget.
- 104. To counter the cash flow problem caused by the late payment for cotton harvests, WCAs accept the irrigation fee in the form of in-kind payments, such as harvest produce.** The WCA then officially deducts the price of the crops from the irrigation fee the farmer is supposed to pay, and distributes the crops among employees. This is the case, for example, in the selected low-performing WCAs in Dustlik District, Jizzakh, and Pap District, Namangan. Another form of in-kind payment involves farmers allowing the WCA to use their equipment/machinery and materials (fuel, cement, and so on) that are required to maintain the canals or repair some part of the common irrigation system.

The cost of the materials and rent are then deducted from the fee the farmer is supposed to pay the WCA. In the high-performing WCA in Kyzyltep District in Navoi, for example, instead of paying their irrigation fee, farmers sometimes rent out their equipment to the WCA, buy cement or fuel for maintenance and repair activities, or give the WCA some part of their harvest (secondary crops). In the medium-performing WCA in Akaltyn, some farmers said they repair a part of the common irrigation system in lieu of paying the irrigation fee.

- 105. In about half the WCAs we studied (mostly the low- and medium-performing ones) dehkans farmers and tomorka owners do not pay for the water they use (see Table 9).** In some of the case study sites they pay the VAC, which then transfers the amount to the WCA, fulfilling contractual obligations. In the latter case, amounts vary between Soum 15,000 and 50,000 per ha. Payments can be made in cash. The head of the high-performing Qodirjon Azimonov WCA in Kuwa District, Fergana Oblast, claims that collecting fees from *dehkans* and tomorka-owning households is difficult for several reasons. He conveyed that:

“When mirobs come to the houses, there are no adults at home or people say that they do not have money at the moment, or pensioners did not receive the monthly pension yet, etc. But anyone receives water anyway.”

WCA authorities have no legal way to cut them off from irrigation canal water. All they can do is hire an extra person to work with *tomorka* owners and convince them of the importance of paying for water.

- 106. Due to low payment of the irrigation fee, only a portion of the planned WCA budget is executed, although this significantly varies across WCAs (see Table 9).** This proportion varied from 37 percent in the low-performing WCA in Dustlik District in Jizzakh to 84 percent in the high-performing WCA in Kyzyltep District in Navoi. The total executed budget per km of interfarm irrigation canal varied between Soum 0.1 and 2 million per km, and this figure tends to be higher among the better-performing WCAs (see Table 9).

Table 9. Budgets of nine* of the ten case study WCAs

Oblast	Khorezm	Samarkand	Navoi	Surkhandarya	Jizzakh	Syrdaryo	Tashkent	Fergana	Fergana
District	Urgench	Kattakurgan	Kyzyltep	Denov	Dustlik	Akaltyn	Akhangaran	Kuwa ****	Kuwa
WCA	Goybu	Politemit-BKh	Suvchi-Mehnat-Rohat	Hazarbag-Denov-Sakhovati	Haet Boshi	Mustakil Dier	Alisher Navoiy	«Kuwa urta buz anori»	«Qodirjon Azimonov»
Case study #	1	2	3	5	6	7	8	9	10
Budget (planned, million Soum)	18	210,5	26,3	79,2	45,2	33,5	14,01	140	40
Budget (executed, million Soum); collected fee	15	96	22,2	60,2	16,9	17	6,43	85	16,3
Proportion of budget that is executed	83%	46%	84%	76%	37%	51%	46%	61%	41%
Canal length (km)	92,6	1097	113	213	155	216	25	41	26
Fee per km of canal** (million Soum/km)	0,19	0,19	0,23	0,37	0,29	0,16	0,56	3,4	1,5
Fee per km of canal*** (million Soum/km)	0,16	0,09	0,20	0,28	0,11	0,08	0,26	2,07	0,6
Salary and taxes (% of budget)	99%	70%	94%	51%	25%	24%	89%	52%	40%
Percentage of fee that is paid on time	83%	46%	84%	76%	37%	51%	46%	61%	41%
Debt of the WCA (% of budget)	20%	3%	17%	0%	162%	149%	111%	0%	0%
Overall WCA performance*	Medium	Medium	High	High	Low	Medium	High	Medium	High

* No data for Namangan are available.

** Planned budget/canal length.

*** Executed budget/canal length.

**** Budget for 2014.

Using their own funds to pay for maintenance

107. **Partly to avoid paying the labor taxes (see Box 2) that the WCAs incur for hiring employees, farmers claimed they have not gone through the WCA but have spent money directly on canal maintenance and repairing parts of the irrigation system that serve their area.** Farmers who said they used their own funds to maintain the irrigation system claimed they spent Soum 1–9 million. The money is used to rent canal cleaning and repair equipment, purchase materials, and pay for labor. One other reason why they prefer to arrange the maintenance themselves is that renting equipment, purchasing fuel, and buying other materials is up to 20–25 percent cheaper if one pays by cash. If they transfer the money to the WCA's bank account, however, the repair work will be more expensive for them. Rather than finance the maintenance and repair costs, the WCA's role therefore appears to have become helping farmers plan the maintenance, find machinery (for example, requesting it from AIS or Vodhoz), purchase fuel, and so on. This is especially the case for the high-performing WCAs.

Box 2. Taxes and WCAs

Taxes represent a significant portion of the WCA budget. Recent legislative changes turned the WCA in a nonprofit organization, requiring it to pay labor tax only. The WCA pays a unified social tax (25 percent of the salary budget), a pension tax (currently 3.5 percent; the tax rate changes every year), and a variable income tax for its employees that ranges from 7.5 percent to 22 percent, depending on how much the salary is above the subsistence wage. For example, if the total monthly salary budget (the amount that is actually spent on paying WCA employees) is Soum 2,000,000, only 71.2 percent of the amount (Soum 1,424,000) goes to employees, and 28.8 percent (Soum 576,000) is paid as taxes. Since for most WCAs the main item of expenditure is salary (70–100 percent of the budget), taxes are quite a substantial part of spending.

Source: Data collected for this study.

108. **The ability of many farmers to maintain the canals using their own cash depends on whether they can grow secondary crops.** Secondary crops in general are more profitable than main crops, and unlike cotton, farmers can sell them for cash (see below).
109. **An important part of the irrigation system's annual maintenance is done through hashars (work parties).** Respondents indicated that three different types of hashars are organized every year. The first is organized by the AIS to maintain secondary canals that provide the WCA with irrigation water. The second type involves the maintenance of canals located on farmers' land and the WCA's common irrigation canals. This type is conducted by the WCA together with farmers. The third type is organized by the VAC, where *dehkans* and *tomorka* owners clean and fix canals located on their land. *Dehkans* and *tomorka* owners participate in hashars twice a year to clean and repair the canals located on the land of their *mahalla*. Respondents reported that WCA staff rarely approach *dehkans* and *tomorka* owners to participate in hashars; VAC and *mahalla* leaders do it instead. In the selected WCA in Denov District, Surkhandarya, a small portion of the WCA (4 percent of the area) depends on pumps that are operated and paid for by farmers. To make things fair, the WCA charges these farmers only 50 percent of the irrigation fees.

Returns from crop production

110. **According to the data, costs and returns vary significantly across different crops and across farmers.** In this section we review the costs and returns for crops in WCAs with good water availability and good/medium performance (the sample WCAs in Akhangaran District in Tashkent Oblast, and Kyzyltep District, Navoi), and a WCA with low water availability and low performance (the studied WCA in Pap District, Namangan). The data suggest that wheat is more profitable than cotton, and most secondary crops are more profitable than wheat.

111. Growing wheat leaves a farmer with higher returns on average than growing cotton, mainly because the input costs to grow cotton are about 50–80 percent higher than for wheat, while gross returns for cotton are only 8 percent to 30 percent higher (see Table 10). The WCA irrigation fees account for only 0.8 percent to 3.5 percent of these costs. Net returns for cotton tend to be lower on average than for wheat, but can be equal to wheat when yields are high.

Table 10. Costs and returns of wheat and cotton cultivation, per ha, in ‘000 Soum

	Wheat		Cotton
Seeds	250–300	Seeds	120–150
Fertilizer	200–250	Fertilizer	400
Machines and fuel	300	Machines and fuel	500–600
Labor	200	Labor	550–700
WCA fee	10–30	WCA fee	10–30
Total costs	960–1,080	Total costs	1,580–1,880
Compulsory sale to state: 2 tons	824	Yield: 2-3 tons. All sold to the state	1,874–2,800
Sold on the free market: 0.5–1.5 tons	300–1,050		
Wheat straw	300	Cotton stalks	100*
Total gross return	1,424–2,174	Total gross return	1,974–2,900
Net returns (before tax)	464–1,224 (200–500 долл. США)	Net returns (before tax)	94–1,420 (24–530 долл. США)

Source: Interviews conducted in the case study sites with farmers.

Note: A farmer that grows wheat has to sell two tons per ha to the government at a price of Soum 412,000 per ton. A farmer can either keep and use the last 0.5–1.5 tons for his/her own needs, or sell it on the market. In 2014 the market price for wheat varied from Soum 600,000 to Soum 700,000 per ton. Farmers also produce 100 packs of wheat straw per ha as a side product, which can be sold for around Soum 3,000 per pack. To grow cotton, a farmer needs to spend around Soum 2 million (US\$670–800) per ha each year. Yields were said to vary between 1.5 and 3.5 tons per ha, but typically between 2 and 3 tons per ha. The average state quota for cotton production was said to be 2.5 ton per ha. The average price to sell cotton to the government ginneries was Soum 937,400 (US\$310–370) per ton of cotton in 2013. A cotton field provides 500–1,000 cotton stalks from 1 ha. The market for these was Soum 1,000 in 2014. However, farmers don’t sell these, but rather let their employees harvest them for free or as part of payment for their labor. We have estimated the value of these for farmers as Soum 100,000 per ha.

112. Crop yields can be highly variable, even more so under uncertain irrigation water supply conditions, which can reduce incomes (see Box 3).

Box 3. Income losses from poor irrigation service conditions

“The plan for the wheat for my farm is 3.5 tons per ha and I have to sell to the government 2.2–2.3 tons per ha. I have managed to meet the quota this year; however, many other farmers in the area could not do that. For the cotton the situation is much worse. I have spent a lot of money to plant the cotton this year. To cover the costs I borrowed Soum 10 million from the bank to pay for fertilizers, fuel, and seeds. However, when the cotton bloomed we did not have water. And we did not have water for the next three months—June, July, and August. None of our farmers could water the cotton. Because of that I have managed to harvest only 5 tons of cotton from 25 ha while my plan was 30 tons. My plan for the wheat was 40 tons and I managed to get 44 tons (120 percent). After paying all expenditures and selling wheat I had Soum 5 million on my bank account. And I have decided to cover part of my debt for cotton from this money. Basically after the season I even owe the bank some money.”

—Pap District, Namangan Oblast, female farmer, 51 years old

113. Apart from the lower input costs and thus the lower risks involved, there are a number of additional reasons farmers prefer to grow wheat instead of cotton. First, cotton occupies the field during the whole growing season (March–October), whereas wheat can be planted in winter (November) and harvested in late spring (June). Consequently, farmers can grow secondary crops on land where wheat has been harvested or can rent out the land to their employees for the

remaining four months of the growing season. Moreover, farmers receive government payment for the wheat crops immediately after delivery, whereas they need to wait several months after cotton is harvested for the money to be transferred to their bank accounts.

- 114. Farmers claim that secondary crops are much more profitable than the state-mandated crops. For example, the average net returns to land for growing vegetables can be as high as Soum 4 million (US\$1,600) per ha, 3–8 times higher than for cotton or wheat cultivation.** Farmers can sell their secondary crops on the free market and obtain all payments in cash. The actual income largely depends on the timing. Right after the peak harvest period, prices tend to be lower than they are 2–3 months later. As mentioned, secondary crops are often grown on land where wheat has just been harvested or on land devoted entirely to secondary crops. However, authorities only allow farmers to do the latter on 5 percent to 10 percent of their land.
- 115. Farmers’ net returns per volume of irrigation water tend to be much lower for cotton than for wheat and horticultural crops (onions) (see Table 11).** That is because the net returns per ha are lower for cotton while the volume of water used per ha is highest for this crop. In order to assess whether these returns to the volume of water are proportional to the costs incurred to obtain it, however, we need to compare these with, say, the irrigation fees paid for the water. This is shown in the last two columns in Table 11.
- 116. We see that for the lowest yields and lowest irrigation fees in our sample, farmers’ net returns per irrigation fee paid are five times lower for cotton than for wheat and ten times lower than for horticultural crops like onions, while for the highest yields, those for cotton and wheat are similar and for horticultural crops are lower (see Table 11, last two columns).** Note, though, that the figure for horticultural crops is based on the irrigation fee of Soum 120,000 per ha in *Kuwa urta buz anori* WCA, in Kuwa District, Fergana Oblast. If we take the second highest irrigation fee in the sample WCAs (of Soum 40,000 per ha, which is more typical), this figure is 100. The data indicate that farmers’ returns to irrigation fee paid are typically 1–5 times lower for cotton than for wheat, and about 2.5–10 times lower compared to horticultural crops (excluding *Kuwa urta buz anori* WCA) (see Table 11 last two columns). Note that these data exclude all other costs that farmers incur for irrigation water, such as their own expenses incurred to maintain the irrigation canals, purchase drip irrigation equipment, and so on.

Table 11. Farmers’ net returns per volume of irrigation water and return per irrigation water fee, per crop, and for the lowest and highest yields and fees

	Water use (m ³ /ton) ^a	Net returns per ha (Soum /ha) (lowest) ^b	Net returns per ha (Soum /ha) (highest) ^c	Net returns per volume of irrigation water (Soum /m ³) (lowest)	Net returns per volume of irrigation water (Soum/m ³) (highest)	Net returns per m ³ water/ irrigation fee per m ³ (lowest) ^d	Net returns per m ³ water/ irrigation fee per m ³ (highest) ^e
Cotton	4,200	94,000	1,420,000	9	135	9	42
Wheat	1,400	464,000	1,224,000	110	291	46	41
Horticulture (onions)	350	1,000,000	4,000,000	95	381	100	33 ^f (100) ^g

Source: Data collected for this study.

a Source: Water footprint of cotton, wheat, and rice production in Central Asia (UNESCO-IHE, 2014).

b Lowest yield in the ten sample WCAs.

c Highest yields in the ten sample WCAs.

d Lowest yields and lowest fees.

e Highest yields and highest fees, in the ten sample WCAs.

f Based on the high fee of Soum 120,000 per ha in *Kuwa urta buz anori* WCA, in Kuwa District, Fergana Oblast.

g Based on a more typical high irrigation fee of Soum 40,000 per ha in the sample WCAs.

- 117. In conclusion, we can say that while farmers’ net returns to the volume of water used are 2–3 times lower for cotton than for wheat and other crops, the returns to the amount paid for obtaining the water are similar to wheat, especially when cotton yields are high.** However, when cotton yields are low (for example, because it is grown in areas not very suitable for growing it) farmers’ net

returns to costs incurred for obtaining the water can be 5 times lower for cotton than for wheat. In these areas, the amount paid for the irrigation water is not proportional to the returns, compared to growing wheat or other crops.

- 118. The productivity of the tomorkas can be very high even if cash inputs are low, leading to high profits per unit of land.** No cash payments are incurred for labor or water as they use household labor, and free or cheap water from the irrigation canals when they can. Moreover, *tomorka* owners keep part of the vegetables to produce seeds for the next year, and use animal dung to fertilize the soil. The only cash costs they incur are land and property tax (for respondents in our sample, it varied from Soum 100,000 to 180,000 a year). In total, cash costs for growing crops on *tomorka* land would not exceed Soum 500,000 a year, and if they would sell everything that was harvested from these plots they would earn no less than Soum 1.5–7 million (from 0.1 ha of land) (see Box 4).

Box 4. Low cash costs and high returns to land for smallholders

“We do all the work in our tomorka and orchard ourselves, myself and my husband. Plant the crops, weed, harvest. Do everything ourselves. Fertilizers we do not buy, we have some livestock and use dung for the purpose. We also do not buy seeds to grow potato, onion and other vegetables. Instead, we use seeds from the previous year harvest. I think we only buy carrot seeds, but they are not expensive. We received a good return last year, for all the crops we got Soum 4.5 million. We were busy repairing our house this year. Because of that we received only Soum 1.5 million for selling our crops this year.”

— Akhangaran District, Tashkent Oblast, female tomorka owner, 66 years old

Obtaining water for main and secondary crops

- 119. Only in some WCAs are farmers able to obtain sufficient irrigation water to water the lucrative secondary crops. Annual water delivery schedule and contracts with farmers do not usually include a provision for irrigating secondary crops.** As was shown in Table 7 sufficient irrigation water for secondary crops is available only in the sample WCAs in Denov District in Surkhandarya, Kyzyltep District in Navoi, and Akhangaran District in Tashkent Oblast, all high-performing WCAs. Provided that the state production quota of cotton and wheat are met, farmers can in principle negotiate with the AIS and the *Hokimiyat* on what size land they are allowed to grow secondary crops, and have irrigation water delivered accordingly. But the data suggest that in reality, this is not a priority.
- 120. As water for irrigating secondary crops is usually not included in the water delivery schedule, farmers in most WCAs can only grow secondary crops by using irrigation water that is allocated to the main crops.** When they are able, farmers grow secondary crops after harvesting wheat in June. This is, for example, the situation in the case study WCAs in Denov District in Surkhandarya, Urgench District in Khorezm, and Akaltyn District in Syrdaryo. Estimating the water needs of secondary crops is said to be more complicated and requires time, according to the WCA director in Tashkent Oblast. However, many WCAs were said to have insufficient water in their canals to adequately irrigate secondary crops. In the sampled WCAs in Pap District in Namangan and Dustlik District in Jizzakh, water is not available to irrigate secondary crops; when they do not have alternative water sources (such as private wells), farmers only grow state-mandated crops. This situation is further illustrated in Box 5, which presents water allocation practices in the sampled WCAs in Kuwa District, Fergana Oblast.

Box 5. Water allocation in Kuwa causes farmers to lose money

Horticultural farmers in the case study WCAs in Kuwa District, Fergana Oblast, expressed their frustration that priority is given to state-mandated crops and that they are not allocated enough water to irrigate their horticultural plots. In Kuwa District, a large proportion of land is allocated to horticultural crops. However, the WCA's water allocation schedule gives priority to cotton and wheat. In spring and summer, cotton and wheat farmers receive water first, and in higher quantity. Farmers who grow horticultural crops, along with *dehkan* farmers and *tomorka* owners, receive water second. This can cause farmers to lose considerable income.

- 121. Horticultural farmers are sometimes forced to ask their *mirobs* to secretly reallocate water slated for other farmers' cotton or wheat plots to their horticultural plots, according to the interviews conducted for this study. This leads to social tension and even conflict.** Participants in discussions with horticultural farmers stated they receive water only 3–4 times per season instead of the required 7–8 times. They claimed farmers who grow wheat and cotton may receive a continuous flow of water for several days, while horticultural farmers receive water for only 20 minutes to several hours. Discussions with cotton and wheat farmers from Qodirjon Azimonov WCA in Kuwa District, Fergana Oblast, revealed that horticultural farmers tend to steal their water; they also said that horticultural farmers' *mirobs* reallocate water from their plots and hope the cotton/wheat farmers will not notice. Participants stated that they might even "get in a fight" with them because of this. *Mirobs* from the WCA were said to mediate conflicts between these two groups of farmers.
- 122. Horticultural farmers do not blame the WCA for the low priority given to their irrigation needs. Instead, they blame the policy of giving preference to state-mandated crops.** Horticultural farmers believe that the WCA works hard and tries its best to improve water management in the area. However, they wish that the government's irrigation policy would show more "respect" for horticultural crops so they can be allocated enough water to earn a decent income.¹¹ They also thought that the generally low amounts of water provided to the WCA by the AIS and BAIS and the generally low availability of water in the main canal were to blame for the lack of water available for horticultural crops.
- 123. The findings suggest that farmers who grow secondary crops use water more cautiously, irrigate their fields more efficiently, and look for ways to save water.** In particular, farmers who grow secondary crops often use drip irrigation, arrange for wells to be drilled, or mix water from drainage canals with water from the irrigation canal. This is the case in the sample WCAs in Urgench District in Khorezm, Akaltyn District in Syrdaryo, Kyzyltep District in Navoi, and Kattakurgan District in Samarkand, where water availability for secondary crops is low or medium.
- 124. Not being able to grow secondary crops lowers the benefits farmers get from using irrigation water, and from farming more broadly, and inhibits the means to jointly undertake the common irrigation infrastructure's operation and maintenance needs.** Farmer satisfaction regarding the WCAs is low in the two sampled WCAs in Jizzakh and Namangan, where no secondary crops are grown. As we have seen, benefits from using irrigation water appear to significantly differ between WCAs depending on the extent to which they can grow lucrative crops.
- 125. Despite WCA officials' claims that farmers at the tail end of the interfarm canals receive irrigation water for their lands first, tail end farmers tend to receive less water than others.** To address this problem, some of the WCA officials claimed to allocate more time and/or water to tail-end farmers. This is the case in the sample WCAs in Urgench District in Khorezm, Denov District in Surkhandarya, Kyzyltep District in Navoi, and Akhangaran District in Tashkent Oblast. Lining and repairing canals also helps in this respect. In areas where WCAs failed to provide tail-end farmers with sufficient water, these farmers have lower productivity and tend to refuse to pay irrigation fees; this was the case in the sample WCAs in Pap District in Namangan and Dustlik District in Jizzakh.
- 126. The relatively low profitability – from a farmers' point of view - of state-mandated crops undermines farmers' ability to sufficiently contribute to adequate maintenance of the local irrigation and drainage systems.** Somewhat inconsistently, the policy to give preference to state-mandated crops appears to be enforced even if the state has allocated a substantial portion of land to the much more profitable horticultural crops, making horticultural farmers vulnerable to late and insufficient irrigation services. There are signs that horticultural farmers are willing to pay much higher irrigation fees on the condition that their needs are given higher priority in local irrigation schedules.

11. It should be noted that in recent years the government has reduced the area on which cotton has to be grown, freeing up irrigation water for other crops.

Difference in costs incurred by male and female growers

- 127. Irrigation is traditionally a male responsibility, but the gender division of labor is changing due to the growing outmigration of Uzbek men.** This particularly affects *dehkans* and *tomorka* owners. Female members of households are traditionally responsible for duties such as gardening, weeding, and food processing, while male members of households are normally in charge of negotiating deals with government organizations, arranging irrigation, and irrigating household plots (Veldwisch, 2008). Following male outmigration, however, women in *dehkans* and *tomorka*-owning households have become more involved in agriculture and irrigation (Mukhamedova and Wegerich, 2014). Younger women have particularly started to play a more important role. However, it can be difficult for female farmers whose husband has migrated to take care of irrigation activities, as reflected in the testimony in Box 6.
- 128. Female *dehkans* or *tomorka* owners whose husband is absent often have trouble attending to nightly irrigation duties.** Farmers often only allow *dehkans* and *tomorka* owners to water their land during the night. These intakes might be located far from their house, and if men are not around, women must perform this difficult task. In addition, when there is a technical irrigation problem on a *dehkan* or a *tomorka* owner's land where there is no man, women claim it is difficult for them to fix it or to arrange for repairs (see Box 6). Clearly, the social cost incurred to obtain irrigation water is higher for women than for men, given the transport difficulties they face, especially at night (see Box 6).

Box 6. Women struggle to irrigate their plots

"I am the only female farmer in our region. If there is a need to water the field or check if there is water in the canal, men can do it by foot or bicycle. But this is more difficult for women to overcome the distance by foot. It was my turn to water the field last Monday; I got a call at 2 am that I can start watering. I went to my field but there was no water in my canal. The water started running at 4:30 am and after that I had to be for the whole day in the field to control the irrigation to my wheat crop. If there is no water it is a big problem for farmers. It is especially difficult for women. I do not have a husband and I have to do everything myself, sometimes it is very difficult. If there is no water on time I am very worried and can even cry. If there is water I am happy and get strengths to do anything".

—Namangan, farmer, female, 51 years old

*"There are households in our area that have to manage a *tomorka* while the head of the household and older children are working in Russia. Only the wife and younger children often remain at home. Farmers allow *dehkans* and *tomorka* owners to water their land mostly at night. It is difficult for the women to go 30 km from the *tomorka* to the gateway at night and leave kids home alone. There are farmers who help these women and allow them to use water during the day. But not all farmers are like that, especially in our area where there are frequent difficulties with water supply. And the woman cannot just not go to the gateway and not water the *tomorka*. In this case the family will starve."*

—Namangan, WCA accountant, male, 40 years old

"Women struggle a lot. We have to water our land at night—a woman cannot do it herself. She needs to find somebody to do that and pay him for the service. The person will ask for Soum 5,000–10,000 for one day depending on the amount of land that needs watering."

—Navoi, *tomorka* owner, female, 48 years old

- 129. In this chapter we reviewed whether the costs of getting irrigation water are proportional to the benefits of using it.** We found that in all WCAs the irrigation service fee is fixed per ha and not based on actual amount of water used. Amounts are low and the irrigation fee accounts for only a small percentage of total production costs. We find that in all of the WCAs we studied, irrigation fees are lowest for the crop that uses the most irrigation water—cotton, the main state-mandated crop.

However, there are substantial differences in cotton irrigation fees across WCAs. They tend to be lowest in the poorly performing WCAs, where farmers' level of satisfaction with irrigation services is low.

130. **Farmers' net returns to the volume of water used are 2–3 times lower for cotton than for wheat and other crops. In addition, the returns to the amount paid to get the water are five times lower when cotton yields are low.** This could be because it is planted in areas not very suitable for growing it. In these areas, the amount paid to obtain the water is not proportional to the returns, compared to growing wheat or other crops. However when cotton yields are high, net returns to the amount paid to obtain water can be the same for cotton and wheat.
131. **Charging lower fees to irrigate the state-mandated crops which tend to generate low profits for farmers may make the costs of irrigation water proportional to the benefits of using it, but doing so undermines the ability of WCAs to allocate water to the crops that are most profitable for farmers.** The best-performing WCAs tend to be those that are able to make water available to cultivate profitable secondary crops. They also tend to be the ones that charge the highest irrigation fees for these secondary crops. Both actions make it possible for farmers and WCAs to generate sufficient resources to maintain and repair the irrigation system.
132. **The state regulation that makes it mandatory for farmers to grow cotton in areas less suitable for growing it, together with the current practice of paying producers low prices for seed cotton, leads to low profit margins for cotton from a farmers' point of view, and makes it hard for WCAs to recover costs of operation and maintenance.** This particularly affects the WCAs where overall water is scarce and where there is limited irrigation water available to grow the more profitable secondary crops. These WCAs or their farmers often also incur additional pumping costs to meet their irrigation needs. When overall water availability is low, a WCA can still perform well, provided it is able allocate sufficient amounts of water to secondary crops, which enables farmers to recover their costs.

5. Design principles 4, 5, and 6: Those who monitor water use(rs) and those that sanction violators are accountable to water users

133. In the previous chapter we looked at whether the costs of appropriating irrigation water are proportional to the benefits it provides, and what factors determine whether this is the case. In this chapter we will look at design principles 4, 5, and 6. Design principle 4 requires that those who monitor the use of the irrigation canal water, and those who monitor irrigation water users, are accountable to those water users. Design principle 5 states that users who violate operational rules should be sanctioned by other users or by officials accountable to them. Lastly, design principle 6 implies that irrigation water users and their officials have access to low-cost conflict resolution methods.

AIS monitoring and accountability

134. The findings suggest that even though farmers sign water delivery contracts with the WCA, and the WCA is in principle accountable to water consumers, the AIS plays an important role in checking whether farmers stick to those water-use agreements. It is particularly common for the AIS to “look over the shoulders” of the WCA in the poorly functioning WCAs. The WCA also monitors farmers’ water use, but—unlike the AIS—does not have any legal way to penalize farmers.
135. While the AIS plays an important role in monitoring overall water use, it is not accountable to WCAs or water consumers. Even if a contract is signed between the WCA and the AIS, when the AIS is unable to honor the agreement and cannot deliver the agreed amount of water when needed, the WCA is not in a position to hold the WCA accountable. Data suggest that it is not uncommon for the AIS to be unable to deliver the agreed amount of water. This is usually due to lower-than-expected volumes of primary canal water it receives from the BAIS, though problems with outdated water pumps (see Picture 9), electricity supply, poor management, and lack of maintenance and repair to the irrigation structures under AIS responsibility likely also play a role.

Picture 9. Irrigation pumps owned and operated by Goybu WCA, Urgench District, Khorezm



136. The WCA is not in a position to enforce the contractual arrangement it has with the AIS, partly because the WCA does not pay for the water it receives from it. As we saw in Chapter 4, farmers pay irrigation service fees per the amount of land they have. However, study findings reveal that the WCAs, and thus the farmers, often receive only a portion of the promised water from the AIS. Indeed, the AIS may deliver less water if it turns out that there is greater water shortage and water levels in the rivers and canals are lower than anticipated, or if pumps or canals are broken and there are no funds for repairs. This has caused friction between farmers and WCAs. Farmers—especially those

who paid their irrigation fees on time—insist on receiving all of the water they were promised. But the WCA has no mechanism to hold the AIS to account and no way to force it to meet its contractual obligations. The WCA is not legally entitled to the water it was promised by the AIS, and will not be compensated if the deliveries are not made.

137. **Poorly functioning and outdated pumping equipment can be responsible for the AIS’s failure to deliver water to the WCA.** For example, the AIS of one of the worst-performing case study WCAs—the selected WCA in Pap District, Namangan—operates pumping stations that have low capacity and are frequently broken. The WCA’s water supply is often interrupted for days and sometimes weeks. Farm productivity is very low. The WCA is said to be poorly managed and some farmers refuse to pay the fee, or pay very late. The current head of the WCA was appointed by the *Hokimiyat*, as nobody wanted to apply for the position. Picture 10 shows a WCA pump in Pap District, Namangan.

Picture 10. WCA-owned water pump in Pap District, Namangan



138. **The AIS’s lack of accountability to the WCA appears to be an important reason why some WCAs are not keen on raising irrigation service fees.** Some WCA officials claimed that if irrigation fees are raised, farmers will demand more accountability from the WCA regarding the quantity and timing of water delivery to their farms. This is difficult for the WCA to do, given that they in turn rely on water delivery from the AIS, and there are few mechanisms to hold the AIS accountable if it fails to deliver water. This would suggest that the AIS’s limited accountability prevents the WCAs from mobilizing the resources needed to recover costs and pay for canal operation, maintenance, and repairs.
139. **The *Hokim* instructs local government and AIS officials to ensure that the water allocation schedule to the WCAs delivers sufficient and timely amounts of water to the state-mandated crops.** WCA members interviewed in all case study sites—except those in Surkhandarya and Tashkent Oblasts—claimed that the WCA water supply schedule almost entirely focuses on meeting the production quota of these state-mandated crops. Overall, the AIS and *Hokimiyat* have an interest in making sure WCAs are able to maintain the irrigation system, deliver sufficient water to farmers to (mainly) cultivate cotton and wheat, and prevent or settle disputes among farmers. Farmers stated they supported the interference of the AIS when the WCA is weak, as it helps them meet the state production quota.
140. **The strong involvement of the AIS in local water management planning and monitoring, especially when the WCA is weak, is related to the *Hokim*’s role in making sure local cotton and wheat production quotas are met.** As mentioned, in areas where the WCA is weak and its staff are not respected by farmers (such as in the sampled WCAs in Namangan and Jizzakh), the AIS and other government organizations intervene and more or less take over WCA management. However, given the continued weak performance of these WCAs and farmers’ low satisfaction with water delivery,

this “interference” seems to do little to improve the overall management of irrigation water as a common-pool resource. It also risks undermining design principles 4 and 5, which suggest that those that monitor resource use and sanction rule violators should be accountable to resource users.

141. **In contrast, in areas with strong WCAs (such as the sampled WCAs in Navoi, Surkhandarya, Syrdaryo, and Tashkent Oblasts), farmers suggested there is no need for the AIS and/or Vodhoz to intervene.** Their WCA was said to be able to handle all water management issues and sometimes negotiate all issues directly with BAIS. Farmers in the selected WCA in Tashkent Oblast, for example, claimed that the AIS can be abolished and that the WCA can work directly with the BAIS.
142. **A good practice was found in Kuwa District, where the AIS meets with all WCA directors in the district once every ten days** to discuss current issues with water delivery, maintenance activities (including hashars), new regulations, and required documentation, among other issues. Respondents regarded this as a good practice, as it provides opportunities for WCA directors to learn from each other. Relevant experiences and practices by WCAs outside Kuwa District are sometimes also discussed for how they can be applied to their own area.

WCA monitoring and accountability

143. **In the WCAs that function relatively well, the WCA administration has a strong informal influence on farmers’ water-use behavior and plays an important role in getting farmers to honor the water-use agreements they have signed with the WCA.** For example, in the sampled WCA in Akhangaran District in Tashkent Oblast, farmers have a committee called beshyuzbashi. WCA members elect the most respected farmers to sit on this committee, who then monitor the water consumption of all farmers in the area. They also help settle disputes among farmers, and help farmers complain to the WCA administration about not receiving sufficient water. The selected WCA in Denov District in Surkhandarya has a similar committee. In the case study WCA in Akaltyn District in Syrdaryo, the head of the WCA meets daily with members of the WCA during the irrigation season. All farmers typically attend these meetings. Discussion topics include whether everybody has used water according to the schedule, problems with water supply, and plans for the following day.
144. **In one WCA (Kuwa urta buz anori WCA in Kuwa District, Fergana Oblast) water delivery contracts with members explicitly include “force majeure” conditions,** stating the factors that are outside the WCA’s control (such as droughts, electricity supply interruptions, AIS pump breakdowns, and so on). This was said to decrease tension between the WCA and water consumers. Water is fairly scarce in this WCA, and returns to irrigation water can be high given the prominence of horticultural crops.
145. **It is unclear whether WCAs are allowed to sanction farmers or other water consumers that violate the irrigation schedule or make excessive use of water, such as through fines.** WCAs not being able to apply sanctions would undermine the design principle that those who violate operational rules are sanctioned by users or by officials accountable to users. An exemption to this practice, again, is the *Kuwa urta buz anori* WCA in Kuwa District, Fergana Oblast. Here, farmers’ water use is strictly monitored by the WCA, and, if they violate the rules, it is claimed that the WCA can stop supplying water to their farm for a period of time. The eight *mirobs* who control the water supply to farm plots keep a journal where farmers have to sign for the water received. There is even a special journal for *tomorka* owners where they can write complaints to the WCA.
146. **Finding qualified *mirobs* is a particular challenge for many WCAs.** Poor technical skills make staffing *mirobs* difficult in places such as Goybu WCA in Urgench District, Khorezm, and *Chodak* WCA in Pap District, Namangan. It is difficult to find enough young and qualified specialists willing to work in rural areas. To do this challenging job, *mirobs* are low paid (Soum 200,000–400,000 per month) and

often paid late. They have to travel long distances, be in the field at night, and have technical and social skills. Some WCAs rely on young people who lack social skills, which can exacerbate water conflicts.

147. **Many respondents indicated the need to install meters and controlling devices to monitor water use. This came up, for example, in the sampled WCAs in Khorezm, Samarkand, and Denov, Surkhandarya.** WCA staff claimed these devices can help resolve water consumption conflicts between farmers. They can also enable the WCA to verify precisely how much water was received from the AIS during the season. If this amount was less than what was agreed, the WCA should at least in theory be able to complain to the AIS and hold it accountable, or negotiate for an increase in supply. Picture 11 shows a tertiary canal intake (without metering device).

Picture 11. Tertiary canal intake in Politemit-BKh WCA, Kattakurgan District, Samarkand



Conflict resolution

148. **Irrigation water shortages were said to have a range of serious consequences, including:** (i) tension and conflicts between farmers and the WCA (such as in the sampled WCAs in Jizzakh and Navoi), between farmers and *dehkans/tomorka* owners, and/or between farmers; (ii) farmers refusing to pay ISFs (such as in the sampled WCAs in Namangan and Jizzakh); (iii) farmers losing their land-use rights if they are unable to meet the state quota; and (iv) migration of farmers to other regions of Uzbekistan or abroad (such as in Namangan).
149. **As mentioned, conflicts can arise if *dehkans* and *tomorka* owners frequently make unplanned water withdrawals from irrigation canals, which causes water shortages for private farmers further down the canal.** In some WCAs, this has led to conflict between farmers and the *dehkans/tomorka* owners and between farmers and the WCA administration. The WCA does not have any power or legal way to impose penalties on *dehkans* or *tomorka* owners, as they are not members of the WCA. This was the case in the Navoi and Namangan WCAs.
150. **If there are disputes among farmers over irrigation water, they are solved through discussion meetings or settled personally by the WCA head.** This approach works particularly well in those WCAs where the head enjoys the respect of the local community (such as in the sampled WCAs in Navoi and Samarkand).
151. **A number of WCAs have informal well-functioning conflict-resolution mechanisms.** These include informal committees made up of respected community members and experienced farmers. In the case of conflict regarding water use between different users, these committees try to mediate a solution. In some WCAs, the most respected farmers have established a special committee that deals with all water disputes among farmers. In the event of a water supply problem, farmers

forward a complaint to the committee, which helps negotiate the issue with the WCA. This is a relevant example of Ostrom's sixth design principle, which states that water users and their officials should have "rapid access to low-cost local arenas to resolve conflicts among users or between users and officials" (Cox, Arnold, and Tomás, 2010).

152. **As mentioned, some respondents (for example, in Surkhandarya and Jizzakh) claimed that if there are no water meters, it is very difficult for the WCA to know the actual amount of water that was supplied to a farmer.** Similarly, it makes it hard to determine what amount of water the WCA actually received from the AIS, and to enforce water delivery contracts and solve problems around perceived shortages.
153. **In conclusion, the AIS's lack of accountability makes it hard for WCAs to deliver good services, and undermines its ability to raise irrigation fees.** Also, while it is helpful in the short term for the AIS to "take over" the management of weaker WCAs, in the medium term it damages the WCA's authority and capacity to solve their own conflicts. It also undermines the sustainable management of the irrigation canal water as a common-pool resource. The inability of the WCA to sanction its members when they break water-use rules and regulations has a similar effect.
154. **However, there are number of informal practices that promote effective monitoring and improve the accountability of the AIS and the WCA.** Some WCAs—especially the better-performing ones—have found mechanisms to monitor water use and water consumers, and hold the WCA to account through a committee of respected farmers. Other WCAs hold daily meetings with members of the WCA during the irrigation season. In some of the case study areas, the AIS meets with WCA directors on a regular basis (once every ten days), possibly ensuring some informal way to prevent disputes over water delivery. As mentioned by respondents, installing meters and controlling devices to track water use would go a long way toward improving monitoring and accountability for irrigation water.

6. Design principles 3, 7, and 8: Users can modify rules and have the right to devise their own institutions; these are nested in a larger resource system

155. **In the previous chapter we looked at design conditions 4 and 5 for the management of common-pool resources**, which are about resource use and user monitoring and accountability. We assessed how these differ across WCAs and why. In this chapter we review design principles 3 and 7, which concern the need for common-pool irrigation water users to be able to modify rules and devise their own institutions. We also review design principle 8, which looks at cross-scale cooperation and vertical linkages between the local irrigation water management institutions and the larger irrigation resource management system.

WCA decision-making structures

156. **In each case study site, the WCA administration reports to a General Assembly that consists of farmers and WCA staff, but the meeting is also attended by officials of the AIS, BAIS, Vodhoz, VAC, and by Hokimiyat and mahalla leaders.** In principle, the General Assembly oversees the WCA staff and its director. The agenda can include the election of the WCA head, board members, and sometimes the appointment of other key staff members. Also up for discussion are the budget and irrigation fees for the coming year as well as planning maintenance activities for the irrigation system. In one of the selected Kuwa WCAs, for example, the WCA presents a report about its activities, and WCA staff and water consumers can pose questions to *Hokimiyat* and AIS officials.

157. **At the start of each growing season, each WCA administration drafts a budget for their upcoming expenditures to ‘run’ the WCA which is discussed during the general assembly.** This budget includes staff salaries, office costs, other costs (electricity, fuel) for operating the irrigation and drainage system, and taxes. Then during the general meeting farmers discuss and vote on the proposed budget. In principle, members can propose adjustments and the final budget and the level of the irrigation service fee are decided through majority vote. As we have seen, the fee varies among WCAs. Also it was said to be up to WCA members to decide whether they want pay one single fee per ha for all crops or whether they would like the fee to differ between crop types.

158. **How frequently General Assembly meetings are held varies across WCAs.** In our sample, the number of meetings in 2013 varied from no meetings in the poorly performing WCA in Dustlik District in Jizzakh, to 20 meetings in the high-performing WCA in Kyzyltep District in Navoi, with meetings typically taking place 2–6 times a year.

159. **In addition to the General Assembly, all WCAs have a supervisory board of farmer and community representatives that oversee the WCA director.** The WCAs appear to benefit from the hands-on monitoring and day-to-day problem solving these board members provide. This is particularly so in the high-performing WCAs. However, the regulation issued by the Ministry of Justice in 2013 weakens the oversight role of this board and gives more power to the WCA director.

Government involvement

160. **In WCAs where farmers were not satisfied with the quality of water management, they feel helpless about the situation. They do not regard the WCA as “their” organization but rather as an additional government entity.** In particular, in the selected WCA in Pap District, Namangan, many farmers are frustrated by poor water management and the WCA’s inability to solve problems. Farmers at the tail end of the canal in this WCA receive insufficient amounts of water, and many struggle to meet the production quotas for cotton and wheat. Many refuse to pay their irrigation fees. In the poorly performing WCAs, both the WCA administration and farmers see no other solution but to have the government take over the financing of the WCA’s operations and the maintenance of the irrigation system.

- 161. Many respondents in the low-performing WCAs claim that their WCA is too weak to solve the issues that arise; they suggest significantly involving the AIS and Vodhoz in water management at the local level instead.** In the WCA in Pap, Namangan, for example, the *Hokimiyat* temporarily appointed a WCA director, as WCA members appeared unable to identify one to help them solve their water management problems. In low-performing WCAs, trust among farmers—and between farmers and the WCA—tends to be low. Here, farmers are uncertain about the timing and the amount of water they will receive, especially those at the end of the canal. They are constantly stressed about meeting the quota, losing their land, and being unable to make at least some profit. Farmer incomes tend to be low. Also, there are more opportunities to “cheat” and take more water than allocated, which further erodes trust.
- 162. Findings suggest that inclusive governance arrangements can significantly increase farmers’ sense of community.** For example, in the sampled WCA in Denov District in Surkhandarya, WCA management has involved farmers, *dehkans*, and *tomorka* owners in operating and maintaining the irrigation and drainage system. Farmers provide their equipment to the WCA free of charge; the WCA only pays for the fuel. Farmers maintain the parts of the irrigation system that are located on their land, and *dehkans* and *tomorka* owners maintain the irrigation infrastructure that runs through their fields. The fees and water are fairly distributed. This WCA is fully responsible for all matters related to water management. The AIS and the *Hokimiyat* are minimally involved in water management in the area.
- 163. In many cases, the Hokimiyat, AIS, or VAC provides free office space for the WCA administration,** either in the *Hokimiyat* building or in the building of the rural administration. In other instances, donors provided support to establish WUAs. While government support to the WCAs is of course helpful, it also risks integrating them too closely into the government structure, which undermines their accountability to users.
- 164. In well-managed WCAs, farmers and the WCA administration help each other to maintain the irrigation system.** Farmers may provide the WCA with machinery and pay for fuel, spare parts, and labor when the WCA repairs interfarm canals. On the other hand, the WCA may help farmers repair on-farm canals, purchase fuel, or help farmers who lack equipment borrow what they need from the AIS or the *Hokimiyat*. To this end, the sampled WCA in Denov District, Surkhandarya, has a fund for emergencies (see Box 7).

Box 7. Emergency fund of the WCA in Denov District, Surkhandarya

In case of an emergency with the irrigation system—such as a canal breakdown—this WCA emergency fund allows the WCA to address the issue without involving government bodies. The fund currently consists of Soum 7.5 million. If a WCA has its own machinery—as do the case study WCAs in Tashkent Oblast, Surkhandarya Oblast, and Kuwa district—it can more quickly repair interfarm canals. In addition, the WCA can lend the equipment to farmers to repair on-farm canals; in return, farmers can help the WCA take care of the machines by paying for repairs.

- 165. In poorly functioning WCAs (such as the one Pap District, Namangan), the WCA is less involved in repairing interfarm canals and helping farmers maintain on-farm canals.** Farmers of this WCA claim that their WCA does not have the machinery or resources to maintain the irrigation system. Instead, the AIS and the *Hokimiyat* help farmers do this, for example, by providing machinery or materials. In this WCA, despite the low productivity and low income, farmers do their best to maintain on-farm canals, but receive no help from the WCA.
- 166. In seven out of ten case studies, WCAs members thought the WCA administration represented their interests, and regarded the WCA as “their” organization.** The seven case studies included the selected WCAs in Akhangaran (Tashkent Oblast), Navoi, Samarkand, Syrdaryo, Surkhandarya oblasts, and Kuwa district (both WCAs). Farmers here felt they were involved in the WCA’s decision-making process. Officials of these WCAs are to some extent able to negotiate irrigation regulations with government bodies, providing some flexibility to their implementation.

167. **In the well-performing WCAs, farmers and staff claimed to be driven by a “shared vision,” and the most experienced and resourceful farmers sometimes help others with advice, machinery, and even small loans.** Also, the WCA receives enough water to irrigate the main crops of all farmers; because water is less scarce, there is less need to “cheat.” This is the case in the selected WCAs in Surkhandarya, Syrdaryo, Navoi, and Tashkent Oblast. Here there is a common understanding that “everybody should meet the production quota” or that “all parts of the irrigation system should be well maintained.” This encourages farmers to work together and motivates well-off farmers to help others.
168. **The drive to produce state-mandated crops creates a common vision and goal for stakeholders, farmers, and local irrigation bureaucrats alike.** This joint sense of purpose, combined with strong incentives for local government officials to ensure farmers meet the production quotas, strengthens the overall commitment to the timely delivery of irrigation to cotton and wheat crops. WCAs are not allowed to fail, and the state will interfere if they collapse.
169. **Nonstate institutions such as the WCA can to some extent make independent water allocation decisions, but only within the overall framework of the state’s agricultural policy.** The state’s strong presence—even at local levels—ensures that the entire irrigation and drainage system is geared toward the production of state-mandated crops, and almost all water allocation decisions made by the WCAs serve these crops’ production. This makes the WCA and its members dependent on government directives, removing incentives to innovate and use more effective water management arrangements. Moreover, because of the relatively low profitability of the state-mandated crops, there are not enough resources to adequately operate and maintain the irrigation and drainage network.
170. **Respondents named two barriers to women’s inclusion in decision-making processes regarding water management.** First, few women have the necessary technical qualifications, such as hydroengineering or irrigation. Second, to hold a management position in a WCA or to be a farmer requires being in the field at night. It also involves traveling some distance every day (30–50 km). Few women can be at the field at night by themselves and not that many have driver’s licenses.
171. **WCA members have the right to organize, meet, and make decisions around how they allocate water, manage operations, and conduct maintenance.** They can decide on operational aspects, set the irrigation fee, and determine the irrigation schedule. A range of informal institutions for managing and maintaining canals, and for dispute resolution, have emerged in some of the better-functioning WCAs. In many, for example, farmers and smallholders make their own maintenance arrangements off the WCA’s books, mainly to avoid paying labor tax. This is particularly common for farmers that have their own machines. While this flexibility certainly has advantages in the short term, over time this could undermine the role and viability of the WCA in its current form.
172. **All decision making by WCA members has to remain within the overall state agricultural policy of giving priority to state-mandated crops.** These use most of the irrigation water, which removes opportunities for farmers to innovate and allocate water to more lucrative crops. *Dehkans* and *tomorka* owners can only indirectly influence water allocation decisions, and whether their right to organize is recognized depends on the quality of the interaction between the *dehkans*, *tomorka* owners, the VAC, and the WCA.

7. Conclusions and recommendations

173. **This final chapter presents conclusions and proposes a set of policy recommendations** that would help institute the design principles to manage irrigation water as a common-pool resource. We also present a first draft of a diagnostic tool that can be used at the local level to assess whether it is likely that the design principles are met and what can be done to make sure that they are.

Conclusions

174. **Overall, farmers claimed that the management of local irrigation water has much improved since WUAs/WCAs were established.** These organizations appear to have played a role in bringing structure to the chaos that surrounded the local management of irrigation canal water after the *shirkats* were abandoned.
175. **Farmers identified a number of characteristics of well-functioning local water management institutions.** These include: water is allocated in a timely and fair manner; operation and maintenance is well planned; good relationships are enjoyed with the government irrigation management system; conflicts among WCA members are solved internally; farmers are involved in decision-making processes; farmers trust each other; everyone takes care of irrigation system; and the WCA has a financial buffer for emergency repairs.
176. **In the eyes of stakeholders, a WCA's performance depends on three conditions.** First, the proportion of the WCA area that depends on electrical pumps should be low, especially if the supply of electricity is unreliable. Second, growing conditions should be suitable for the crops the WCA farmers have been assigned to grow by the state. If this is not the case, yields will remain low, which will lead to low profits for farmers, limited resources, and few incentives to improve local water management. Third, the WCA director should have high-quality leadership skills that enable him or her to build trust among users and the WCA; strengthen social capital; and establish good relations with farmers, officials, and all water consumers, including smallholders.
177. **Our data suggest that the presence of these characteristics and conditions is highly variable across WCAs in Uzbekistan.** Many WCAs are deeply in debt due to low irrigation fees, high salaries, and substantial operational costs. In some poorly functioning WCAs, farmers are demoralized and lack a reliable supply of irrigation canal water for their crops. They look to the local government to solve their problems. In other WCAs, however, farmers are satisfied with how their WCA functions, and feel involved in decision-making processes. Interestingly, overall water availability (the amount available to the WCA) has an ambiguous influence on the quality of water management and farmer satisfaction. Even in WCAs where overall water is scarce, farmer satisfaction with irrigation water management can be high.
178. **Relatedly, the Ostrom design principles for the management of irrigation water as a common-pool resource are met in some WCAs, but not others.** For example, the needs of *dehkans* and *tomorka* owners are not always included in the local management arrangements for irrigation water, which can interrupt the water supply to all users. A number of factors influence whether their needs are addressed: (i) if separate canal intakes exist for the irrigation needs of *dehkans* and *tomorka* owners; (ii) if the WCA has signed contracts with the VAC to supply irrigation water to *dehkans* and *tomorka* owners; (iii) if the VAC office is not too far from the WCA office (less than 10 km) to foster interaction between them; and (v) whether *mirobs* have been appointed for *dehkans* and *tomorka* owners.
179. **In situations where many male *dehkans* have migrated, their wives are left behind to take care of irrigation needs.** The current practice in which *dehkans* tend to receive their irrigation water at night has put these women in a difficult position for several reasons, one of which involves their need to care for their family. They also feel unsafe at night and are often unable to travel the far distances that can be required.

180. **In all of the WCAs we studied, irrigation fees are lowest for the crop that uses the most irrigation water—cotton, the main state-mandated crop. This undermines the second Ostrom design principle.** However, there are substantial differences in cotton irrigation fees across WCAs. They tend to be the lowest in the poor-performing WCAs, where farmers have a low level of satisfaction with irrigation services. This would suggest that farmers are prepared and able to pay higher fees—also for cotton and wheat cultivation—when irrigation service conditions improve. Those that grow cotton obtain much lower returns per unit of water used than wheat and horticultural crops when cotton yields are low (2 tons/ha). This implies that when growing conditions for cotton are poor there are enormous economic inefficiencies in using irrigation water to grow these crops anyway.
181. **WCAs are only willing to substantially raise irrigation fees (to better recover operation and maintenance costs) if they can hold the AIS more accountable for the amount of water they have agreed to deliver** (given weather conditions in upstream areas). The AIS's current limited accountability to the WCAs puts them in a difficult position vis-à-vis their members and makes it hard for them to be accountable for delivering irrigation canal water to farmers and other water consumers.
182. **The compulsory planting of cotton and wheat (even in areas less suitable for their cultivation) combined with low state purchase prices undermines farmers' ability to generate sufficient resources to pay for local operation and maintenance,** either through their own initiatives or through the irrigation fees they pay to the WCAs. Those WCAs that manage to make sufficient amounts of water available for the profitable secondary crops perform better and are better able to recover operation and maintenance costs. They also tend to be the ones that charge the highest irrigation fees for these secondary crops.
183. **The AIS's involvement in managing "weaker" WCAs (those that are unable to adequately manage their irrigation canal water in the medium term) undermines "ownership" and the sense of responsibility water users have for the management of canal water, and makes them dependent on the state.** WCAs lack the ability to sanction farmers or other water consumers—only the AIS can do this, which also undermines one of the design principles for reducing uncertainty and promoting trust for the sustainable management of common-pool irrigation water.
184. **There are number of good practices that promote effective monitoring and improve the accountability of the AIS and the WCA.** These include establishing a committee of respected farmers to solve conflicts, having daily meetings with members of the WCA during the irrigation season, and having the AIS meet with WCA directors on a regular basis.
185. **The current lack of meters and controlling devices to monitor water use** makes it difficult to monitor irrigation water and establish accountability relationships between suppliers and consumers.
186. **In many WCAs, farmers and smallholders make their own maintenance arrangements off the books of the WCA to avoid paying labor tax.** This is especially true of farmers that have their own machines. This could undermine the role and viability of collective action through the WCA in its current form.
187. **Even if irrigation canal water consumers in principle are able to devise their own institutions, meet, and make decisions, this design principle is undermined by the nationally enforced policy to make it mandatory to grow wheat and cotton.** Currently, WCA rules can only be changed if they remain within the overall framework of this state policy.
188. **Dehkans and tomorka owners can only indirectly influence water allocation decisions,** and whether their right organize is recognized depends on the quality of the interaction between the *dehkans*, *tomorka* owners, the VAC, and the WCA.

Recommendations

189. **The findings enable us to arrive at a number of recommendations for improving the local management of common-pool irrigation water in Uzbekistan.** These are presented below along three categories: institutions, policies, and investment.

Recommendations for institutions

190. **Clarify the roles and responsibilities of stakeholders in the management of local irrigation water in order to strengthen operational functioning of the WCAs.** This includes the AIS, WCA staff, WCA members, other water consumers and local government officials of other organisations. The clarification could be provided through a new Water Law/ Code (see below).
191. **Involve *dehkans* (especially women) more structurally in decision making that pertains to water allocation scheduling, and arrange for them to have canal water intakes. More awareness raising among them of how they should more actively engage with decision making and providing better support services to make that happen is important.** As *dehkans* and *tomorka* owners are important consumers of the irrigation water that is managed by the WCAs, their water needs must be better addressed, and their involvement in decision making that pertains to water allocation schedules must be more structural. The VAC does not currently seem consistently able to adequately manage this.
192. **Clarify in the Water Law/ Code whether WCAs are allowed to sanction water consumers that break the rules.** If WCA members establish rules and regulations for allocating irrigation water to all consumers, it is important that the WCA, under certain circumstances, be able to sanction water consumers that break those rules. This is an important condition for operating the irrigation system as a common-pool resource.
193. **Strengthen the provision of support services to the WCAs and promote learning across them, using successful WCAs as schools and training sites.** Many WCAs are in need of support services that better enable them to fulfill their role and better recover costs. Many of them confront similar challenges, but some appear better able to address them than others. There are significant learning opportunities to be had by exchanging experiences across WCAs, and in allowing poorly performing WCAs to learn from successful ones. Ultimately, such WCA-to-WCA learning could also be done across different countries in the region
194. **Encourage and empower the WCA board.** The WCA board plays an important role in supervising WCA authorities, giving advice, overseeing its overall functioning, and solving conflicts. It is important that its role be further strengthened and not undermined by new government regulations.
195. **Better track the irrigation system's performance through administrative data collection or sample surveys that feature some of the questions in the diagnostic tool.** In order to help policy makers understand whether water allocation systems are working and whether the BAIS, AIS, and WCA are adequately performing their functions, it is important that the WCA's performance is more systematically monitored. In addition, sample surveys could be conducted that systematically collect data on water users' satisfaction with the current irrigation system. Such feedback to policy makers and service providers is critical for addressing shortcomings in a timely manner.

Recommendations for policies

196. **Adopt a new water law/water code** and take legal measures that provide for a better financing aspects of WCA operations. These legal changes should better provide for the WCAs' financial and operational sustainability and provide a stronger accountability mechanism for their governance structure. The water code should provide a strong legal basis for the supervisory board of farmer and community representatives to oversee the WCA director. This study suggests that WCAs benefit from the hands-on monitoring and day-to-day problem solving these board members provide. The

water code should also provide a legal basis for a more contractual relationship between the AIS and the WCA, with clear monitorable agreements on water delivery. It should also arrange for a stronger, more structural, and direct role for *dehkans* and *tomorka* owners in decisions pertaining to water allocation. More broadly, the new water code should clarify the roles and responsibilities of all stakeholders in the management of irrigation water.

197. **Bring the water allocation policy in line with the land-use liberalization policy.** While the government has indicated its interest in allowing farmers to grow the crops that they prefer—usually horticultural crops—the water allocation policy at the local level often prevents the allocation of adequate irrigation water to these lucrative secondary crops. These also provide much higher returns per volume of water used, leading to more economically efficient water use.
198. **Lower the labor tax so WCAs can generate more resources for O&M.** A lower labor tax will improve WCAs' functioning by enabling them to more systematically contract laborers for maintenance work; farmers currently hire such laborers informally. This will make it possible for WCAs to better plan and implement canal repair and maintenance work.

Recommendations for investment

199. **Improve the water delivery contracts between AIS and WCA and install water meters at the level of the WCA canal intake.** Contracts that the AIS signs for the amount of water to be delivered to the WCA, and the amount actually delivered, need to be better monitored. The AIS need to be held accountable for the volumes of water it actually delivers to the WCA (given weather conditions in upstream areas). Meters at the level of the WCAs' water intake will enable these amounts to be more accurately measured. This would allow WCAs to provide more reliable irrigation services to its members and will open opportunities to raise irrigation fees and improve cost recovery.
200. **Upgrade outdated irrigation pumps.** Many WCAs and farmers depend on irrigation water that enters the canals through electric pumps, or they use pumps themselves. For a reliable and predictable supply of local irrigation canal water, it is important that outdated irrigation pumps that are owned and/or managed by the AIS (and possibly the WCAs) be replaced with modern ones. However, this requires a reliable supply of electricity to all areas in Uzbekistan, and requires a financing model to be found that enables pumping stations to recover their costs.

Diagnostic tool

201. **Using the findings from this study and following from the recommendations, we designed a diagnostic tool that can be used to assess whether, in a particular WCA and the corresponding AIS, it is likely that the design principles for sustainable management of common-pool irrigation water are being met.** This tool then helps assess the extent to which conditions for well-functioning local governance arrangements to manage irrigation canal water are present. It can also be used to design priority interventions to improve local water management to make sure it reduces uncertainty, builds trust, is more sustainable, reflects local conditions, and includes all water consumers.
202. **The tool consists of a set of questions that apply to a local management unit of irrigation canal water, such as a WCA.** These questions are based on each of the Ostrom design principles for the sustainable management of irrigation water as a common-pool resource.

Well-defined boundaries

- 1) Is there an institutional mechanism that enables the needs of *dehkans* and *tomorka* owners to be incorporated into decision making about the WCA's annual irrigation plan?
- 2) Do WCAs have a contract with the VAC to deliver irrigation water to smallholders? Is the VAC office more than 10 km away from the WCA office?

- 3) Is there a concrete delivery schedule that specifies how much and when irrigation canal water will be provided to *dehkans* and *tomorka* owners?
- 4) Are there separate canal intake structures for *dehkans* and *tomorka* owners?
- 5) Are there *mirobs* who deal specifically with the needs of *dehkans* and *tomorka* owners?
- 6) Do *dehkans* and *tomorka* owners pay for the irrigation water that they use, and do those that use more also pay more?

Congruence between the benefits and costs of irrigation water use

- 7) Are there farmers growing state-mandated crops (cotton/wheat) and is the land suitable for this? Are yields of these crops in the area typically lower than 2 tons per ha?
- 8) Are the irrigation fees higher for the crops that provide higher returns per volume of water (for example, highly profitable secondary crops)?
- 9) Are secondary crops included in the water delivery schedule?
- 10) Are irrigation fees paid in full and on time? Is the proportion of the budget that is executed larger than 80 percent of the proposed budget?
- 11) Is the proportion of the area that relies on pumps for irrigation water larger than 50 percent, and do the pumps operate at least 80 percent of the time during the growing season?
- 12) Do farmers that rely on their own pumps for irrigation pay lower fees?
- 13) Do farmers and smallholders at the tail end of the canal receive at least 90 percent of the water as those whose fields are located at the beginning of the canal?
- 14) Do female *dehkans* and *tomorka* owners whose husband is absent have to irrigate their land, mostly at night?

Those who monitor canal water use and canal water users are accountable to these users

- 15) Is the proportion of water the AIS agreed to deliver to the WCA actually measured, monitored, and delivered?
- 16) Does the AIS rely on irrigation pumps and are these in adequate working condition?
- 17) Does the AIS interfere in the WCA's local water management decisions?
- 18) Does the WCA director meet with WCA farmers to discuss water management issues at least once a month?
- 19) Does the AIS meet with WCA directors to discuss water management issues at least once a month?
- 20) Does the WCA have a committee of respected farmers that meets to discuss water management issues?
- 21) Do water delivery contracts between the WCA and its members include "force majeure" conditions?
- 22) Are WCA members able to sanction those who violate operational rules, or can only the AIS do that?
- 23) Does the WCA have sufficient *mirobs* and are they sufficiently qualified?

Users can modify rules and have the right to devise their own institutions, which are part of a larger resource management system

- 24) Does the General Assembly of the WCA meet at least once per year?
- 25) Is there an active supervisory board?
- 26) Are *dehkans* and *tomorka* owners involved in discussions around water management?
- 27) Do the AIS and the *Hokimiyat* leave the WCA to make its own water management decisions?
- 28) Does the WCA have an emergency fund with which to, for example, address canal breakdowns?
- 29) Does the WCA have an agreed-upon vision statement?
- 30) To what extent is the director a respected member of the community?

- 203.** The tool has been applied to each of the case study sites to assess the extent to which they meet the conditions for reducing uncertainty and building trust for sustainably managing common-pool irrigation canal water. For most of the questions, a score is given to each WCA, where 1 indicates “yes” and 0 indicates “no.” For some of the questions the score is determined as explained in the second column of Table 12b. The total score represents the extent to which the WCA meets the Ostrom design principles for local management of irrigation canal water. We have used the data collected for this study to conduct a first test of the draft diagnostic tool. Note that data are not available for all questions for all WCA case studies.
- 204.** Available data suggest that the overall score varies significantly across the ten case studies (see Table 12a and Table 12b). There is a reasonably strong correlation between the overall score for each of the case study WCAs based on the draft diagnostic tool and the overall WCA performance scores as assessed earlier in the report. This could suggest that meeting the Ostrom design principles is related to overall performance of the case study WCAs. Highest scores are obtained by the case study WCAs in Navoi, Surkhandarya, and the two selected WCAs in Fergana Oblast. Three of these four WCAs were also regarded as high performing in our earlier assessment. Only *Kuwa urta buz anori* WCA in Fergana Oblast has a high score for the diagnostic tool and only a medium score for overall performance. This is mainly related to a relatively good score for module 1 on well-defined boundaries of this WCA. The two WCAs with the highest scores for the diagnostic tool are both also high performing according to the earlier assessment (see Table 4). They score particularly well for the design principles regarding “well-defined boundaries” and “congruence between the benefits and costs of irrigation water use.”
- 205.** Among the three WCAs with the lowest scores for the diagnostic tool, two have a low score and one has a medium score according the earlier performance assessment of the case study WCAs (see Table 4). The two lowest-scoring WCAs that also have the lowest performance score particularly low for “well-defined boundaries” and for “congruence between the benefits and costs of irrigation water use.” Further fine-tuning and testing of the diagnostic tool is needed before it can be fully applied in the field.

Table 12a. Application of the diagnostic tool to the 10 case studies (summary)

	Khorezm	Samarkand	Navoi	Namangan	Surkhandarya	Jizzakh	Syrdaryo	Tashkent Oblast	Fergana Oblast (I)	Fergana Oblast (II)
Overall score draft diagnostic tool	6	6	11	4	14	4	3	8	13	14
Overall WCA performance as assessed earlier in report	Medium	Medium	High	Low	High	Low	Medium	High	Medium	High

(i) Are the irrigation fees higher for the crops that provide higher returns per volume of water (e.g., highly profitable secondary crops)?	Yes => score =1 No/no data => score=0	Yes	No	Yes	Yes	No	No secondary crops	No	No	No	No	Yes	Yes	
(iii) Does the irrigation schedule include water delivery for secondary crops?	Yes => score =2 Some => score =1 No => score =0	No	Yes	Yes	No	No secondary crops	No	No	Yes	Yes	Yes	Yes	Yes	
(iv) Are irrigation fees paid in full and on time? What is the proportion of the budget that is executed?	(>60 % => score =1) (<60 % => score =0)	83%	46%	84%	No data	76%	37%	37%	51%	51%	46%	61%	61%	No data
(v) What proportion of the area relies on pumps for irrigation water and how often during the growing season are the pumps unable to work?	(<33% => score =-1) (>33% => score =0)	46%	84%	No data	76%	37%	51%	46%	61%	No data	0%	No data	No data	
(vi) Do farmers that rely on their own irrigation pumps pay lower fees?	Yes => score =1 No/no data => score =0	No data	No data	No data	No data	Yes	No data	No data	No data	No data	No data	No data	No data	
(vii) Water users at the tail end of the canal														
(a) Are farmers at the tail end of the canal or further from the canal scheduled to receive water first?	Yes => score =1 No/no data => score =0	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
(b) Do farmers at the tail end of the canal or further from the canal receive sufficient water?	Yes => score =1 No/no data => score =0	No Data	No data	No	No	No	No	No	Possibly	No data	Yes	No data	Yes	
(viii) To what extent do female farmers whose husband is absent incur higher social costs than men for irrigating their land (e.g., because of the physical strain)?	No/no data => score =1. Yes => score =0	No data	No data	Yes	Yes	No data	No data	No data	Yes	No data	No data	No data	No data	
Score Module 2	5	5	6	3	6	2	3	5	4	6				

Module 3. Those who monitor canal water use and canal water users are accountable to these users	Khorezm	Samarland	Navoi	Namangan	Surkhandarya	Jizzakh	Syrdaryo	Tashkent	Fergana (I)	Fergana (II)
(i) What proportion of the water the AIS agreed to deliver to the WCA is actually delivered? Is this measured?	Not scored	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
(ii) Does the AIS rely on irrigation pumps, and how old are these?	Data are available on the number of pumps operated by AIS/APS (Administration of Pump Stations) (In poor condition/ no data =0)	6 (in poor condition)	13 (in poor condition)	No data	In poor condition	In poor condition	No data	No data	1 (in poor condition)	No pumps
(iii) To what extent is the AIS involved in the day-to-day administration of the WCA?	Not scored	No data	No data	No data	High involvement	No data	High involvement	No data	No data	No data
(iv) How often does the WCA director meet with WCA farmers to discuss water management issues?	(at least once every two weeks during the growing season => score =1) (< once a month/ No data => score =0)	No data	No data	No data	No data	No data	No data	No data	No data	No data
(v) How often does the AIS meet with WCA directors to discuss water management issues?	(at least once every 10 days during the growing season => score =1) (Otherwise: score =0)	No data	No data	No data	No data	No data	No data	No data	Once every 10 days	Once every 10 days
(vi) Does the WCA have a committee of respected farmers that meets to discuss water management issues?	(Yes => score =1) (no/no data => score =0)	No data	No data	No data	No data	Yes	No data	Yes	No data	No data
(vii) Do water delivery contracts between the WCA and its members include "force majeure" conditions?	(Yes => score =1) (no/no data => score =0)	No data	No data	No data	No data	No data	No data	No data	Yes	No data
(viii) Are WCA members able to sanction those that violate operational rules, or can only the AIS do that?	WCA administration can have a strong informal influence on farmers' water use behavior and water delivery schedule (not scored)	No	No but WCA has informal influence	No but WCA has informal influence	No	No but WCA has informal influence	No	No but WCA has informal influence	No but WCA has informal influence	No but WCA has informal influence

(ix) How many mirobs does the WCA have and are they sufficiently qualified?	(In most cases it was said that mirobs are not qualified enough) Number of mirobs	2 full-time, 2 part-time	11	2 full-time	2 full-time	6 full-time	4 full time	2 full-time	1 full-time, 1 part-time	5	2 full-time, 8 part-time
	Length of canal (km) Number of mirobs	92.6	1,097	113	150	213	155	216	25	41	26
	Km of canal per full-time mirob	31	100	57	75	36	39	108	17	8	4
	(<50 km per mirob => score =1) (>50 km per mirob => score =0)										
Score Module 3											
		1	0	0	0	1	1	0	2	3	2

Module 4. Users can modify rules and have the right to devise their own institutions	Khorazm	Samarkand	Navoi	Namangan	Surkhandarya	Jizzakh	Syrdaryo	Tashkent	Fergana (I)	Fergana (II)	Estimations provided in the report		Overall WCA performance as assessed earlier in report
											Medium	High	
(i) How frequently does the General Assembly meet?	(Not scored)	1-2 times per year	Once per year	0-1 times per year	2 times per year	Once per year	0-2 times per year	1-2 times per year	1-2 times per year	1-2 times per year			
(ii) Is there a supervisory board and how often does it meet?	According to the study, all 10 WCAs have a supervisory board, but it is not clear how active the board is and how to measure activeness (not scored)	Yes but no data on meeting frequency											
(iii) Does the WCA have an emergency fund with which to, say, address canal breakdowns?	(Yes => score =1) (No/ no data => score =0)	No data	No data	No data	No data	Yes	No data	No data	No data	No data			
(iv) (a) Does the WCA have an agreed vision statement?	There are no data about the vision statement	No data	No data	No data	No data	Yes	No data	No data	No data	No data			
(b) Is the director a respected member of the community?	Answers refer to the second question (Yes => score =1) (No/ no data => score =0)	No data	Yes	Yes	Yes	Yes	No data	No data	Yes	Yes			
Score Module 4		0	1	1	1	2	0	0	1	1			
Overall Score		6	6	11	4	14	4	3	8	13			

Rolling out the assessment method to other Central Asian countries

206. **This country study served as the pilot to test the approach and methodology before rolling it out to other Central Asian countries.** Countries in this region share the same history where after the dismantling of state-dominated institutions that served communal farming methods under the Soviet Union, an institutional vacuum existed for the local management of irrigation canal water. Countries subsequently experimented with different institutional arrangements for local irrigation canal water management.
207. **There is therefore an opportunity for cross-country learning on what has worked best under the circumstances that exist in Central Asia and why.** The draft diagnostic tool can help with this learning process. It enables an assessment of the conditions that are important for reducing uncertainty and building trust among irrigation users as well as with government providers that are essential for the sustainable management of local irrigation canal water management. The diagnostic tool also helps to subsequently track these conditions. However there is a need to further test and fine-tune the diagnostic tool in each of the Central Asian countries to make sure the specific institutional situation in each of the countries is reflected in the questions that make up the tool, while keeping the nature of the questions the same to enable cross-country comparison.

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Appendix 1. Sampling

Table A1. Sampling criteria

Oblast	Khorezm	Samarkand	Navoi	Namangan	Surkhandarya	Jizzakh	Syrdaryo	Tashkent Oblast
District	Urgench	Kattakurgan	Kyzyltep	Pap	Denov	Dustlik	Akaltyn	Akhangaran
WCA name	Goybu	Politemit-BKh	Suvchi Mehnat-Rohat	Chodak	Hazarbag-Denov Sakhovati	Haet Boshi	Mustakil Dier	Alisher Navoiy
Donor support (yes/no)	No	Yes	Yes	Yes	No	No	No	Yes
Water availability (high/medium/low)	Low	High	Medium	Low	Low	Medium	Medium	High
Extent of crop diversification/ extent of adoption of horticulture (high/medium/low)	Medium	Medium	High	Low	Medium	Medium	Medium	High
Population density (high/medium/low)	High	High	Low	High	Low	Low	Medium	High
Gender representation in WCA (high/medium/low)	Medium	High	Medium	Low	High	Medium	Medium	High
WCA performance (good/medium/poor)	Medium	Good	Medium	Poor	Good	Poor	Medium	Medium

Table A2. Case study WCAs selected for the first round of data collection and types of respondents interviewed in each site

Cases	Amount of data by groups of respondents		
	Local government	Representatives of WCA (number of key informant interviews position in WCA, gender, level of education of each respondent)	Private farmers (number of KIIs, gender, amount of land, year when started his/her private farm)
Khorezm	Hokimiyat, BAIS, and AIS	1—Head, male, vocational education (specialization—agriculture), more than 20 years of work experience 2—Accountant, male, vocational education (economics), 3–10 years of work experience 3—Mirob, male, higher education (irrigation), more than 20 years of work experience	1—Female, 1997, 45 ha 2—Male, 2001, 47 ha 3—Male, 2011, 82 ha 4—Male, 2002, 5 ha 5—Male, 2002, 90 ha 6—Male, 2001, 14 ha
Samarkand	Hokimiyat, BAIS, and AIS	1—Head, male, vocational education (irrigation), more than 20 years of work experience 2—Accountant, male, vocational education (economics), 3–10 years of work experience 3—Engineer, male, higher education (irrigation, drainage), more than 20 years of work experience	1—Male, 2004, 574 ha 2—Male, 2006, 92 ha 3—Male, 1999, 126 ha 4—Male, 2011, 189 ha 5—Male, 2004, 266 ha 6—Male, 2004, 177 ha
Navoi	Hokimiyat, BAIS, and AIS	1—Head, male, vocational education (irrigation), more than 20 years of work experience 2—Accountant, male, vocational education (economics), more than 20 years of work experience	1—Male, 2003, 117 ha 2—Male, 2003, 86 ha 3—Male, 2004, 85 ha 4—Male, 2004, 56 ha 5—Male, 2001, 113 ha 6—Male, 2012, 56 ha
Namangan	Hokimiyat, BAIS, and AIS	1—Head, male, 10 years of school, 10–20 years of work experience 2—Accountant, male, vocational education (economics), 10–20 years of work experience	1—Male, 1994, 247 ha 2—Male, 2013, 57 ha 3—Female, 2013, 159 ha 4—Male, 1999, 189 ha 5—Male, 2002, 427 ha 6—Male, 2003, 70 ha
Surkhandarya	Hokimiyat, BAIS, and AIS	1—Head, male, higher education, more than 20 years of work experience 2—Accountant, male, vocational education (agriculture), more than 20 years of work experience	1—Male, 2006, 88 ha 2—Male, 2006, 90 ha 3—Male, 2007, 140 ha 4—Male, 2000, 108 ha 5—Male, 2006, 58 ha 6—Male, 1995, 130 ha 7—Male, 2007, 61 ha
Jizzakh	Hokimiyat, BAIS, and AIS	1—Head, male, 10 years of school, more than 20 years of work experience 2—Accountant, male, vocational education (economics), more than 20 years of work experience	1—Male, 2004, 74 ha 2—Male, 2002, 73 ha 3—Male, 2004, 74 ha 4—Male, 1996, 98 ha 5—Male, 2002, 107 ha 6—Male, 2002, 73 ha
Syrdaryo	Hokimiyat, BAIS, and AIS	1—Head, male, vocational education (agriculture), 3–10 years work of experience 2—Accountant, male, vocational education (agriculture), more than 20 years of work experience	1—Male, 1993, 115 ha 2—Male, 2010, 49 ha 3—Male, 2010, 67 ha 4—Male, 2003, 56 ha 5—Male, 2010, 48 ha 6—Male, 2003, 63 ha
Tashkent Oblast	Hokimiyat, BAIS, and AIS	1—Head, male, higher education (irrigation), 10–20 years of work experience 2—Accountant, female, vocational education (economics), 3–10 years of work experience	1—Male, 2011, 60 ha 2—Male, 2007, 11 ha 3—Male, 1999, 127 ha 4—Female, 2003, 47 ha 5—Female, 2007, 37 ha 6—Male, 2007, 65 ha
Total	25 interviews	18 interviews; 16 male and 2 female respondents	49 interviews; 45 male and 4 female respondents

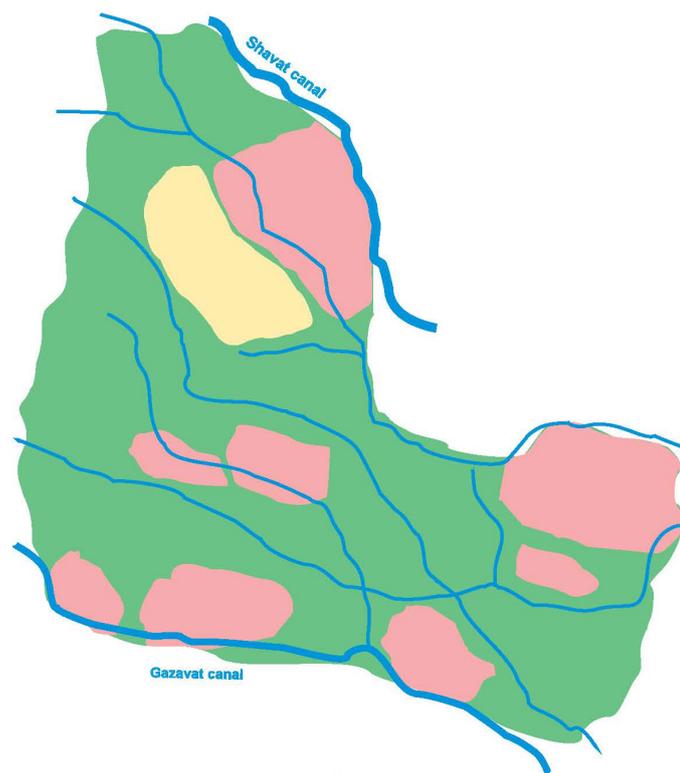
Table A3. Case study WCAs selected for the second round of data collection and groups of respondents interviewed in each site

WCA (region)	WCA performance	WCA director/ accountant	VAC head	Private farmer	Dehkan farmer	Tomorka owner	AIS
Navoi	Excellent	Male	Male	Male	Male	Female	-
Tashkent Oblast	Good	Male	Male	Male	Male	Female	-
Namangan	Poor	Male	Male	Female	Male	Male	-
Fergana Oblast (case 9)	Good	Female	Male	-	Male	Male	-
Fergana Oblast (case 10)	Excellent	Male	Male	Male	Male	Male	Male

Appendix 2. Description of each research site

Introduction to Case Study 1. Goybu WCA, Urgench District, Khorezm Oblast. This WCA has about 100 km of canals that irrigate about 1,500 ha for 43 members (see Table 2 and Map A2.1). Seventy percent of the area depends on pump irrigation, making it the WCA in our sample with the highest dependency on electric water pumps. There are four pumps on the WCA's balance sheet, four pumps on the AIS's, and 35 on farmers' balance sheets. Most farmers have a pump and incur electricity expenses, and have to buy and maintain the pumps. If a WCA's pump is broken, farmers provide the WCA with spare parts and cover the labor costs of the repair. The WCA has no electricity payment debts. However, it has a salary debt (Soum 3.3 million). There were said to be frequent electricity outages that affect water availability. The head of the WCA has established good working relations with farmers, officials, and VAC/mahalla leaders. Members of the WCA are generally satisfied with the services; they are motivated to pay the irrigation service fee on time and to keep common parts of the irrigation system in good shape. The WCA has an office with the necessary office equipment. The WCA plays an important role in resolving conflicts among farmers. The plots of dehkans and tomorka owners use water from interfarm and on-farm canals without paying. There are no contracts between the WCA and VAC/mahalla who represent the dehkans and tomorka owners.

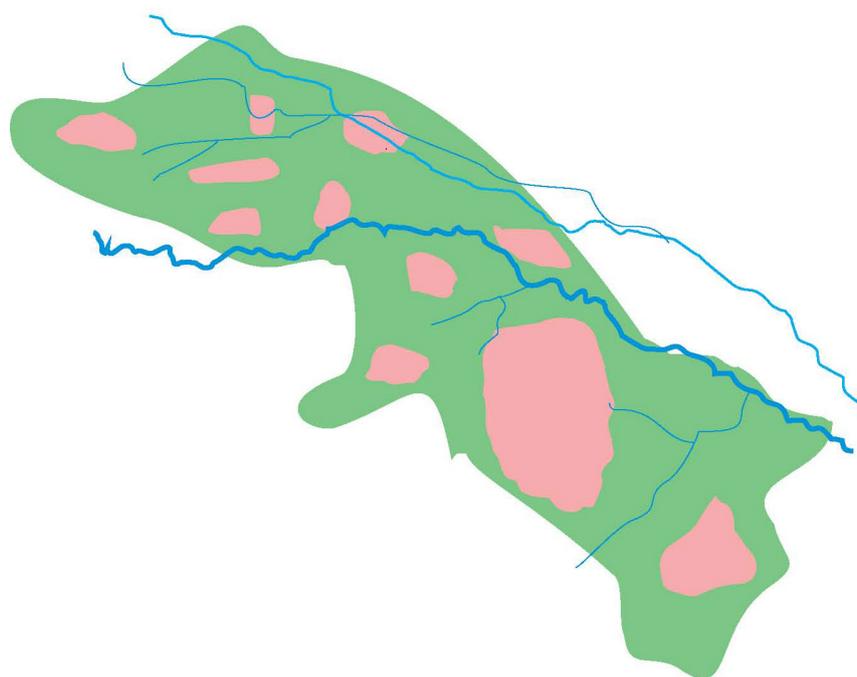
Map A2.1. Map of Goybu WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



- LEGEND**
Region: Khorezm
District: Urgench
WCA: Goibu
- - Private Farmers (Irrigated Land)
 - - Tomorka / Dehkans
 - - not used salted land
 - - Irrigation canal

Introduction to Case Study 2. Politemit-BKh WCA, Kattakurgan District, Samarkand Oblast. This is the largest WCA in our sample. It has 202 members and almost 1,100 km of canals that irrigate about 23,000 ha (see Table 1 and Map A2.2). There is only one WCA in all of Kattakurgan district and all farmers are members of the WCA. Before 2010, there used to be four WUAs, but all of them were merged into one WCA. One-third of the area is served by pump irrigation. The director of this WCA is respected by both farmers and local authorities. He spends a lot of time in the field working with farmers and advising them. The WCA office is located in the same building as the hokimiyat. The WCA has a well-furnished office and is equipped with at least three computers, a printer, a scanner, and a copy machine. Water availability is satisfactory for state-mandated crops, but less so for secondary crops. The WCA area is located far from the main canal and from April to May there is a seasonal drop in water availability in the main canal, which particularly affects the secondary crops, as priority is given to the state-mandated crops. The plots of dehkans and tomorka owners are located nearer to the main canal than farmers' land, and are irrigated using water from the WCA irrigation system, taking water from the canals whenever they can. They are not WCA members and do not pay for the water.

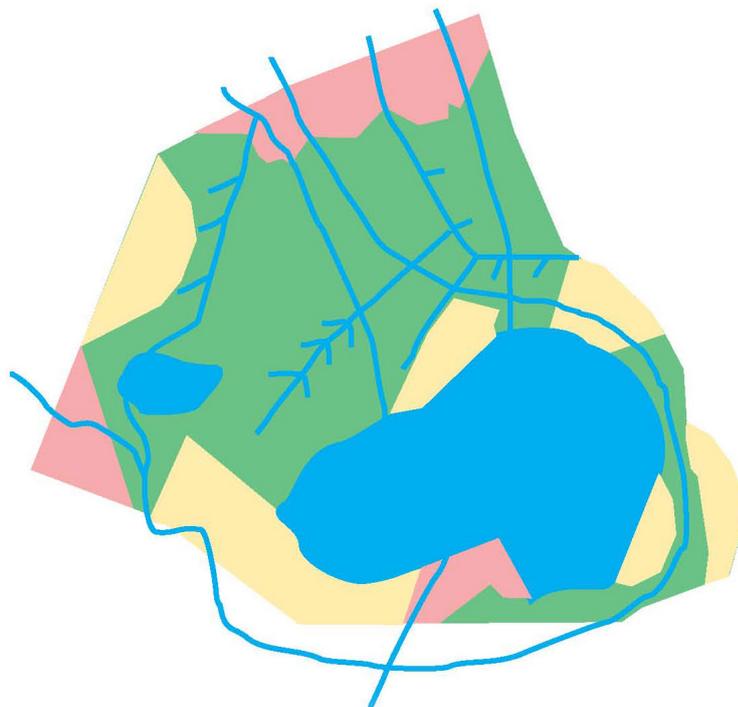
Map A2.2. Map of Politemit-BKh WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



LEGEND
 Region: Samarkand
 District: Kattakurgan
 WCA: Politemit BX
 ■ - Private Farmers (Irrigated land)
 ■ - Tomorka / Dehkans
 ~ - Irrigation canal

Introduction to Case Study 3. Suvchi Mehnat-Rohat WCA, Kyzyltep District, Navoi Oblast. This WCA has 15 members and covers about 1,000 ha (See Table 1 and Map A2.3). Farmers conveyed that usually there is enough water both for main and secondary crops, but there are water supply shortages due to droughts or unlimited water consumption by dehkans and tomorka owners. The WCA has a proper office and functioning computers. The WCA has no debt and farmers pay their irrigation fees on time. Farmers claimed they are keen to work together to manage water resources. They have heard that water management is worse in other WCAs and are proud that theirs functions well. The WCA’s director is well educated and well off, and respected by farmers and members of the local community. Dehkans and tomorka owners take water from the WCA canals whenever they can. They do not pay and believe it is a private farmer’s responsibility to clean and maintain canals. Some tomorkas are located between the main canal and the farmers’ fields. Their unscheduled withdrawals from the WCA interfarm canals cause frequent conflicts between farmers and the WCA administration. However, the WCA has no legal way to limit their consumption. There are no canal intakes to the land of dehkans and tomorka owners.

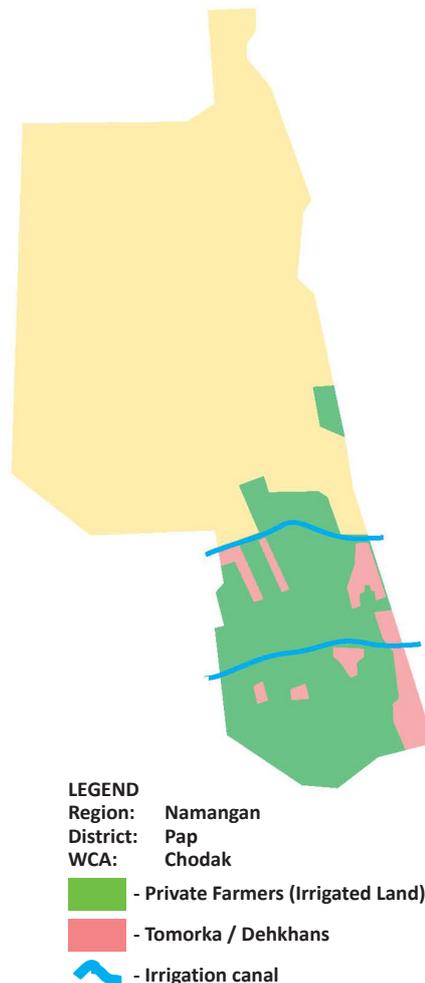
Map A2.3. Map of Suvchi Mehnat-Rohat WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



- LEGEND**
 Region: Navoi
 District: Kyzyltepa
 WCA: Suvchi Mehnat-Rohat
- - Private Farmers (Irrigated Land)
 - - Tomorka / Dehkans
 - - not used salted land
 - - Irrigation canal
 - - Lake

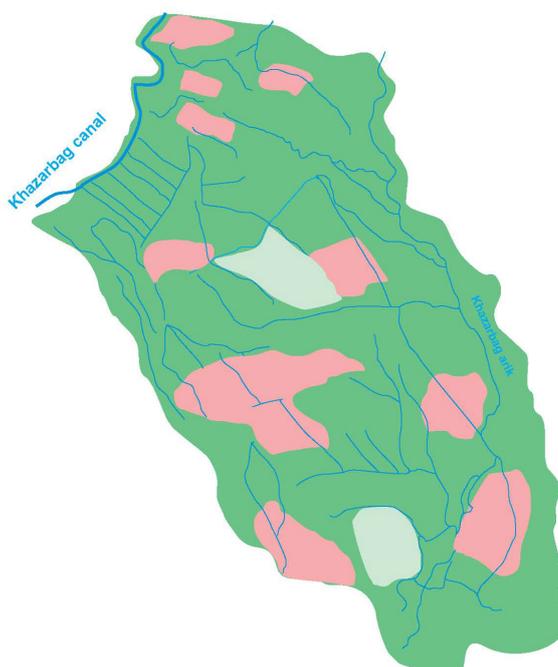
Introduction to Case Study 4. Chodak WCA, Pap District, Namangan Oblast. This is one of the smaller WCAs in our sample with 113 km of canals and ten members (Table 1 and Map A2.4). It is located in hilly terrain. Water is delivered to the WCA by two pump stations operated by the AIS. It was said there are frequent shortages in electricity supply, and the stations are often out of order. The AIS has no resources with which to install new equipment. The pump stations were built in the 1950s, and are now so old that spare parts are no longer available on the market. This forces the AIS to use parts from other equipment, which does not last long. Farmers interviewed for this study claimed there are constant problems with water supply to the fields, resulting in low agricultural yields. The soil tends to be poor, not very suitable for cotton and wheat cultivation, and soil salinity was said to be high. Only half of the land in the area is suitable for farming, and landslides often occur. Some farmers have not been able to meet their quota of state-mandated crops and either gave up or had to give up their land. Farmers do not want to pay for water since they claim the WCA does not deliver enough to them. Farmers have no interest in investing in the joint management of water. Many of them claimed the WCA administration has poor management skills. The WCA head and most of the WCA staff have less than secondary education. They were said to have poor record-keeping skills and do not engage in long-term planning. Dehkans and tomorka owners use water from a mountain river. Dehkans also use wells and drip irrigation technology. Some claimed that in this WCA it is much preferable to be a dehkan, as you can more easily choose the most suitable crops for the situation and you have less land to manage than a private farmer.

Map A2.4. Map of Chodak WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



Introduction to Case Study 5. Hazarbag-Denov Sakhovati WCA, Denov District, Surkhandarya Oblast. This WCA is among the larger ones in our sample, with 84 members and an area of about 4,000 ha (see Table 1 and Map A2.5). Nearly all land (96 percent) is served through gravity irrigation. Farmers claimed to all get enough water, irrespective of where their plot is located. There is a strict schedule, and everybody follows it. The head of the WCA is well respected by the members. He has completed higher education and has extensive experience in agriculture. He advises farmers on cultivation and water management matters. Even staff from the hokimiyat come to him for advice. (He believes that farmers should not be given land to cultivate before they have undergone agricultural training.) The WCA has a proper office and good equipment, including computers. Farmers pay their irrigation fees on time. The WCA has no debt. Unlike other ones, this WCA employs two accountants: one to work with farmers and one to work specifically with dehkans. The WCA employs five mirobs who take care of water in the area. Dehkans and tomorka owners are included in the water distribution schedule and receive water accordingly in sufficient amounts. There are separate canal off-takes for dehkan/tomorka owners' land. It allows the WCA to deliver water to their land according to a certain schedule and to control what is supplied. The WCA has a contract with the VAC and mahalla offices. The head of the VAC and mahalla leaders represent dehkans/tomorka owners at the WCA meetings. If there are any shortages in supply, dehkans/tomorka owners complain to the VAC or mahalla office. Dehkans and tomorka owners pay the irrigation fee to mahalla offices or to the VAC. The tariff is Soum 150 per 0.01 ha. Then, mahalla offices and the VAC transfer the money to the WCA. If dehkans or tomorka owners do not have cash, they can pay by debit card at the bank.

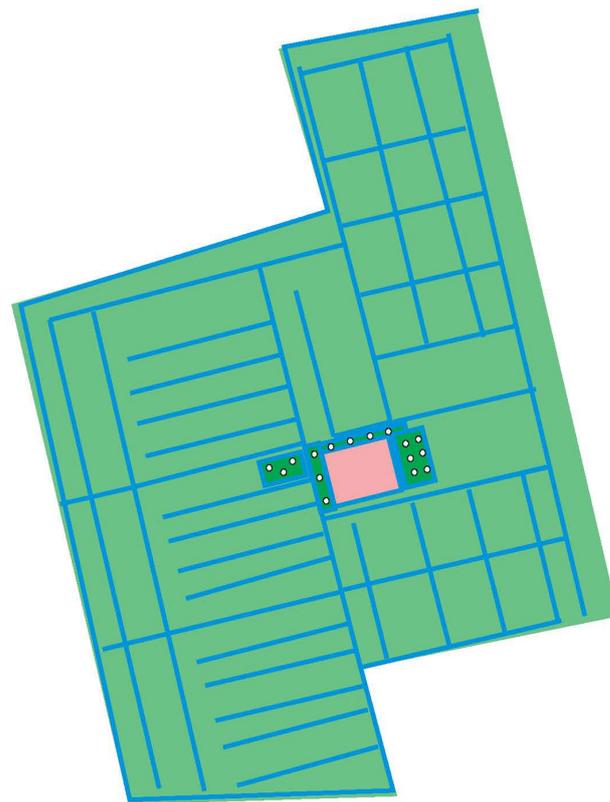
Map A2.5. Map of Hazarbag-Denov Sakhovati WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



- LEGEND**
 Region: Surkhandarya
 District: Denau
 WCA: Khazarbog-Denov Sakhovati
- Private Farmers (Irrigated Land)
 - Tomorka / Dehkans
 - Plough-land
 - Irrigation canal

Introduction to Case Study 6. Haet Boshi WCA, Dustlik District, Jizzakh Oblast. This WCA has 115 km of canal, which is small relative to the total size of the irrigated area (about 4,000 ha; see Table 1 and Map A2.6). Dependency on pump irrigation is high (50 percent) due to the somewhat hilly terrain. There are frequent electricity outages that interrupt the irrigation pumps. Farmers have trouble paying electricity bills. There are two pumps on the balance sheet of the WCA, one of which was broken when the field research took place. Farmers own another 12 pumps and pay for their electricity themselves. Soil salinity is high. The WCA head has only ten years of schooling and was said to have limited planning skills. He often relies on the better-trained and more experienced accountant. The WCA has only one room for an office situated in the hokimiyat building. There is no computer. All documents are stored at the accountant's house. The WCA employs eight people, and only two of them have educational qualifications above secondary school. Half of the farmers do not pay for water. The WCA has significant debt and has not paid any salary to its employees for months. The head of WCA has asked the hokimiyat for help in convincing farmers to pay. The interests of dehkans and tomorka owners are represented in the WCA through the VAC. They are supplied with water according to a schedule. They claimed to pay for water to the VAC head but it is not clear how these payments appear on the WCA books.

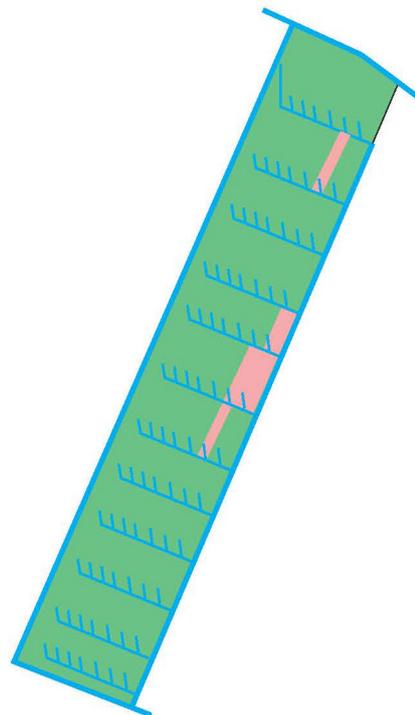
Map A2.6. Map of Haet Boshi WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



- LEGEND**
 Region: Jizzakh
 District: Dustlik
 WCA: Hayot Boshi
- Private Farmers (Irrigated Land)
 - Tomorka / Dehkans
 - Irrigation canal

Introduction to Case Study 7. Mustakil Dier WCA, Akaltyn District, Syrdaryo Oblast. This WCA has 44 members and a total irrigated area of about 2,500 ha. Total canal length is 216 km (see Table 1 and Map A2.7). Only 15 percent is pump irrigated. The WCA head is relatively young but has a good education and strong managing skills. He has established good relations with the AIS and all the farmers, and knows how to promote cooperation among members. His team is well qualified. The accountant, agronomist, and land surveyor have higher education. The WCA has a one-room office that is well furnished and large enough to hold meetings with farmers. Overall, farmers claim water is sufficiently available for their state-mandated crops, but less than satisfactory for lucrative secondary crops. The mission statement of the sampled WCA in Syrdaryo says that it aims to “help all farmers meet the state quota.” Farmers share this mission and claim they work well with the WCA administration. Despite the fact that irrigation fees are low, a significant number of farmers pay late. The main reason is that farmers are only able to pay once they receive their harvest payments from the government, and farmers say they receive these late. However, farmers also use their own funds to maintain the irrigation system (both on their own plots and in the common canals). Some also provide the WCA with machines for free. In return the WCA keeps the irrigation fees low. The WCA director claimed that a major part of dehkans and tomorka owners’ land is located outside the WCA. They do not receive water from the WCA and do not pay an irrigation fee.

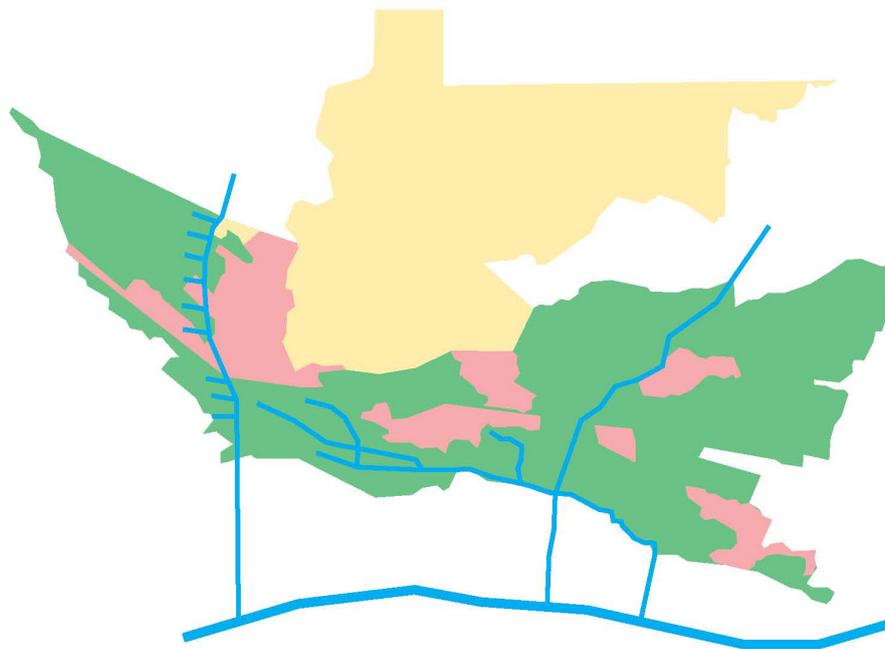
Map A2.7. Mustakil Dier WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



- LEGEND**
 Region: Syrdaryo
 District: Akaltyn
 WCA: Mustakil Dier
 ■ - Private Farmers (Irrigated Land)
 ■ - Tomorka / Dehkans
 — - Irrigation canal

Introduction to Case Study 8. Alisher Navoiy WCA, Akhangaran District, Tashkent Oblast. This WCA covers an irrigated area of about 2,200 ha and has 37 members. The total length of the canal is only 25 km and one-fifth of the area is pump irrigated (see Table 1 and Map A2.8). It is the only WCA in our sample that does not grow any cotton. The head of the WCA is well qualified and knows how to solve operational problems, as well as who to turn to for help. He has experience working with international organizations. There are not many problems with water supply to farmers. The WCA has a decent office equipped with computers. However, fee payment is low and the WCA is fairly indebted. Farmers have to pay the irrigation fees by bank transfer, and only pay when they have money in their accounts, which depends on when they receive payments from the government for the state-mandated crop. A second reason may be that water is easily available in the raion, so farmers' dependence on WCA management is relatively low; this might affect their motivation to pay the fee. Dehkans and tomorka owners receive water from the WCA according to a schedule, and there are separate off-takes to their land. The WCA has a contract with the VAC. The head of the VAC represents dehkans/tomorka owners at the WCA meetings, and if there are any water supply shortages, dehkans/tomorka owners complain to the VAC. Tomorka owners and dehkans pay the irrigation fee to the VAC; the VAC provides receipts and transfers the money to the WCA. The fee is Soum 15,000–20,000 per 1 ha.

Map A2.8. Map of Alisher Navoiy WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners

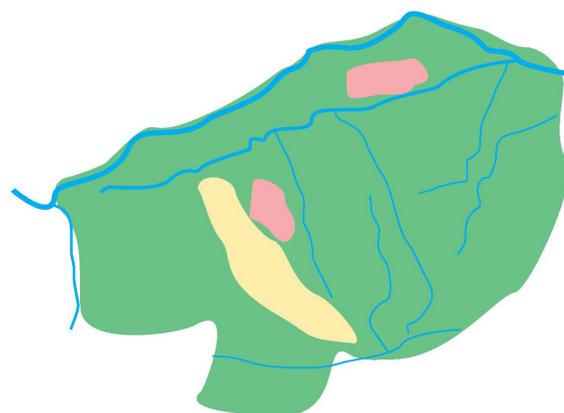


- LEGEND**
 Region: Tashkent
 District: Akhangaran
 WCA: Alisher Navoi
- Private Farmers (Irrigated land)
 - Private Farmers (Not irrigated land)
 - Tomorka / Dehkans
 - Irrigation canal

Introduction to Case Study 9. Kuwa urta buz anori WCA, Kuwa District, Fergana Oblast. This WCA has 135 members and the total irrigated area is about 1,481 ha. The majority of farmers grow horticultural crops; 80 percent of the land is devoted to these, and the remainder to cotton and wheat. The WCA is located at the Kyrgyz border, and water availability is low. The WCA depends heavily (70 percent) on pump irrigation. Water availability is affected by frequent electricity shortages. However, despite this, all respondents thought that the WCA manages to distribute water fairly among all water consumers, including to dehkans and tomorka owners. Highly qualified mirobs were said to distribute efficiently. The distribution schedule is strictly kept and everybody follows it. If farmers are unable to meet the quota due to water supply shortages, the WCA helps prepare official documents to prove that low water availability was the reason, so that there are no penalties for farmers. The WCA received machines from the former shirkat, such as a tractor and a crane. The machinery is well maintained and still used to clean canals. The WCA director is female, has higher education, and is well respected by water consumers, directors of other WCAs in the raion, and the raion administration. The WCA recently installed meters on interfarm canals in this WCA with the help of a donor, SDC, which also held seminars and training.

The largest part of the area (about 1,100 ha) is irrigated by pumps. During the last five years, water availability has declined, for a number of reasons. During the spring and summer, when farmers need water the most, there are 4–5 power outages per day and the WCA can use pumps only around 10 hours per day. During shortages, farmers that grow wheat and cotton receive water first (80 percent of the water is allocated to these farmers), and other farmers and dehkans later. Frequent power interruptions cause pumps to break down. Also, water to the WCA area is delivered by a large government-owned pumping station built in 1978, which needs to be replaced. Last year it was broken for 45 days during the vegetation period. Water consumers claimed the WCA represents farmers well in negotiations with the AIS and hokimiyat. The WCA, for example, has contacted the hokimiyat multiple times to complain about power interruptions, but were told these are outside the local government’s control. The hokimiyat promised a new pump station would be installed in 2016. Dehkans and tomorka owners pay the irrigation fee (Soum 62,000 per ha per year) to the VAC and mahalla offices, and then the fee is transferred to the WCA. Dehkans and tomorka owners are included in the irrigation schedule.

Map A2.9. Map of Kuwa urta buz anori WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners

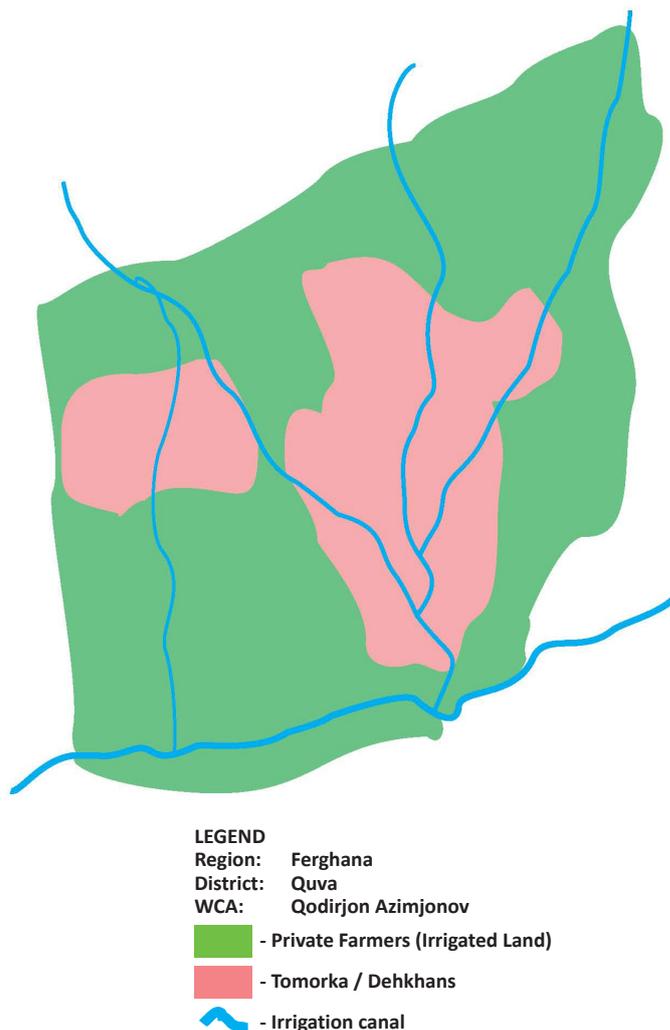


- LEGEND**
 Region: Fergana
 District: Quva
 WCA: Quva urta buz anori
- Private Farmers (Irrigated land)
 - Tomorka / Dehkans
 - Not used land - mountains
 - Irrigation canal

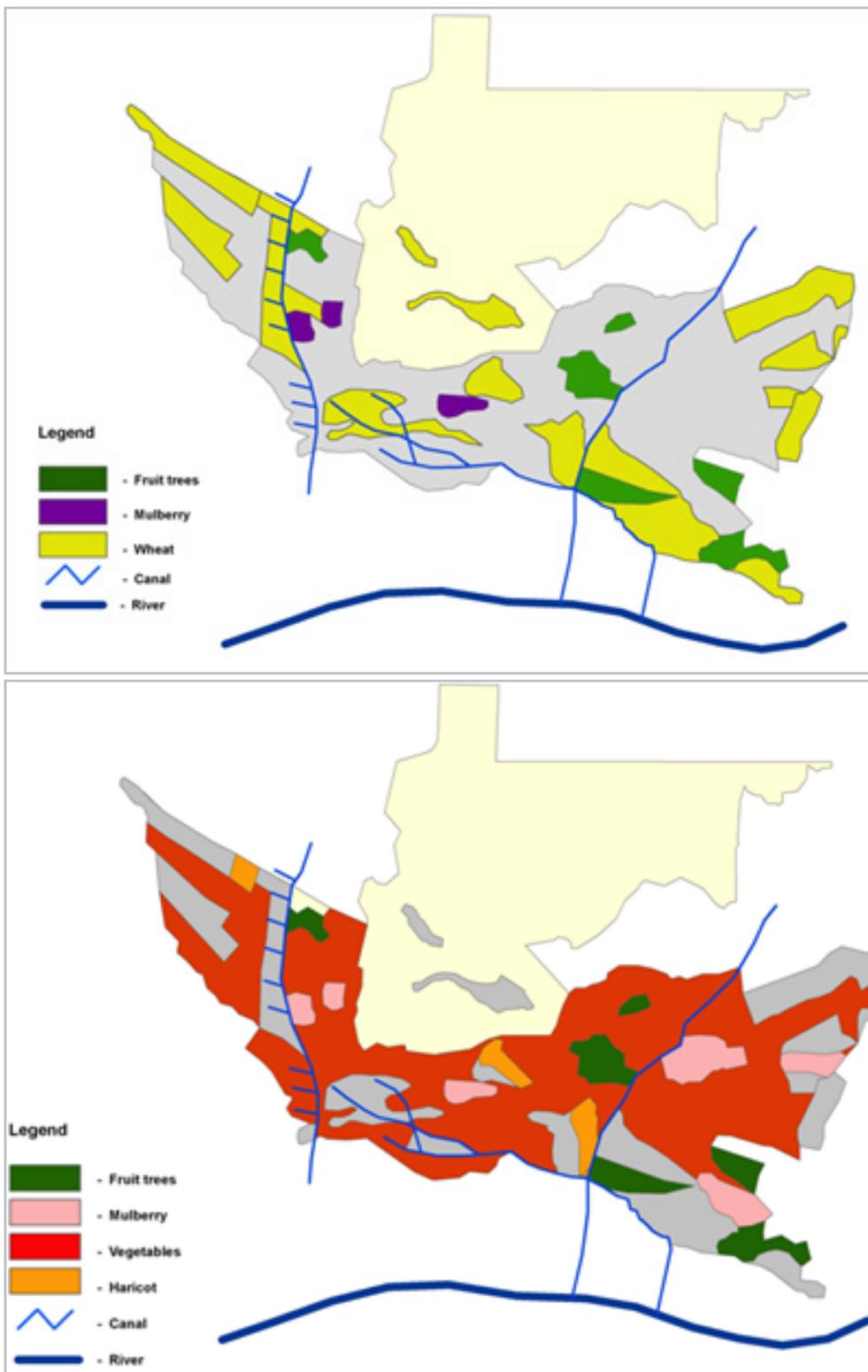
Introduction to Case Study 10. Qodirjon Azimonov WCA, Kuwa District, Fergana Oblast. This WCA has 50 members; 24 grow wheat and cotton, 10 grow horticultural crops; there are also 15 mahalla and 1 VAC. The total irrigated area is 3,406 ha. There is enough water for main crops, horticultural crops, and secondary crops. All irrigation is by gravity. Recently the WCA installed meters on interfarm canals in this WCA with the help of a donor, SDC, which also held seminars and trainings). The WCA has a good office (a separate one-floor building) with all the necessary office equipment. The WCA charges farmers that grow wheat/cotton and secondary crops Soum 25,000 per ha per year, and horticultural farmers Soum 45,000 per ha per year. The WCA director and farmers explained the difference is due to the fact that horticultural farmers get higher income and spend less on labor.

The WCA director has secondary vocational education (irrigation), and has worked in the current position for the last four years. Interviewed farmers said that previously, they had a WCA director whom they did not trust. They all went to the supervisory board and complained, and elected a new director. Participants believe that they have the power to choose who will run the WCA. Dehkans and tomorka owners pay the irrigation fee to the VAC and mahalla offices; the fee is then transferred to the WCA. Dehkans and tomorka owners are included in the irrigation schedule. According to the WCA head the fee is Soum 200 per 0.01 ha per year.

Map A2.10. Map of Qodirjon Azimonov WCA showing irrigated area, irrigation canals, and farmland of private farmers and dehkans/tomorka owners



Map A2.11. Land use in the case study WCA in Akhangaran, Tashkent Oblast, where farmers do not have to grow state-mandated crops and can freely grow secondary crops on their land



Note: The top map represents the winter–spring season and the bottom one the summer–fall season.

Appendix 3. Methodology review and lessons learned

Data used for this study were largely gathered through ten case studies. This method was chosen because it enabled the team to assess the phenomenon of local irrigation water management within its real-life context. Where the boundaries between the phenomenon of local water management and the context within which irrigation water is allocated and used are not clearly evident, case study research can offer a better understanding of this complex issue and add much to what is already known from previous research.

This assessment was the first of a broader regional assessment, and Uzbekistan served as a pilot to test the methodology and determine whether it is suitable for achieving the study's objectives. It is therefore appropriate to review how the method performed and what has been learned.

Overall, the approach generated a wealth of information from a range of contexts and situations, and covered many different stakeholders. Despite the sensitivity of the topic, the method provided us with detailed insight into many different aspects of the local management of irrigation water. The methodology also provided many clear ideas regarding what factors cause the Ostrom design principles to be better met in some WCAs than in others. However, there were also shortcomings, which are summarized below, together with lessons learned and what we will do differently when this research is repeated in a following round.

1. Ensure a balanced sample. We did not have a comprehensive sampling frame of WCAs from which to choose the case study WCAs. Instead, we used lists of WCAs available at the oblast and raion levels. Characteristics of these WCAs were gathered through informal conversations with local government officials. However, this information was probably insufficient to ensure the sampled WCAs comprised a balanced spectrum of high- and low-performing WCAs, or of WCAs with a large and small proportion of areas under horticultural crops, or of high and low overall water availability. In an attempt to correct this, the team had to expand the sample to include WCAs where horticulture plays an important role and where overall, water is relatively scarce.

Lesson learned: It would have been better to put more effort into assessing where water is generally scarce and where it is relatively abundant; choose sample areas from both groups; and then select WCAs from among these. Subsequently, we should have conducted a quick survey of WCAs in selected areas to gather detailed characteristics of the WCAs and then chosen the case studies from among these, making sure a balanced range of characteristics were covered.

2. Cover all stakeholders. The list of stakeholders to be covered needed to be continuously adapted. For example, as evidence came in from the first few case studies, it became apparent that the presence of *dehkans* and *tomorka* owners within the WCA irrigation system was an important factor for local water management. Yet this group of stakeholders was not included in our initial interview lists. Similarly, the head or other members of the WCA board were not interviewed in all WCAs, as their importance became only clear after we had started data collection.

Lesson learned: During the pilot test, the team should have drawn up a list of all water users and all “players” in a WCA and then use this information to design the lists of people to invite to participate in the study.

3. Use researchers instead of facilitators. Case study research requires a thorough understanding of the rationale behind the research, the reasons why it is conducted, and its objectives. It implies more than facilitating discussions and conducting in-depth interviews with stakeholders. Intense efforts are needed to probe, triangulate findings, and cross-check all information that is gathered with other information. It involves taking the initiative to solve any remaining “puzzles” and covering all outstanding issues. We discovered that the data collection team was not always sufficiently prepared for this approach. Once this was realized, a junior international researcher was hired to provide hands-on support for data collection in the field.

Lesson learned: Case study research requires the continuous field presence of a well-trained social scientist who can guide and supervise the data collection team and design follow-up strategies in the field to clarify any issues that come up. This is essential to ensure that every effort is made to obtain the information needed

to thoroughly understand the local situation around irrigation water management. To this end, an irrigation specialist should possibly be added to the research team.

4. Use more participatory data collection tools and spend more time at each case study site. The data collection team was given a high degree of freedom regarding how to collect information in the field. On average, three days were spent at each of case study site. This appeared to be insufficient. Numerous interviews and small group discussions were held with a range of stakeholders. While this generated much valuable information, a more structured data collection that includes more exercises with participants, and that makes use of visual tools such as maps, ranking, and scoring of issues and problems, would have added depth to the gathered data. This would have required longer stays in the field by the data collection team.

Lesson learned: Case study research would have benefited from more structured data collection, using pre-prepared sets of visual exercises, making more use of maps, pictures, and transects to gather data, and conducting group field visits that promoted stakeholders' active participation in the case study area. A longer stay in the field (up to five days) would be necessary to make this possible. After each case study it is a good idea to discuss findings with the team to allow moderators and interviewers involved in data analysis to share observations that might not be reflected in interview transcripts.

5. Obtain more and better technical data. It appeared difficult to obtain reliable statistics on planned and actual water provided to the WCA and to farmers and other water users. Similarly, hard information on crop production, prices, and crop water use were not available, making it difficult to understand incentives and assess economic inefficiencies in local water use.

Lesson learned: It is important to gather technical background data from each of the case study WCAs that includes water use and crop production economics.

6. Expand the sample. Given the diversity of situations in which irrigation water is locally managed, and the many factors at play, ten case studies appeared to not always be sufficient to draw conclusions.

Lesson learned: Depending on the variability in circumstances in which local irrigation water management takes place, expand the sample to 12–15 case studies.



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